L. A. HAWTHORNE.

METAL PUNCHING MACHINE.

APPLICATION FILED JUNE 1, 1914.

1,241,258.

Patented Sept. 25, 1917.

7 SHEETS—SHEET 1.

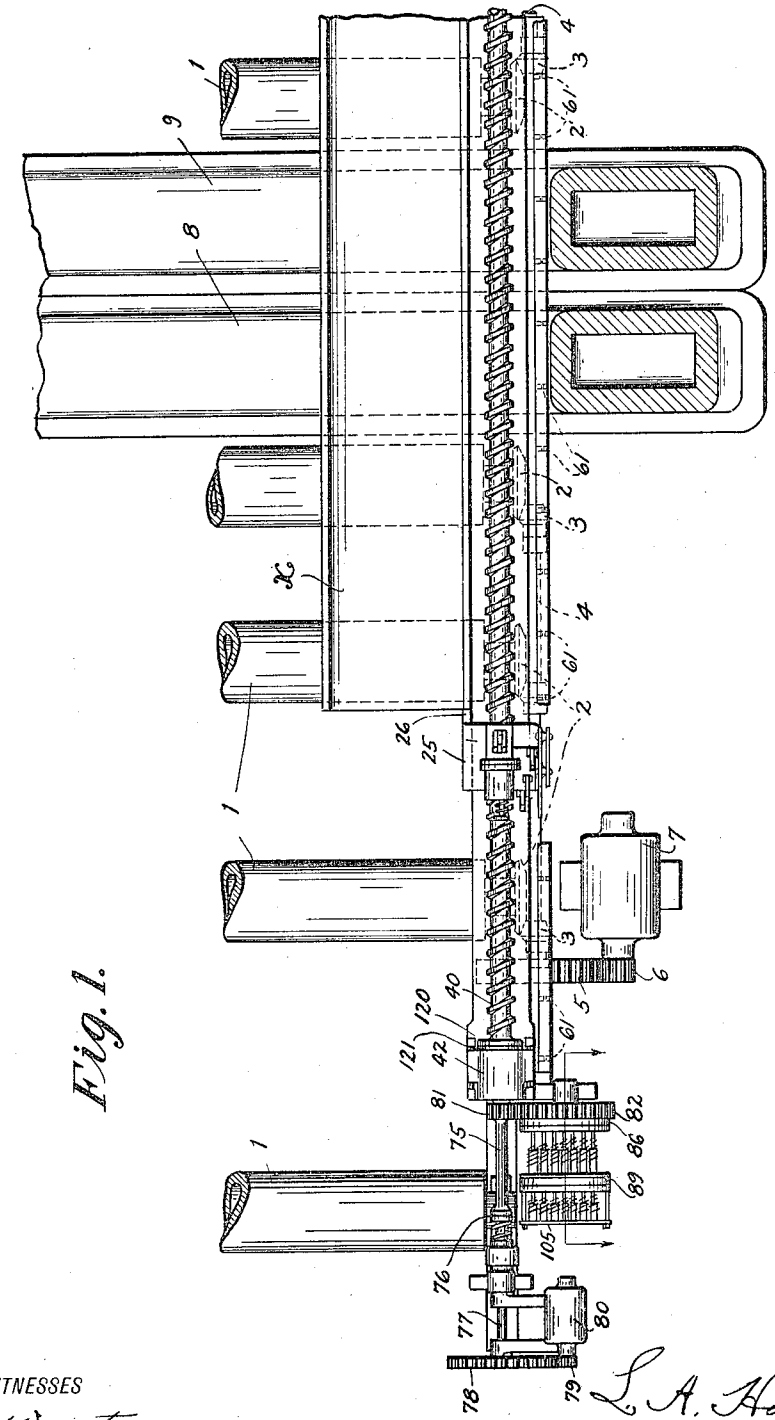



Fig. 1.

WITNESSES

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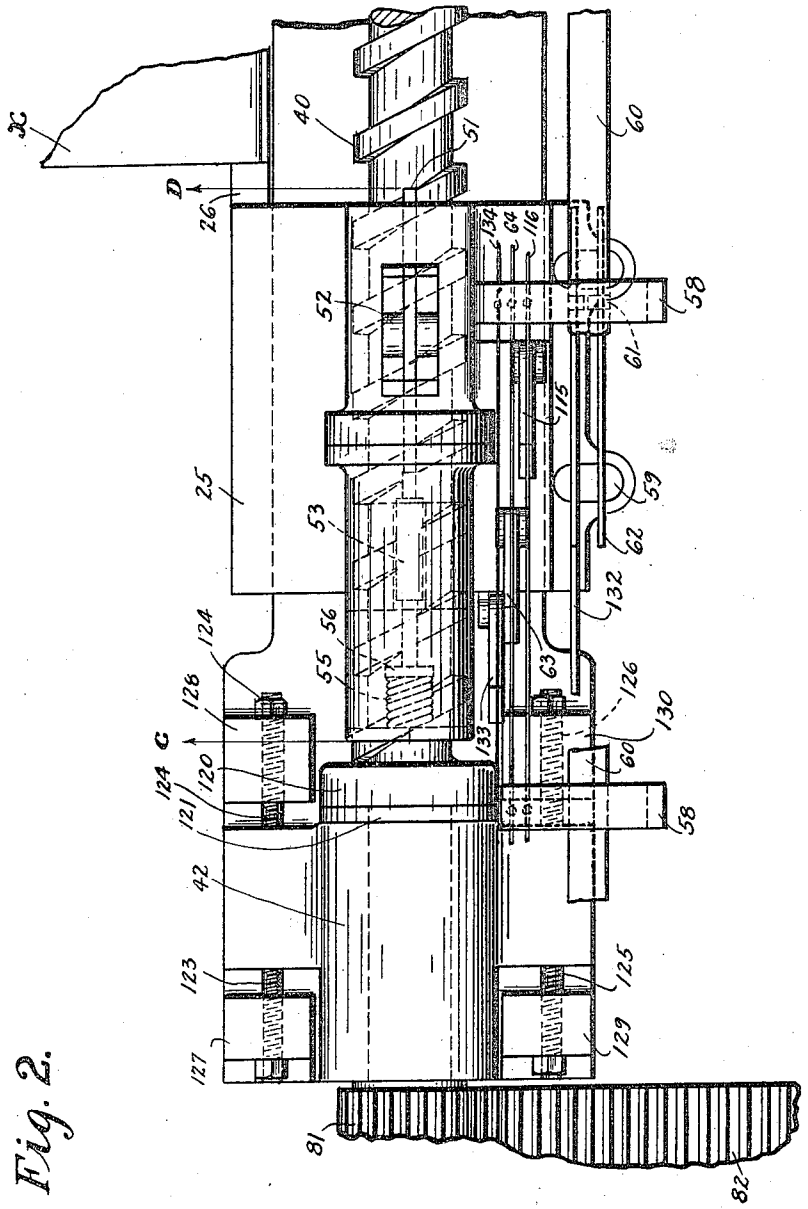



Fig. 2.

