L. A. HAWTHORNE.

METAL PUNCHING MACHINE.

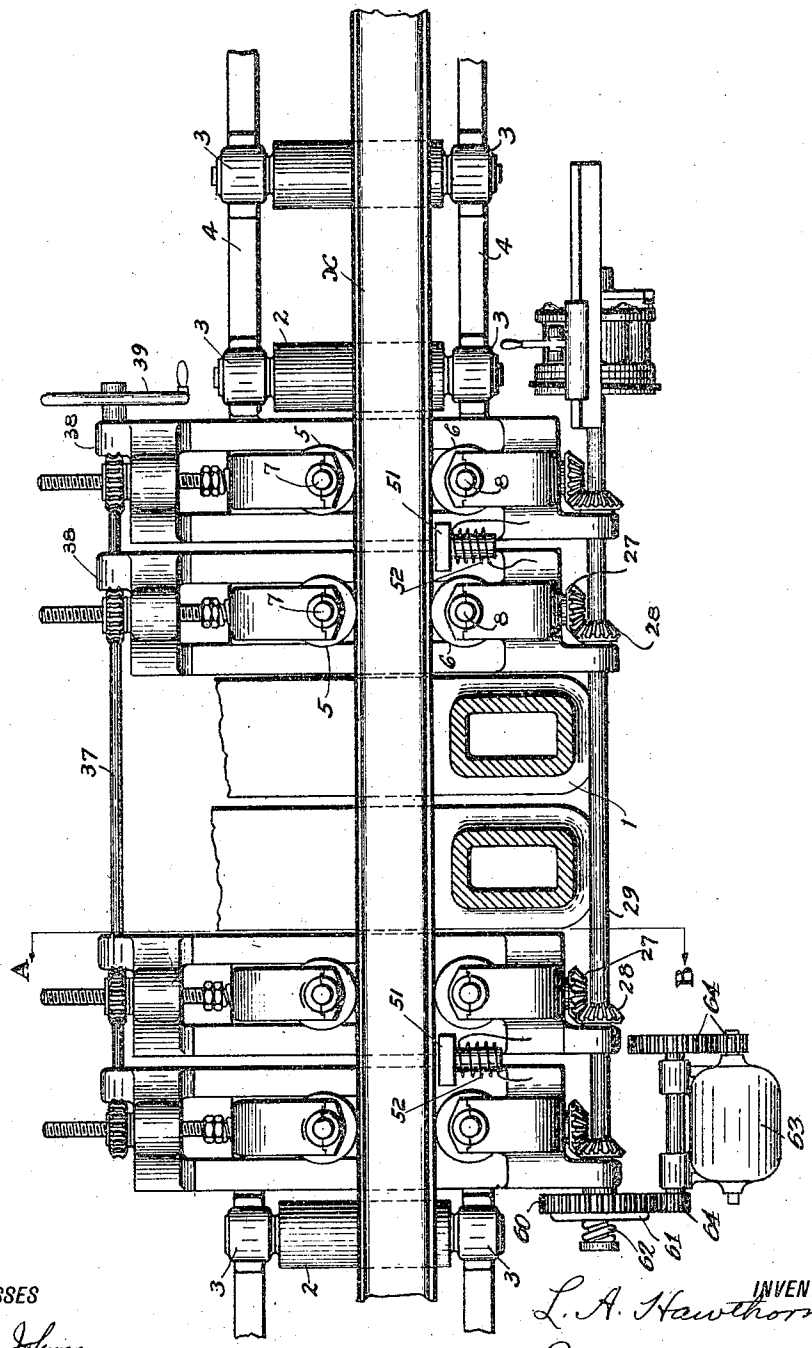
APPLICATION FILED JULY 10, 1915.

1,241,267.

Patented Sept. 25, 1917.