WITNESSES

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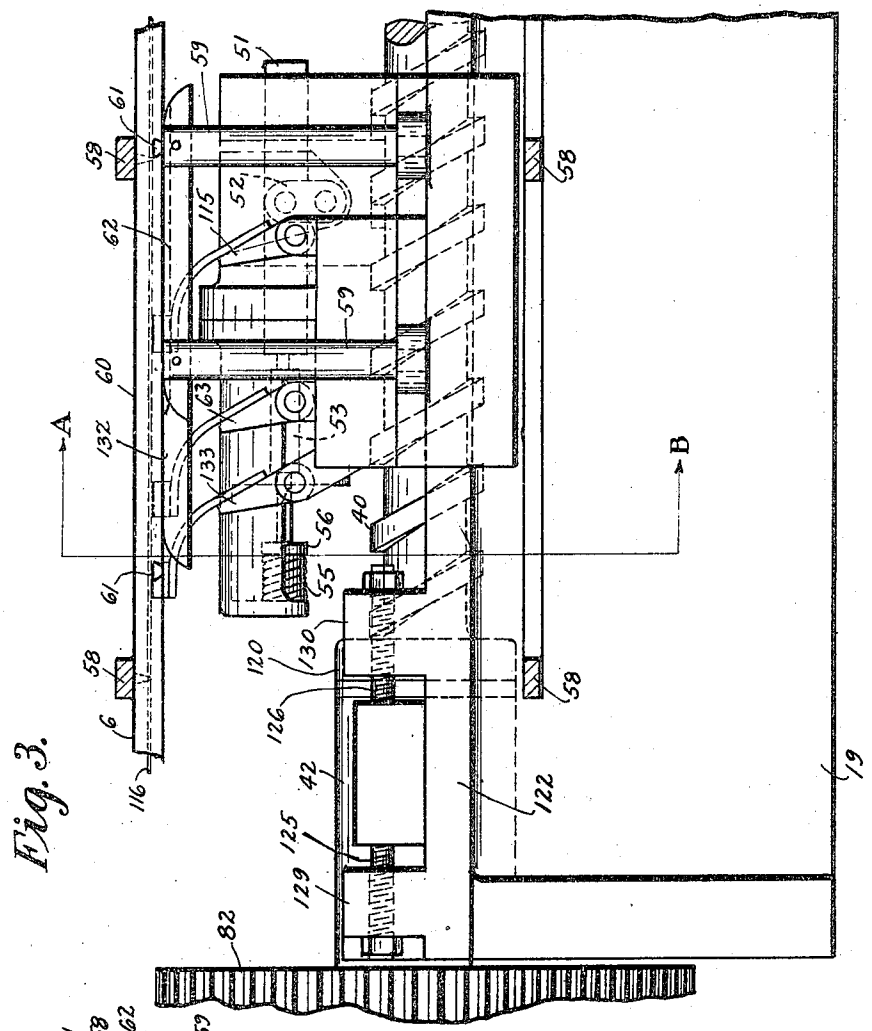



Fig. 3.

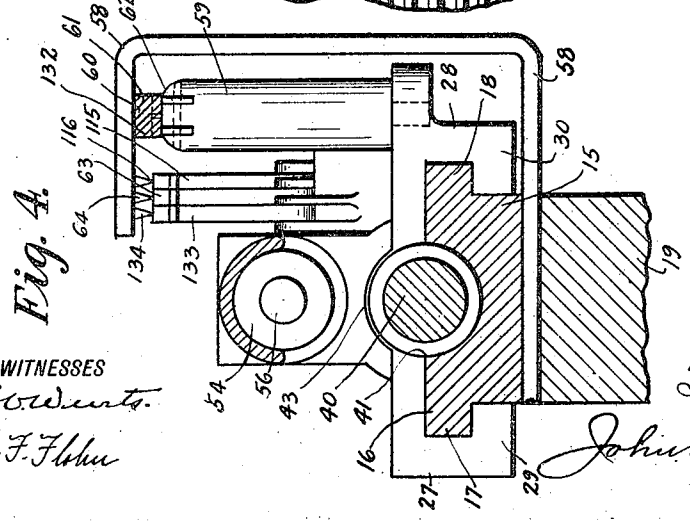



Fig. 4.

WITNESSES

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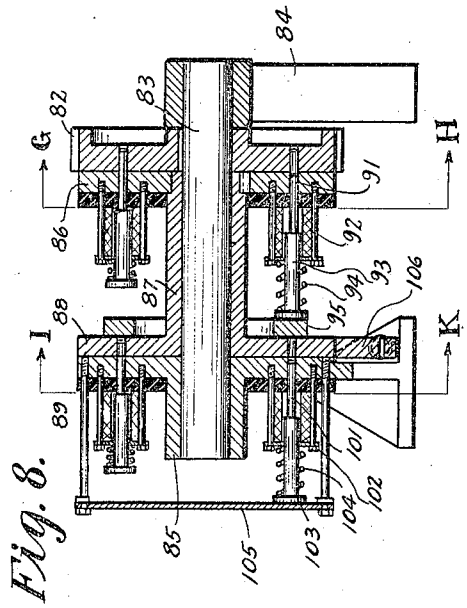



Fig. 8.

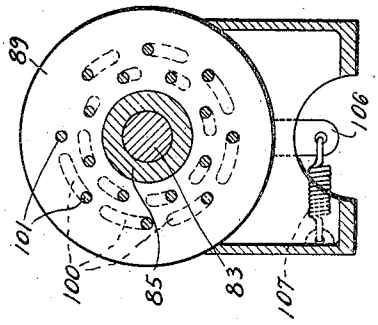



Fig. 10.

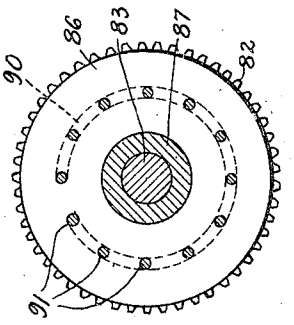



Fig. 9.

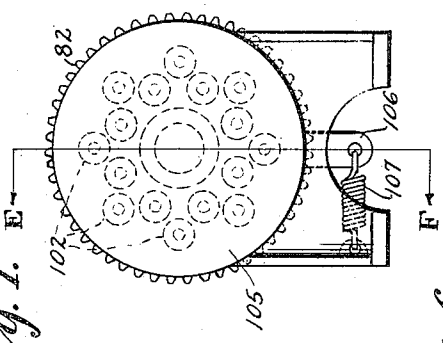



Fig. 7.

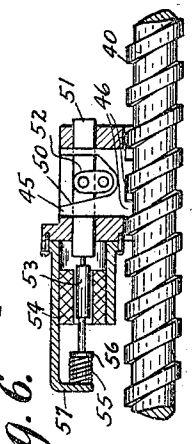



Fig. 6.

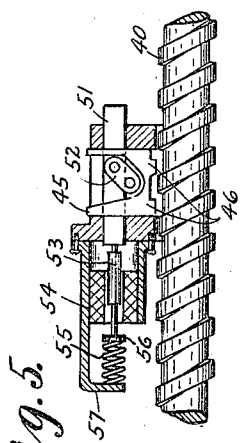



Fig. 5.

WITNESSES

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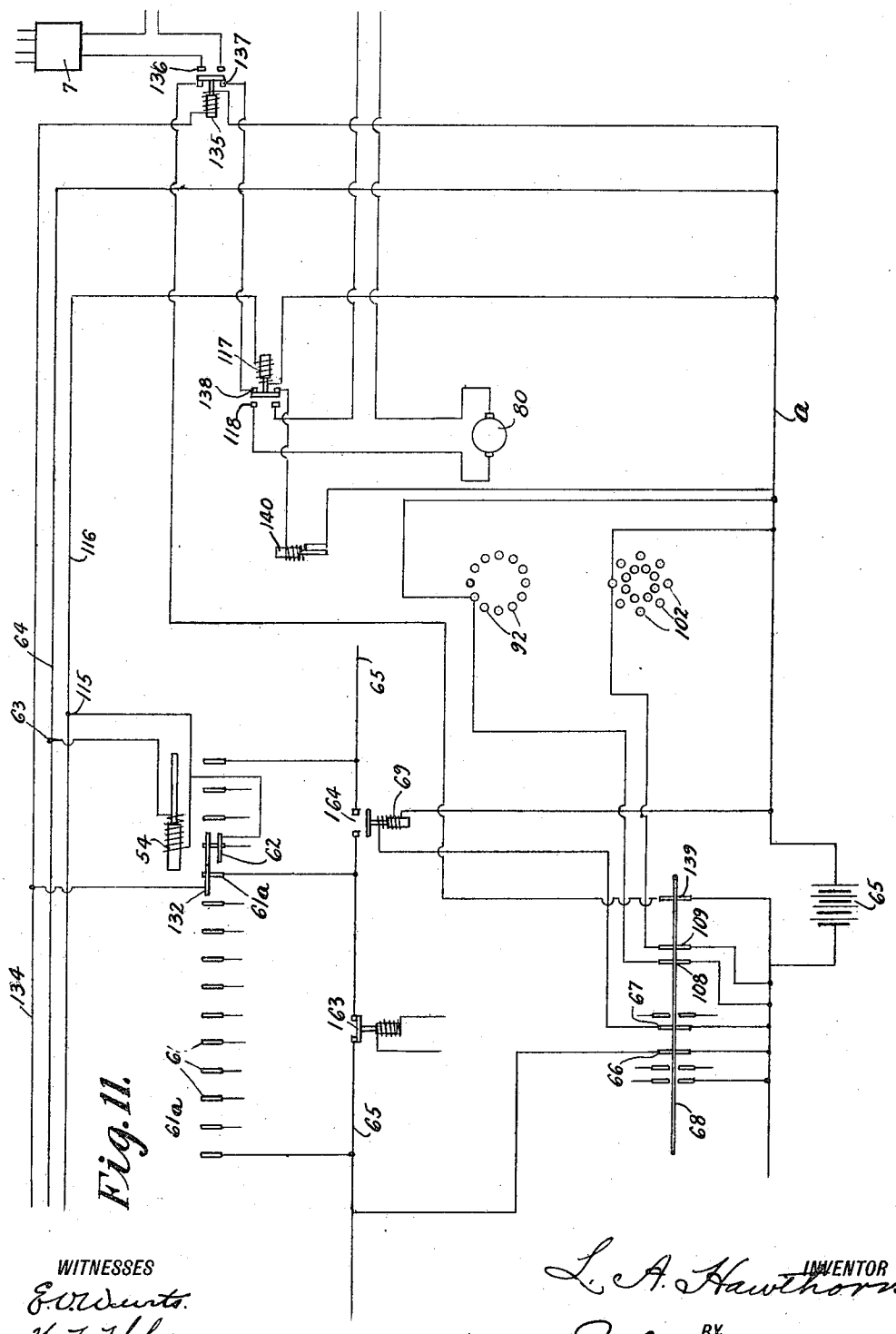



Fig. 11.

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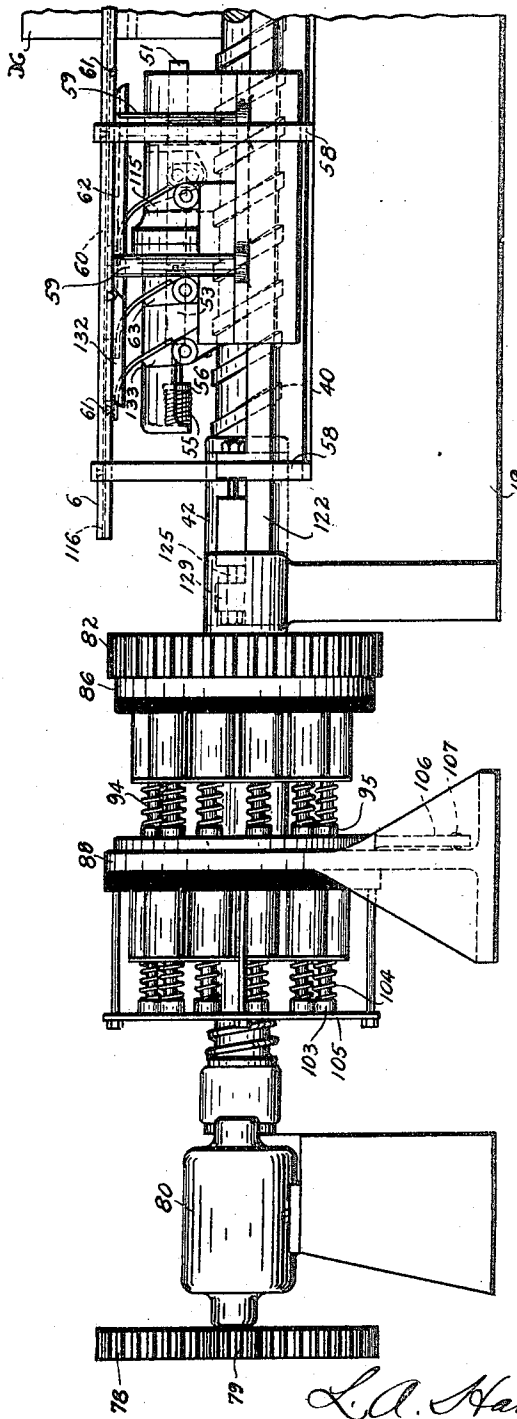



Fig. 12.