5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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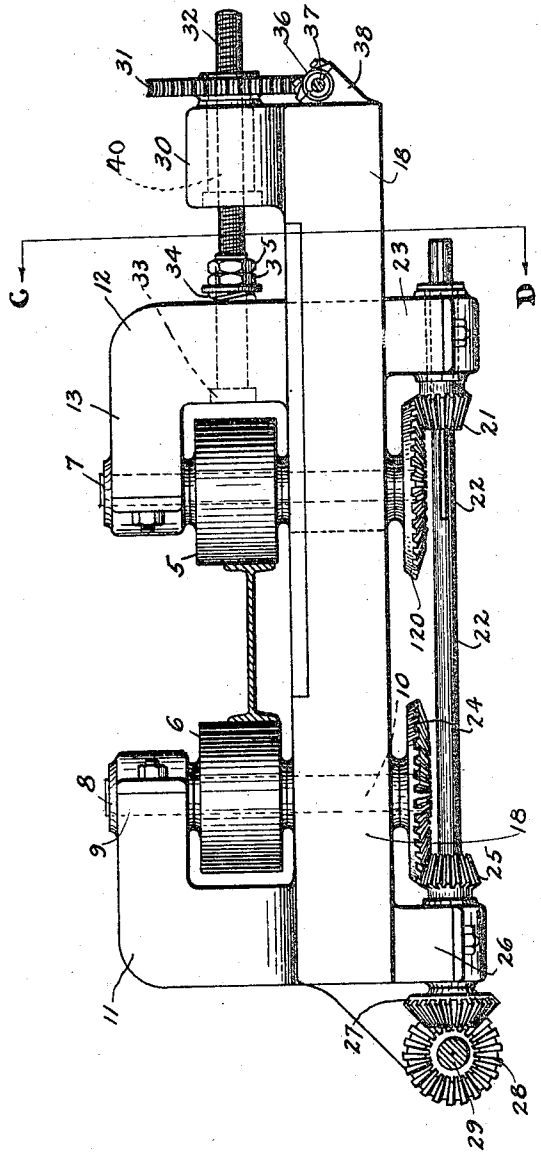


Fig. 2.

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Fig. 8.

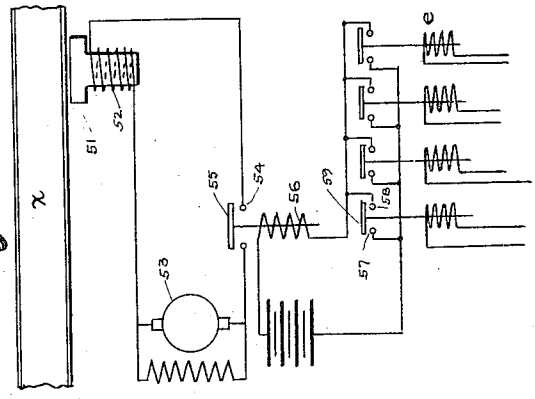
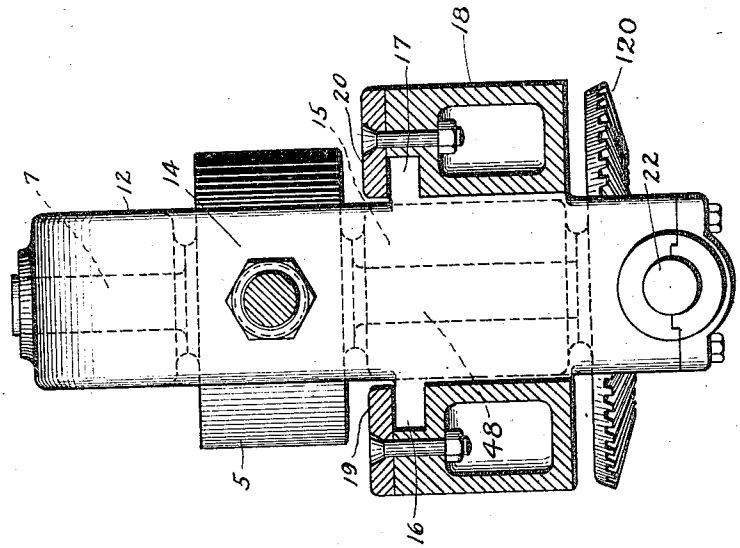


Fig. 3.



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5 SHEETS—SHEET 4.