WITNESSES

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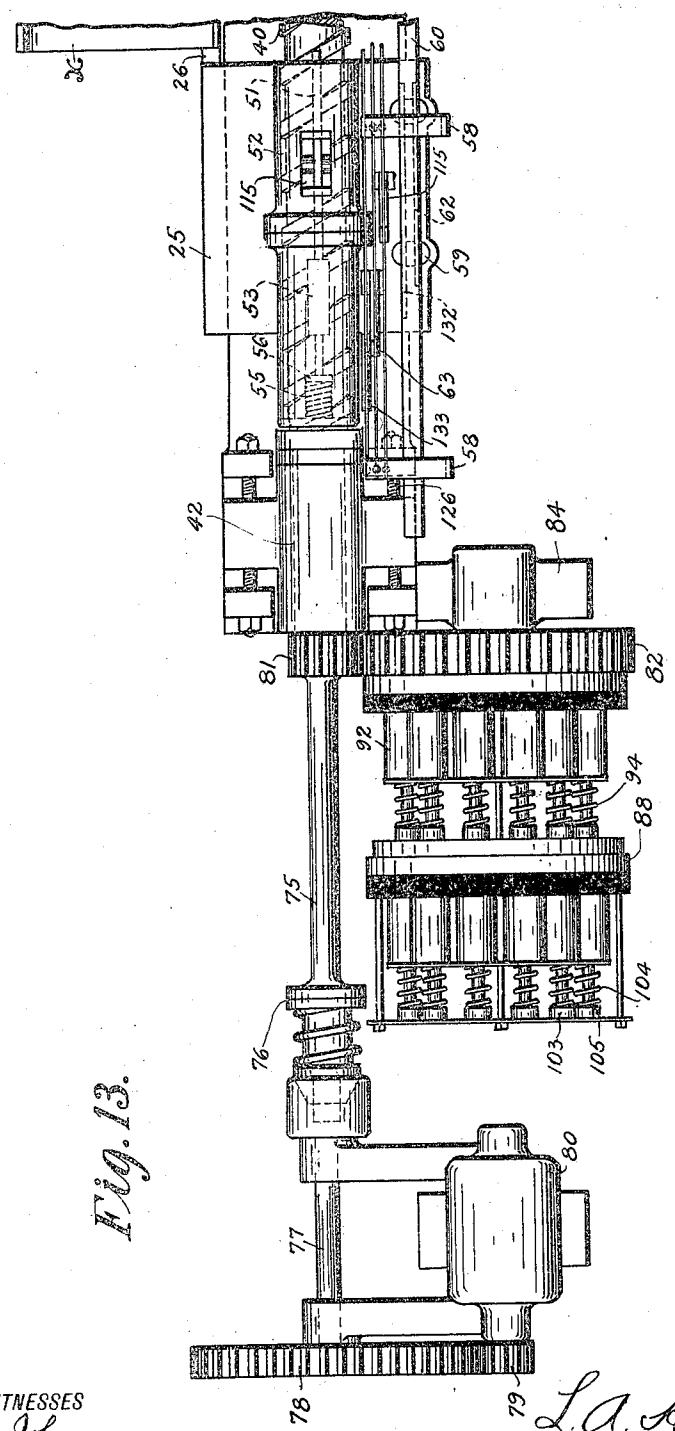



Fig. 13.

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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-PUNCHING MACHINE.

1,241,258. Specification of Letters Patent. **Patented Sept. 25, 1917.**

Application filed June 1, 1914. Serial No. 842,231.

*To all whom it may concern:*

Be it known that I, LOUIS A. HAWTHORNE, a citizen of the United States, and resident of Newark, in the county of Essex, State of New Jersey, have invented new and useful Improvements in Metal-Punching Machines, of which the following is a specification.

The invention relates to machines for punching structural shapes and more especially to devices for successively traveling and stopping the beams or shapes in definite and accurate relation to the punching devices so as to accurately locate the punches for the rivet holes in the beam or shape. Objects of the invention are to provide for accurate and rapid successive traveling and stopping of the shape relatively to the punching means, and especially in connection with heavy shapes and beams; to provide means for effecting this under the control of automatic distance record devices; to provide novel devices and mechanism for the purposes indicated; to provide selectively operated means for the purposes stated wherein any desired distances including denominations and fractions thereof within all requirements of commercial usage may be set without duplication or multiplying the machine parts, and independently of the rate of travel of the work; to provide novel forms of mechanism for effecting these results and objects; to effect other objects and functions necessary or desirable in such a machine. These and other objects of invention will in part be obvious, and in part will be set forth hereinafter.

The invention consists in the novel parts, constructions, arrangements, 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 partial plan, with parts in section, of a machine embodying the invention;

Fig. 2 is a fragmentary view, on an enlarged scale, corresponding to the left central part of Fig. 1;

Fig. 3 is an elevation looking at Fig. 2 from the foot;

Fig. 4 is a vertical section on the line A—B of Fig. 3;

Fig. 5 is a vertical section, on a reduced scale, on the line C—D of Fig. 2, showing the parts in nonengaging position;

Fig. 6 is a view corresponding to Fig. 5, but showing the parts in engaging position;

Fig. 7 is an end elevation, looking at the inch and fraction-of-an-inch controlling mechanism (shown at the lower left hand part of Fig. 1) looking thereat from the left;

Fig. 8 is a vertical section on the line E—F of Fig. 7 looking in the direction of the arrows;

Fig. 9 is a full vertical section on the line G—H of Fig. 8;

Fig. 10 is a full vertical section on the line I—K of Fig. 8; and

Fig. 11 is a partial wiring diagram of the circuits from the various mechanisms and the controls therefor from the distance record sheet;

Fig. 12 is an enlarged, fragmentary elevation of the left hand end of Fig. 1; and

Fig. 13, is an enlarged, fragmentary plan of the left hand end of Fig. 1.