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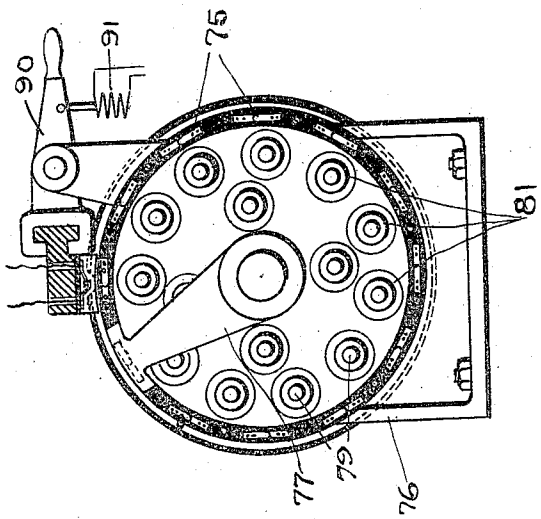


Fig. 5

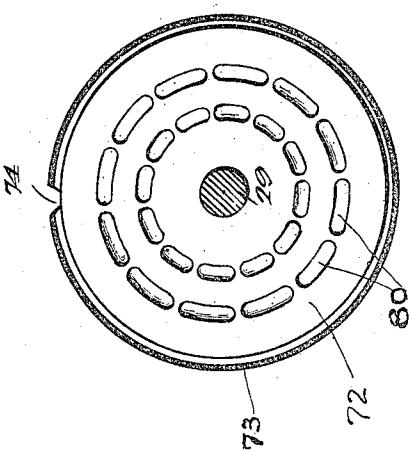


Fig. 6.

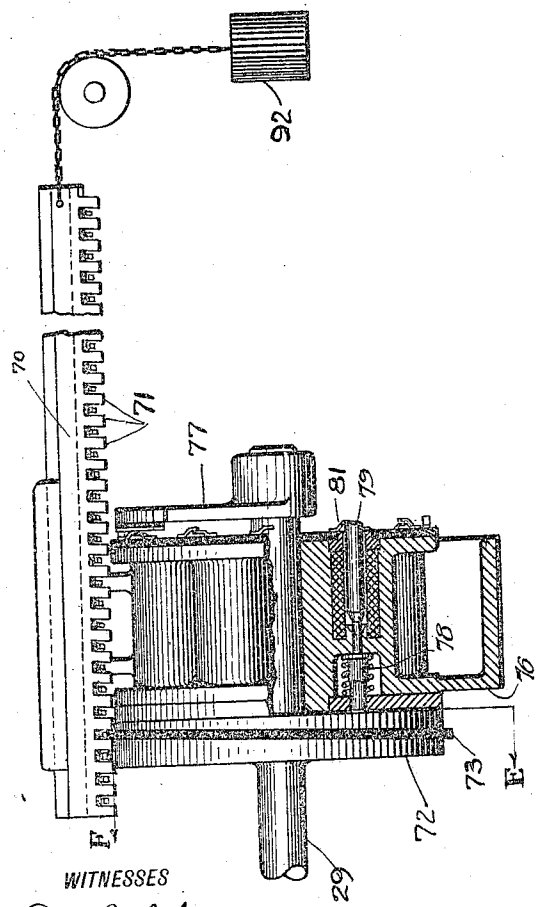


Fig 4

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5 SHEETS—SHEET 5.

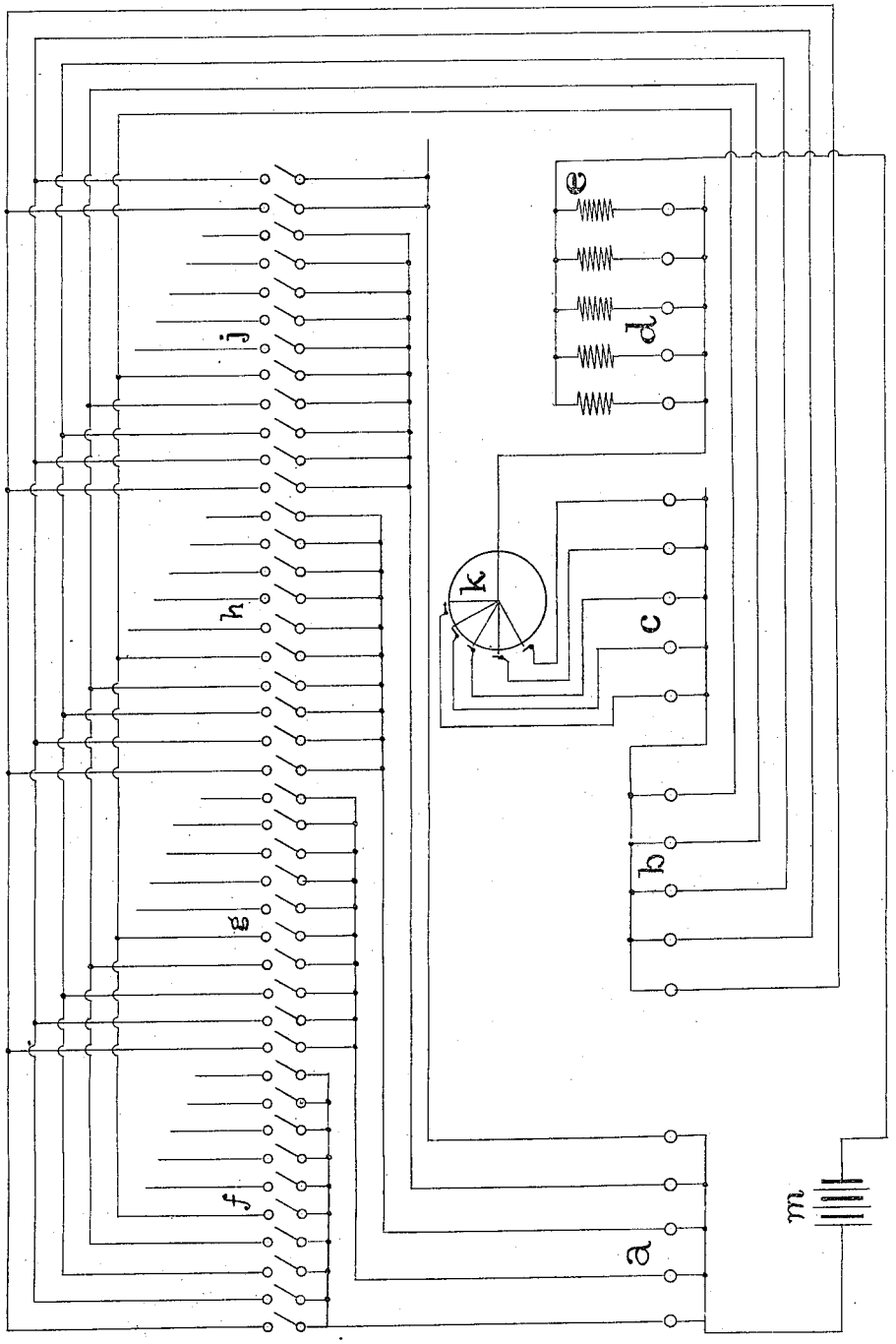


Fig. 7.

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

METAL-PUNCHING MACHINE.

1,241,267. Specification of Letters Patent. **Patented Sept. 25, 1917.**

Application filed July 10, 1915. Serial No. 39,082.

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 or like work and more particularly to automatic means and devices for alternately traveling and stopping the work relatively to the punch or other tool equipped means in successive desired positions to be punched thereby. The objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom.

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

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

Of the drawings:

Figure 1 is a fragmentary plan of a machine constructed in accordance with the principles of the invention;

Fig. 2 is a transverse vertical section on an enlarged scale, substantially on the line A—B of Fig. 1;

Fig. 3 is a side elevation, on an enlarged scale, with certain parts in section, substantially on the line C—D of Fig. 2;

Fig. 4 is a fragmentary elevation, with parts in section of the distance determining device, which is shown in plan, in connection with the machine at the lower right hand part of Fig. 1;

Fig. 5 is a fragmentary elevation looking at Fig. 4 from the right;

Fig. 6 is a section, substantially on line E—F of Fig. 4;

Fig. 7 is a diagrammatic view of a system of wiring for the punch rolls, or other work starting and stopping means to be controlled by the distance determining device; and

Fig. 8 is a wiring diagram for the electromagnetically operated work stopping devices.

Referring to the embodied form of mechanism illustrated by way of example, in the accompanying drawings, the work to be operated upon is shown as an I-beam x, which is progressed longitudinally along a horizontal or substantially horizontal pathway through the machine. The location of the punching mechanism or other tool equipped means is indicated by the housing 1. The form of means for successively traveling and stopping the shape or other work after predetermined distances of travel to position the work relatively to the punch or like tool equipped means, to accurately position the various perforations or operations upon the work, comprises devices which frictionally engage the work, and by the starting and stopping of said devices, the travel and stopping of the work as desired is effected in accurate and predetermined relation to the punches.