Referring to the accompanying drawings, illustrating by way of example one embodiment of the invention, means are provided for progressing or traveling and successively stopping the beam or shape in correct position with reference to the punching mechanisms to be punched thereby. In the embodied form of such means, the beam or shape $x$ rests upon driven rollers 1, arranged in a series horizontally and driven in a suitable manner. Said rollers 1 have fixed to their shafts beveled gears 2 with which mesh beveled pinions 3 fixed upon the shaft 4. Shaft 4 has fixed thereto a gear 5 driven by a pinion 6 on the shaft of a motor 7. For convenience two sets of driving mechanisms may be provided at either side, respectively, of the punching devices.

The punching devices are indicated generally by a portion of their frame or housing 8 and 9, and are shown two in number, arranged in series or tandem along the path of travel of the shape. The mechanism just described is generally similar to that shown and described in copending application, Serial Number 814,380 filed January 26, 1914, of T. P. Payne. It will be understood, however, that so far as concerns many features

of the present invention the punching mechanisms and the traveling mechanisms for the shape or beam may be of other forms.

In accordance with certain features of the invention, the beam or shape is permitted to travel in obedience to the driving or impulsion of the rollers 1 or is restrained therefrom by connections from the distance determining means, the travel and stopping of the beam thus being permissive and controlled by the setting of the distance determining devices. The rolls 1 may be continuously or intermittently driven as desired, so far as concerns many features of the invention.

In accordance with certain features of the invention, a head or member is provided traveling with and controlling the travel of the shape and adapted to selectively engage with a plurality of engaging members or devices, located along the path of travel of the shape, and spaced apart proportionately to or in accordance with, distance units, as for instance, lineal feet of travel of the shape along its path. The invention in certain of its aspects provides also for further movement of the head and the engaging devices after they have passed into engagement with each other to complete the desired or selected distance of travel. Thus, the travel in integral feet may be determined by the engagement of the head and a particular one of the spaced apart engaging devices, and their movement together after passing into engagement will effect the inches and fractions of additional travel necessary to complete the full distance reading or amount of travel.

The embodied form of machine has been arranged to operate in accordance with the foot and inch system. In said embodiment, a stationary guide member 15 is arranged horizontally along the path of travel of the beam or shape, extending on both sides past the location of the punching mechanisms 8 and 9. The guide member 15 is provided with a flat upper bearing surface 16 and projecting or shouldered edges 17 and 18, and is supported upon suitable supports 19. Traveling along the pathway of the beam or shape $x$ and along the guide 15 is a head 25 which engages with the shape, and has connections to the distance determining means whereby the shape is stopped or permitted to travel in correspondence with the settings or indications of the distance determining means.

As embodied, the head 25 has a bearing or engaging surface 26 against which the forward end of the shape $x$ abuts, and by which the shape is held from travel when positioned and stopped for punching. The head 25 rests upon the face 16 of the guide 15 and has downwardly extending side pieces 27 and 28, which terminate, respectively, in inwardly projecting flanges or walls 29 and 30 fitting about and embracing the shoulders 17 and 18 of the guide 15, and thus firmly and accurately holding the head 25 to the guide 15 while permitting it to slide or travel therealong.

Extending along the guideway or member 15 is a screw threaded shaft 40 having a bed or bearing in a semi-cylindrical recess formed in and along the upper surface 16 of the guideway 15. The screw shaft 40 has also at its ends thrust bearings 42 and longitudinal adjustments later described in detail.

Means are provided by the invention for causing or permitting a set or predetermined free travel of the head 25 and for then causing the head 25 and screw shaft 40 to engage together so that the head 25 can then move only with the rotation of screw shaft 40. The head is traveled and stopped thereby accurately and nicely at the set or predetermined distance. Means are also provided for permitting such relative travel of the head 25 and screw shaft 40 for a desired pre-determined distance as set by the distance record device.

In accordance with certain features of the invention also, the free travel of the head 25 relatively to the shaft 40 corresponds to the amount of travel in one distance denomination while the amount of travel in another distance denomination is effected or allowed for by the combined movement of the shaft 40 and the head 25 when in engagement with each other. In the embodied form, the travel in feet is effected with the head 25 traveling out of engagement with the shaft 40, and the inches and sixteenths-of-an-inch of travel required over and above an integral foot is effected by and through the rotation of the shaft 40 while the head 25 is in engagement therewith.

In the embodied form of means, the devices for causing the head 25 to engage with or disengage from the shaft 40 are controlled from a distance record device, and by means of electrically operating connections. The head 25 is semicircularly recessed as at 43 to fit about the part of the shaft 40 projecting above the surface 16 of the guideway 15, the head and the guideway thus completely encircling the shaft 40. Within the head 25 is an aperture within which reciprocates an engaging member 45 said member 45 having its inner surface of semicylindrical form and provided with a partial or fragmentary screw thread 46, which fits the thread upon the shaft 40. The member 45 is reciprocable to and fro in the head 25 to pass into and out of engagement with the thread on the shaft 40. Thus when member 45 is out of engagement with shaft 40, free travel of the head 25 relatively to the shaft 40 is permitted, and when the

engaging member 45 is in engagement with the thread on shaft 40, travel of the head 25 in proportion to the rotation of the screw shaft 40 only is permitted. Each turn of the screw thread about shaft 45 thus constitutes an embodiment of an engaging member or device regularly spaced along the path of travel of the shape and head, the head being adapted to pass selectively into engagement with any desired turn of the screw thread. The translational travel of the head 25 is thus proportional to and is controlled by the rotational movement of the shaft 40.

For causing and controlling the movements of the engaging member 45, as embodied, there is mounted in horizontal apertures in the head 25 and above the screw shaft 40 a reciprocable bar 51, which bar also passes through slots in the engaging piece 45, which slots permit relative transverse movement between the rod 51 and piece 45. Pivotally connected to the bar 51 and to the reciprocating engaging piece 45 are links 52 so proportioned that the movement of the bar 51 will draw the piece 45 out of engagement with the shaft 40 or press the piece into engagement with the shaft. To the reciprocating bar 51 is attached the core 53 of a solenoid 54, which solenoid is carried upon the front of the head 25. Operating also upon the solenoid core 53 is a spring 55 in compression between a bracket 57 and the head of a rod 56, attached to the solenoid core 53. When the solenoid is deënergized, the spring 55 decenters the core and forces the bar 51 to the right (from the position shown in Fig. 6 to that shown in Fig. 5) lifting the screw threads of the engaging member 45 out of engagement with the screw threads of the shaft 40 and thus leaving the head 25 free to travel unconnected from the shaft 40. When the solenoid 54 is energized, it moves the bar 51 against the spring 55 and forces the screw thread of the engaging member 45 into engagement with the screw thread on the shaft 40 as shown in Fig. 6.