In accordance with certain features of the invention, said progressing and stopping means engage the work at opposite sides thereof and by their rotation and stopping serve to respectively feed and position the work. In the embodied form of said means, a series of substantially horizontal arranged rollers 2 are provided suitably mounted in bearings 3 carried upon the frame 4 of the machine, said series of rollers extending at either side of the tool equipped means for the purpose of supporting the work to, past and away from the tool equipped means. The distance determining means and cooperating mechanism for traveling and stopping the shape, in the embodied form, comprise series of opposed rolls 5 and 6, preferably arranged at either side of the tool equipped means 1, said rolls engaging the sides of the work at opposite points and exerting sufficient frictional pressure thereon to accurately control and determine both the amount or length of travel and the stopping point of the work, in conformity to the setting of the distance determining devices.

The pairs of rolls 5 and 6 are mounted respectively upon vertically disposed shafts 7 and 8. The shaft 8 is journaled in fixed bearings 9 and 10 respectively, in the frame of the machine, the bearing 9 being carried by a bracket 11. To adapt the machine for work of different widths, the rolls 5 of the various pairs, are movable to and from the corresponding rolls 6, although so far as concerns many features of the invention

both rolls may be movable if desired. Accordingly the shaft 7 of the roll 5 is journaled in a bracket 12. The bracket 12 has horizontally extending arms 13 and has a vertical portion 14, and also an inwardly extending portion 15 (back of the part 18 in Fig. 2) for carrying the lower bearing 8 for the roller 5. The bracket 12 has at either side thereof longitudinally extending and projecting wings or tongues 16 and 17 (Fig. 3), which rest upon and slide along suitable guideways in the transverse frame member 18. Retaining plates 19 and 20 are bolted over the projections 16 and 17 to guide and retain the supporting bracket in its seat.

The various pairs of rolls, and the rolls of each pair, are moved and stopped together, and in the embodied form of such means, each shaft 7 has at its bottom end a beveled gear 120 meshing with a beveled pinion 21, which pinion is splined to rotate with a shaft 22, but is slidable along said shaft. Each pinion 21 has a collared bearing in a downward projection 23 from the bracket 12, whereby the pinion moves to and fro with the roll 5 and the gear 120 as they are moved or adjusted in and out for beams or work of different widths. For the purpose of driving roll 6 of each pair, there is fixed to each of the shafts 8 at its bottom end a beveled gear 24, said gear 24 meshing with a beveled pinion 25 fixed to rotate with shaft 22. Each shaft 22, in addition to its bearing in the downward projection 23 of the corresponding bracket 12, has a bearing at 26 in a portion projecting downwardly from the transverse frame member 18.

For the purpose of driving the rolls 5 and 6, on the end of each shaft 22 is carried a beveled pinion 27, meshing with a pinion 28 upon a shaft 29. The shaft 29 extends longitudinally of the machine, its various pinions 28 engaging with the respective pinions 27 to drive each pair of rolls 5 and 6. The driving of rolls 5 and 6, and their starting and stopping, in the present embodiment, are effected through shaft 29 by means later to be described.

Means are provided for simultaneously moving or adjusting the rollers 5 in and out for work of different widths, and in the embodied form of such means, at the right hand end of each of the transverse frame pieces 18 there is provided a bearing 30, in which is journaled a collared sleeve 40 (shown in dotted lines in Fig. 2) to which sleeve is fixed a worm wheel 31. The worm wheel or its sleeve is internally threaded to engage with the thread upon a shaft 32, which shaft extends through an aperture in the movable bracket 12, the shaft 32 having a square head 33 seated in a recess in the bracket 12. Thus the shaft 32 will not rotate in the bracket, but will move the bracket 12 with it longitudinally. On the right hand side of the bracket 12 in Fig. 2 is shown a spring 34 with lock nuts 35 to regulate the tension thereof. Thus the rolls 5 are nicely adjusted for beams of different widths and at the same time an adjustable or varying spring pressure may be exerted upon the beam or shape both to increase the frictional hold or grip thereon and to compensate for any slight variations in the beam if any such there be. Meshing with worm wheels 31 respectively, are worms 36 fixed on shaft 37, which shaft is journaled in brackets 38, carried upon the ends of the various cross frames 18. A hand wheel 39 or other suitable device may be used to rotate the shaft 37, and simultaneously adjust or position the various rolls 5 for beams of different width.

In accordance with one feature of the invention, electro-magnetic means for controlling or assisting in controlling the movement or positioning of the shape or other work are provided. In accordance with one feature of the invention, the action of said electro-magnetic means may be controlled by a distance record sheet, such as is designed to coöperate with the contacts shown in Fig. 7 and as shown also in application Ser. No. 814,380, of T. P. Payne, filed January 26, 1914. So far as concerns certain features of the invention, the action of the electro-magnetic means upon the work may be by approach to or recession therefrom. In the embodied form, such action is effected by controlling the current for the windings of the electro-magnetic devices, such control being effected in said embodied form from a distance record device. Furthermore, in accordance with certain aspects of the invention, the electric devices could be employed with driven rolls supporting the work, instead of the pinch or pressure rolls as shown.

In the embodied form of such means, the electro-magnets have their respective heads 51 close to the work and their windings 52 in circuit with a source of electric energy, such as a generator 53. At 54 in the circuit for each of the windings is a switch 55 controlled by a solenoid 56. Said solenoid 56 is in circuit with contacts 57 and 58, which are in series electrically with contacts operated by the setting of the sixteenths stop pins *e*. Each sixteenth stop pin has a pair of contacts, with common terminals, so that the setting of any sixteenth pin, through the action of the timing device, as previously described, will complete the circuit through the solenoid 56 and energize the retarding pole piece 51.

In connection with the embodied form of distance determining devices, the shaft 29 is frictionally driven and has a continual rotative tendency imparted to it by suitable means, such as a friction drive comprising

a gear 60 loose on shaft 29. A disk 61 is fixed to rotate with shaft 29 but is movable longitudinally thereof. A spring 62 presses the disk 61 against the side of the gear 60. A motor 63 drives gear 60 through reducing gears 64. The distance determining device permits or prevents the rotation of shaft 29 and thus travels, stops and positions the work as desired.

It will be understood that the distance determining device is applicable also to other forms of work progressing means than that shown herein.

In accordance with certain features of the invention, the distance determining device comprises a plurality of contacts or circuit closing devices in series with the ultimate or least distance representing device, the simultaneous closing of the various contacts occurring at the set or predetermined distance to energize ultimate distance devices to stop the work. More particularly, in the present embodiment, means are provided for simultaneously closing the desired or selected foot contact and the desired or selected inch contact simultaneously, to thereby set the selected or desired sixteenths-of-an-inch solenoid to stop the work at the right point in its travel relatively to the punching mechanism.

As embodied, the distance determining means comprises a member traveling proportionally to the work such as toothed bar 70. Between each of the teeth 71 is a contact representing one foot of travel of the work (assuming the machine to be arranged for the foot, inch and fractions system of measuring). These contacts 71 are selectively energized by means of a system of contacts for the tens and units of feet and circuits therefor arranged in series. This system will be generally understood from Fig. 7. That is, in the tens of feet if the third contact were closed it would close all circuits for the twenties of feet up to contacts *b* (in Fig. 7) but if only the seventh contact of contacts *b* (representing units of feet) were closed, the only contacts, 71 which would be alive would be those for twenty seven feet, but as they are normally separated no current flows.

The disk 72 is fixed to rotate with shaft 29, making one rotation for each foot of travel of the work, and has a helical ridge 73 thereon of insulating material. The ridge 73 successively engages the recesses between the teeth of the rack 70, and has a pitch equal to the distance between two successive or adjacent teeth 71. The helical ridge 73 feeds bar 70 along proportionately to the travel of the work, the gap 74 serving to pass the successive teeth 71. The ridge 73 successively closes each set of contacts for each foot, but as they are dead, except the one for the desired reading, there is no result until the desired one is reached. When the live contacts are reached, the ridge 73 keeps the circuit closed at this point for the entire foot, awaiting the energizing of the selected inch contact.

The frame 76 is stationary and provides a bearing for the shaft 29. Arranged about the rear face of frame 76 (see Figs. 4 and 5) are a series of contacts 75 representing inches. On shaft 29 is an arm 77 which rotates with the shaft 29 and successively wipes over and closes the various inch contacts. These are all dead, however, except the one the circuit for which is closed at the contact C in Fig. 7 by the presence of a perforation in the distance record sheet. When the arm 77 wipes over and closes the contact 75 corresponding to the inch for which the contact C is closed at the keyboard or distance record sheet, the solenoid for the pin 78 corresponding to the sixteenths-of-an-inch value of the closed contact as *d* is energized and that pin 78 is projected into slot 80, and permits an additional feed of disk 72 and shaft 29 to allow for the additional sixteenths-of-an-inch required.