In accordance with one feature of the invention, said means comprises a plurality of actuating devices for the engaging device 45, said actuating devices being spaced proportionately along the path of travel of the head 25, and settable means for rendering such actuating devices operative or inoperative to cause the engaging device to engage the screw shaft.

In the embodied form, as stated, the distance determining means or control for the shape traveling and stopping devices is electrical and also is controlled from a distance record sheet. A contact carrying rail 60 extends above and along the guideway 15, said rail being suitably supported as by angled or bent arms 58, mounted upon the guideway structure. In the rail 60 at fixed distances, and preferably one foot apart, are contact pieces 61 insulated from the rail 60. Carried by the head 25 in circuit with the solenoid 54 is a shoe 62, which slides along the under side of the rail 60 and successively passes into and out of contact with the contacts 61 set into the under surface of the rail 60. Also in circuit with the solenoid 54 is a trolley contact 63, which travels along a wire 64, in circuit with the solenoid 54. A battery or other suitable source of electrical energy is indicated by 65.

In accordance with one feature of the invention, and for the purpose of simplifying the connections, a double make and brake, one controlling the units of feet and the other controlling the tens of feet is employed. There are ten circuits representing ten groups of units of feet, and a particular unit of feet in each denomination of tens is in parallel in said circuit with that particular unit in each of the other denominations of tens. One make and break in the circuit is for the purpose of designating the particular unit of feet and the other make or break is for the purpose of designating or determining in which denomination of tens of feet such unit designation shall become operative. As embodied, the second make and break is employed to kill the circuit in each denomination of tens of lower value than the selected or pre-determined one, by throwing such portion of the circuit open or dead. By way of example, each key for two feet, namely, two, twelve, twenty-two etc., are in parallel, the circuit including a bus wire 65. Said bus wire has switches 163 and 164 therein controlling the tens of feet, namely, zero tens of feet (the units), tens of feet, twenties of feet, etc.

Considering these as controlled by the distance record sheet 68 (Fig. 11) the closed contacts 66 may be regarded as energizing the selected unit of feet, and as putting under potential such unit in every ten feet along the rail 60. The contacts 67 may be regarded as controlling the tens of feet. When the contacts 67 are permitted to close by the presence of a perforation in the distance record sheet 68, the solenoid 69 is energized to open the circuit at 164. The shape is traveling from right to left in Fig. 11. The opening of the circuit at 164 will render the contacts 61 which correspond to the contact 66 at the right of the point 164 dead, while such contact 61 in every ten feet to the left thereof is alive. The shoe 62 will thus pass every contact 61 in the given circuit which is to the right of 164 without result but when the first contact 61 to the left of 164 is reached, the solenoid 54 is energized, and the engaging piece 45 engages the screw rod 40.

Referring now to the means for control-

ling the ultimate or finer divisions of the set or selected distances or measurements (in this embodiment the inches and fraction thereof), the screw shaft 40 (Fig. 1) has an extension 75 fixed to rotate therewith and provided with a friction drive 76 of suitable form. Beyond the friction drive 76 is a shaft 77 carrying a gear 78. Gear 78 is driven by a pinion 79 on the shaft of a motor 80. The motor 80 through the friction clutch 76 tends to drive the shaft 75, and means are provided for permitting or preventing such rotation of the shaft 75 and of the shaft 40 to effect the desired travel of inches and fraction thereof. As embodied, there is fixed on the shaft 75 a pinion 81 meshing with a disk 82 having gear teeth thereon. Geared disk 82 is fixed on shaft 83, said shaft being supported in bearings 84 and 85. The geared disk 82 has in face contact therewith a disk 86 (Figs. 1, 7, 8, 9 and 10), said disk 86 being splined on a sleeve 87. Fixed to sleeve 87 is a disk 88. Disk 88 is in face contact with a stationary plate 89, which carries the bearing 85 of shaft 83. In the disk 86 is an arcuate slot 90. In alinement with said slot 90 and reciprocable in apertures in the rotatable disk 86 are a series of pins 91, projectable into and retractable from the slot 90. Each of said pins is provided with a solenoid 92 to the core 93 of which the corresponding pin 91 is attached. Each pin 91 is provided with a retracting spring 94, and a ring 95 serves as a stop for the retracted solenoid cores.

In the disk 88 are a series of slots 100, and projectable into and retractable from said slots 100 are a series of pins 101 reciprocably carried in apertures in the stationary plate 89. The pins 101 are connected with the cores 103 of the solenoids 102. Said solenoids have retracting springs 104, and the plate 105 serves as a stop for the retracted cores 103. To the disk 88 is connected an arm 106, said arm 106 being acted on by a suitable restoring spring 107. Thus accurate means for effecting the location of the shape in conformity with the ultimate or finer divisions of the set distance is secured, the disk 86 accurately determining the inches and disk 89 the sixteenths-of-an-inch.

The various solenoids 92 and 102 are in circuit with contacts 108 and 109 (Fig. 11) in the distance record sheet 68. In circuit with the shoe 62 is a trolley 115, said trolley running in contact with a wire 116, in circuit with which is a solenoid 117. Said solenoid 117 controls the circuit for the motor 80 which drives the screw shaft 40.

Means are provided for longitudinally adjusting the screw rod 40 to secure nice and accurate positioning of the shape relatively to the punches. Fixed to the rod 40 is a ring or collar 120 working against a face 121 upon the bearing 42. The bearing 42 is slidable upon its supports 122, and is adjustable by screws 123, 124, 125 and 126, threaded into capped lugs 127 and 128, 129 and 130 fixed on the support 122. Thus nice and accurate longitudinal adjustment of the screw shaft 40 is secured. The thrust of the shape is taken up by the bearing 42 from shaft 40.

Means are provided by the invention for controlling the action of rollers 1, in traveling the shape, and for slowing down the shape preparatory to stopping. In the embodied form thereof, a shoe 132 is carried by the standard 59 upon the head 25, said shoe contacting with the energized contact 61 in advance of the shoe 62 which shoe 62 throws engaging member 45 into engagement with screw shaft 40. In circuit with said shoe 132 is a trolley 133 running along the wire 134. The wire 134 is in circuit with the solenoid 135 controlling a make and break 136 for the roll driving motor 7 or for a controller for said motor, either being indicated by reference numeral 7 in Fig. 11.

The manner of operation of the various devices will be clearly understood from the various statements already given in connection with the various devices, but it may be stated by way of summary:

The distance record sheet 68 may be regarded as presenting a certain distance reading or indication, and the rollers 1 may be regarded as being in rotation having been started into motion either automatically by the punching mechanism on completing the previous punching, or by the distance record sheet, or if desired, manually by an operator.

As the shape $x$ travels, the shoes 62 and 132 slide along the under side of the rail 60 and past the various contacts 61 in succession. The selected contact 61 for the units of feet is energized by reason of the setting made by the perforations in the distance record sheet 68. When the shoe 132, which is in advance of the shoe 62 contacts with the energized contact 61, the circuit is closed, the solenoid 135 is energized, its switch is moved from the neutral or high speed position, and the circuit at 136 is controlled to first slow down the drive of the rolls 1 and then to stop them. The shoe 62 meets the live contact 61, and energizes the solenoid 54, and the engaging member 45 passes from the position shown in Fig. 5 to that shown in Fig. 6, thereby engaging the head 25 with the screw shaft 40. At the same time that the circuit between the shoe 62 and contact 61 is closed to energize the solenoid 54, the solenoid 117 is also energized to close the circuit at 118 and start motor 80, thus rotating the shaft 77, and tending to rotate the

shaft 75, and the shaft 40 through friction drive 76, the rotation of shafts 40 and 75 being controlled by the settable pins on disks 86 and 89.

The distance record sheet 68 has also set the selected contacts 108 and 109 corresponding to the inches and fractions of the desired distance, as called for by the perforations in the sheet 68. The contacts 108 and 109, through solenoids 92 and 102, set the corresponding pins 91 and 101, thus leaving the shaft 40 free to rotate. Through such rotation, the pinion 81 rotates the geared disk 82, and such rotation continues until the set pin 91, which is stationary, contacts with the end of the slot 90. When this occurs the disk 86, sleeve 87, and disk 88 start into rotation, and rotate until the set pin 101 reaches the end of its slot 100.

By reason of the member 45 having threaded engagement with the screw thread of shaft 40, there will be an additional advance of the head 25 corresponding to the inches and sixteenths-of-an-inch setting of the mechanism just described.

The punching mechanism may be started as follows: When solenoid 135 opens at 136 the circuit for the shape forwarding rolls, 1, it throws past the neutral position and closes the punch starting circuit at 137. In series with the switch 137 is a similar switch 138 closed by solenoid 117, when the control motor circuit is opened at 108. In the same circuit are contacts 139 working through a perforation in the distance record sheet 68, which indicates the punch or tool which it is desired to operate. When the punch starting circuit is closed at all three points, 137, 138 and 139 a closed circuit obtains which energizes the solenoid 140 releasing the stop motion of the punch, permitting it to perform its work. It will be noted that the punch cannot operate until both driving motors for the shape forwarding rolls, 1, and also the control motor have stopped, bringing the shape $x$ to rest in proper position relative to the punches.

The punching mechanism is called into operation to punch the positioned shape, and it may be called into operation, automatically by connections controlled by the distance record sheet or by the parts controlled thereby. The distance record sheet will also be fed forward automatically in a suitable manner and by suitable means, such for instance as that shown in the copending application already referred to, and thus the successive travelings and positionings and punchings of the beams be effected.

From all the foregoing it will be understood that a machine has been provided embodying 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 particular mechanisms shown and described, within the scope of the accompanying claims, without departing from the principles of the invention, and without sacrificing its chief advantages.

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

1. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape, and another member traveling with the shape and adapted to engage and disengage said first mentioned member and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices.

2. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member while said first mentioned member is at rest and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices.

3. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination, and means for causing additional travel of the shape after such engagement.

4. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination and means for causing additional travel of the shape for a selected distance after such engagement.

5. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned mem-

ber after the shape has traveled a selected number of units of one distance denomination and means for moving said members while in engagement to cause additional travel of the shape for a selected distance.

6. A machine for punching structural shapes, including in combination punching devices, and means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, and means for causing said traveling member to engage said normally stationary member.

7. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, and means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape.

8. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices.

9. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest, means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices and means for controlling the engagement of said members.

10. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest, means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices and settable means controlling the engagement of said members.

11. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices and a distance record device for controlling the engagement of said members.

12. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member while said first mentioned member is at rest and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices, a distance record device, and connections therefrom for electrically controlling the engagement of said members.

13. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest, means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices and means for controlling the engagement of said members and their movement while engaged.

14. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member while said first mentioned member is at rest, means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices and settable means for controlling the engagement of said members and their movement while engaged.

15. A machine for punching structural shapes, including in combination punching

devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, while said first mentioned member is at rest, and means for moving said members while in engagement to give additional travel of the shape relatively to the punching devices, and a distance record device for controlling the engagement of said members and their movement while engaged.

16. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination, means for causing additional travel of the shape for a selected distance after such engagement and means for controlling the engagement of said members and their movement while engaged.

17. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination, means for causing additional travel of the shape for a selected distance after such engagement and settable means for controlling the engagement of said members and their movement while engaged.

18. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination and means for causing additional travel of the shape for a selected distance after such engagement, and a distance record device for controlling the engagement of said members and their movement while engaged.

19. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination, means for moving said members while in engagement to cause additional travel of the shape for a selected distance and means for controlling the engagement of said members and their movement while engaged.

20. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage said first mentioned member after the shape has traveled a selected number of units of one distance denomination, means for moving said members while in engagement to cause additional travel of the shape for a selected distance and settable means for controlling the engagement of said members and their movement while engaged.

21. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape, and means for controlling the engagement of said members.

22. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, and means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape and settable means controlling the engagement of said members.

23. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, and means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape and a distance record device for controlling the engagement of said members.

24. A machine for punching structural

shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape and means for moving said members while in engagement to effect additional travel of the shape for a selected distance.

25. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape and means for moving said members while in engagement to effect additional travel of the shape for a selected distance and means for controlling the engagement of said members and their movement while engaged.

26. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape, means for moving said members while in engagement to effect additional travel of the shape for a selected distance and settable means for controlling the engagement of said members and their movement while engaged.

27. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member, after a selected distance of travel of the shape and means for moving said members while in engagement to effect additional travel of the shape for a selected distance, and a distance record device for controlling the engagement of said members and their movement while engaged.

28. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape, and another member traveling with the shape and adapted to engage and disengage said first mentioned member and means for rotating said first mentioned member while said members are in engagement to cause additional travel of the shape.

29. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member, means for rotating said first mentioned member while said members are in engagement to cause additional travel of the shape and means for controlling said rotation.

30. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape, and another member traveling with the shape and adapted to engage and disengage said first mentioned member, means for rotating said first mentioned member while said members are in engagement to cause additional travel of the shape and settable means for controlling the extent of said rotation.

31. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member not traveling with the shape and another member traveling with the shape and adapted to engage and disengage said first mentioned member and means for rotating said first mentioned member while said members are in engagement to cause additional travel of the shape and a distance record device for controlling the extent of said rotation.

32. A machine for punching structural shapes, including in combination punching devices, and means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance.

33. A machine for punching structural shapes, including in combination punching

devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means for automatically causing said engagement of said members after such selected distance of travel of the shape.

34. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and settable means for automatically causing said engagement of said members after such selected distance of travel of the shape.

35. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance, a distance record device and connections therefrom for causing said engagement of said members after such selected distance of travel of the shape.

36. A machine for punching structural shapes, including in combination punching devices, and means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means for automatically governing the extent of such rotation.

37. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance, a distance record sheet and connections therefrom for causing said engagement of said members after such selected distance of travel of the shape.

38. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape and means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, and means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance, a distance record device, and electrically operating connections therefrom for causing said engagement of said members after such selected distance of travel of the shape.

39. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and settable, automatically operating means for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

40. A machine for punching structural shapes, including in combination punching devices, means for successively traveling

and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means including a distance record device for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

41. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means including a distance record sheet for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

42. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means including a distance record device and devices electrically controlled thereby.

43. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance, and means including a distance record sheet and devices electrically controlled thereby for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

44. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means including devices set by a distance record device for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

45. A machine for punching structural shapes, including in combination punching devices, means for successively traveling and stopping the shape relatively to the punching devices, said means including a member traveling with the shape, a normally stationary member extending along the path of travel of the shape, means for causing said traveling member to engage said normally stationary member after a selected distance of travel of the shape, means for rotating said normally stationary member while said members are in engagement to give additional travel of the shape for a selected distance and means including electrically operating devices set by a distance record device for causing said engagement of said members after such selected distance of travel of the shape and for governing the extent of the rotation of said normally stationary member.

46. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units and means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape.

47. A machine for punching structural

shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means for permitting further movement for a selected distance of said head and the shape after such engagement.

48. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and settable means for causing such engagement.

49. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means including a distance record device for causing such engagement.

50. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means including a distance record devices and electrically operated members settable thereby for causing such engagement.

51. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape, means for permitting further movement for a selected distance of said head and the shape after such engagement and means including a distance record device for causing such engagement.

52. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape, means for permitting further movement for a selected distance of said head and the shape after such engagement and means including a distance record device and electrically operated members settable thereby for causing such engagement.

53. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means for permitting movement for a selected distance of said engaging device and of said head therewith to effect a corresponding travel of the shape.

54. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a head impelled forward by the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and settable means for permitting movement for a selected distance of said engaging device and of said head therewith to effect a corresponding travel of the shape.

55. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, and means for engaging said head with one of said engaging devices

corresponding to a selected distance of travel of the shape.

56. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means for causing further movement for a selected distance of said head and the shape after such engagement.

57. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, means extending along the pathway of the shape and having a plurality of engaging devices located therealong proportionately to distance values or units, means for engaging said head with one of said engaging devices corresponding to a selected distance of travel of the shape and means including a distance record device for causing such engagement.

58. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a screw threaded member extending along the pathway of the shape and head, a settable distance determining device, and connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device.

59. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a screw threaded member extending along the pathway of the shape and head, a settable distance determining device, and connections therefrom for causing said head to engage said screw threaded member and for rotating said screw threaded member.

60. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a screw threaded member extending along the pathway of the shape and head, a settable distance determining device including a distance record device and connections therefrom for causing said head to engage said screw threaded member.

61. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a screw threaded member extending along the pathway of the shape and head, a settable distance determining device, including a distance record device and connections therefrom for causing said head to engage said screw threaded member and for rotating said screw threaded member.

62. A machine for punching structural shapes, including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a screw threaded member extending along the pathway of the shape and head, a settable distance determining device, including a distance record device, and electrically operating connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device.

63. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a normally stationary screw threaded member extending along the pathway of the shape and head, a settable distance determining device, and connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device and for causing rotation of said screw threaded member to complete the set distance.

64. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a normally stationary screw threaded member extending along the pathway of the shape and head,

a settable distance determining device including a distance record device, and connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device and for causing rotation of said screw threaded member to complete the set distance.

65. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a normally stationary screw threaded member extending along the pathway of the shape and head, a settable distance determining device including a distance record device and electrically operated connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device and for causing rotation of said screw threaded member to complete the set distance.

66. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a normally stationary screw threaded member extending along the pathway of the shape and head, a settable distance determining device and connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device and for causing rotation of said screw threaded member to complete the set distance, and means for longitudinally adjusting said screw threaded member.

67. A machine for punching structural shapes including in combination punching means, means impelling the shape forward past said punching means, a guide extending along the path of travel of the shape, a head traveling along said guide and in holding engagement with the shape, a normally stationary screw threaded member extending along the pathway of the shape and head, a settable distance determining device, and connections therefrom for causing said head to engage said screw threaded member in accordance with the setting of said distance determining device and for causing rotation of said screw threaded member to complete the set distance and a slow-down device for said head.

68. A machine for punching structural shapes including in combination punching means, means for successively traveling and stopping the shape relatively to the punching means including a head having engaging means traveling with the shape, a plurality of engaging devices spaced proportionately along the path of travel of the shape and head, a plurality of actuating devices spaced proportionately along the path of travel of the shape, and settable means for selectively rendering said actuating device operative or inoperative to cause said engaging means to engage said engaging devices.

69. A machine for punching structural shapes including in combination punching means, means for successively traveling and stopping the shape relatively to the punching means including a head having engaging means traveling with the shape, a plurality of engaging devices spaced proportionately along the path of travel of the shape and head, a plurality of actuating devices spaced proportionately along the path of travel of the shape, and settable means including a distance record device for selectively rendering said actuating devices operative or inoperative to cause said engaging means to engage said engaging devices.

70. A machine for punching structural shapes including in combination punching means, means for successively traveling and stopping the shape relatively to the punching means including a head having engaging means traveling with the shape, a plurality of engaging devices spaced proportionately along the path of travel of the shape and head, a plurality of actuating devices spaced proportionately along the path of travel of the shape, and settable means including a distance record device and electrically operating connections therefrom for selectively rendering said actuating devices operative or inoperative to cause said engaging means to engage said engaging devices.

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

LOUIS A. HAWTHORNE.

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

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