In the inner face of disk 72 (shown in Fig. 6 and being its right hand side in Fig. 4) are a series of arcuate slots 80, and in the frame 76 are mounted a series of solenoids 81, corresponding to sixteenths-of-an-inch. The various solenoids are set forward on their respective slots to give an additional fraction of a rotation to shaft 29 corresponding to the sixteenths-of-an-inch value of the particular solenoid.

Briefly stated, in the embodied mechanism the circuit is made at the desired foot, the desired inch and the desired sixteenth by the perforations in the distance record strip preparatory to energizing the solenoid of the stop pin 81 corresponding to such desired sixteenth-of-an-inch. The circuit is interrupted, however, at the foot contact and at the inch contact. The arm 77 at every rotation thereof closes the inch contact, but the circuit is still open at the foot contact. The feed of rack 70 proportionate to the travel of the work causes the ridge 73 to close the foot contact, but the inch contact is open until the proper time or point in the desired foot. When the desired inch is reached, the circuit is thus closed at every point in the contacts at the record strip and at the foot and inch contacts of the mechanism and the solenoid 81 is energized and the pin set, thereby stopping the work on the desired sixteenth.

The rack 70 is restored, either manually by lever 90, or automatically from the distance record sheet by the solenoid 91. Lever 90 lifts rack 70 clear of ridge 73 and weight 92, a suitable stop being used to limit the restoring movement of the rack.

Fig. 7 of the drawings represents a wiring diagram suitable for a distance determining

device such as is shown herein, although so far as concerns many features of the invention and of the distance determining device, other systems of wiring may be employed. In the diagram of said Fig. 7, *a* represents keyboard contacts for tens of feet either in a keyboard, or in a distance record sheet or like device, while the group *b* represents contacts for units of feet. The group *c* represents similar contacts for inches, and the group *d* represents the contacts for sixteenths-of-an-inch. *e* denotes a group of solenoids for the sixteenths-of-an-inch stop pins, which are of the proper number in the machine. The group of contacts *f*, *g*, *h*, and *i*, denote respectively, the foot contacts, on the timer for each ten foot intervals. The group marked *k* denotes the inch contacts of the timer disk. *m* indicates any suitable source of electrical energy.

For the purpose of explanation, let it be assumed that a distance feed or travel is to be made of twelve feet, three and three-sixteenth inches. On the keyboard, or by means of the perforations on the distance record sheet, the first key or contact in group *a*, is closed, the second key or contact in the group *b* is closed, and likewise the third key or contact in each of groups *c* and *d* are closed. The current from the source *m* now passes through the a^1 contact to the group *g*. Current also passes through a switch or contact 2 of group *g*, which is closed by the timer after twelve feet of travel, as the reading is in the second tens of feet and then current flows through g^2 to group *b*, then through the closed contact b^2 to group *c*. The current then flows through contact c^3 and k^3, when k^3 is closed by the timer, to group *d*. d^3 is closed by the keyboard or distance record sheet setting and the current passes on through solenoid e^3 setting the stop pin and arresting the work.

From all the foregoing it will be understood that mechanism has been provided, realizing the objects of invention and the advantages herein pointed out together with other objects and advantages. It will be further understood that changes may be made from the illustrated and described form 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 mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including stationary devices arranged in series at different points along the path of travel of the shape, said devices frictionally engaging the shape to progress it and to stop it in desired positions for punching, and distance determining means controlling the progressing and stopping action of said frictionally acting devices upon the shape.

2. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including stationary devices arranged in series at different points along the path of travel of the shape, said devices being also arranged in pairs at either side of the shape and engaging it therebetween, said devices frictionally engaging the shape to progress it and to stop it in desired positions for punching, and distance determining means controlling the progressing and stopping action of said frictionally acting devices upon the shape.

3. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including rotary stoppable devices frictionally engaging the shape and distance determining mechanism controlling said devices to stop it in predetermined position relatively to the punching mechanism.

4. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including driven rotary stoppable devices frictionally engaging the sides of the shape and distance determining mechanism controlling said devices to stop it in predetermined position relatively to the punching mechanism.

5. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including spring pressed rotary stoppable devices frictionally engaging the shape to stop it in predetermined position relatively to the punching mechanism, and distance determining mechanism controlling said action of said devices.

6. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including driven spring pressed rotary stoppable devices frictionally engaging the sides of the shape to stop it in predetermined position relatively to the punching mechanism and distance determining mechanism controlling said action of said devices.

7. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively

to the punching mechanism, said means including distance determining mechanism and stationary rotary stoppable devices controlled thereby and frictionally engaging the shape to stop it in predetermined position relatively to the punching mechanism.

8. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including distance determining devices and driven stationary rotary stoppable devices frictionally engaging the sides of the shape to stop it in predetermined position relatively to the punching mechanism.

9. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including devices located at different points longitudinally, and frictionally engaging the shape, said devices being movable and stoppable together to stop it in predetermined position relatively to the punching mechanism and a distance determining mechanism controlling said action of said devices.

10. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including devices located at different points longitudinally, and frictionally engaging the shape, said devices being rotatable and stoppable together to stop it in predetermined position relatively to the punching mechanism and a distance determining mechanism controlling the rotation and stopping of said devices.

11. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including a series of supporting rollers, and a plurality of driven devices located at different points longitudinally, and frictionally engaging the shape, said devices being stationary but rotatable and stoppable together to stop it in predetermined position relatively to the punching mechanism and a distance determining mechanism controlling the rotation and stopping of said devices.

12. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including a series of supporting rolls, rotary stoppable devices frictionally engaging the shape to stop it in predetermined position relatively to the punching mechanism, driving means therefor, and distance determining means governing said driving means and thereby the stopping and positioning action of said devices, said distance determining means including a distance record device.

13. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including devices frictionally engaging the shape, said devices being stationary but rotatable and stoppable together to stop it in predetermined position relatively to the punching mechanism and engaging the shape upon opposite sides thereof, a single driving mechanism for said devices, and distance determining means governing said driving mechanism and controlling thereby the stopping and positioning action of said devices, said distance determining means including a distance record device.

14. A machine for punching structural shapes including in combination punching mechanism, and means for successively positioning and stopping the shape relatively to the punching mechanism, said means including electro-magnetic devices acting magnetically upon the shape to stop it in predetermined position relatively to the punching mechanism.

15. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including electro-magnetic devices acting magnetically upon the shape to stop it in predetermined position relatively to the punching mechanism and distance determining means controlling the stopping action of said electro-magnetic means.

16. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including electro-magnetic devices acting magnetically upon the shape to stop it in predetermined position relatively to the punching mechanism and distance determining means controlling the stopping action of said electro-magnetic means, said distance determining means including a distance record device.

17. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including electro-magnetic devices acting magnetically upon the shape to stop it in predetermined position relatively to the punching

mechanism and settable distance determining means controlling the stopping action of said electro-magnetic means.

18. A machine for punching structural shapes including in combination punching mechanism, means for successively positioning and stopping the shape relatively to the punching mechanism, said means including electro-magnetic devices acting magnetically upon the shape to stop it in predetermined position relatively to the punching mechanism and automatically operating distance determining means controlling the stopping action of said electro-magnetic means.

19. A machine for punching structural shapes including in combination punching mechanism, means for supporting a shape and progressing it relatively to the punching mechanism, and means engaging the shape at its side to permit and prevent its progression to stop the shape in successive predetermined positions with respect to the punching mechanism.

20. A machine for punching structural shapes including in combination punching mechanism, means for supporting a shape and progressing it relatively to the punching mechanism, comprising means frictionally engaging the shape at its side to permit and prevent its progression to stop the shape in successive predetermined positions with respect to the punching mechanism and a distance determining device controlling said action of the frictionally engaging means.

21. A machine for punching structural shapes including in combination punching mechanism, means for supporting a shape and progressing it relatively to the punching mechanism, comprising driven means frictionally engaging the shape to permit and prevent its progression to stop the shape in successive predetermined positions with respect to the punching mechanism and distance determining means controlling the action of said engaging means.

22. A machine for punching structural shapes including in combination punching mechanism, means for supporting a shape and progressing it relatively to the punching mechanism, comprising devices frictionally engaging the shape upon opposite sides to permit and prevent its progression to stop the shape in successive predetermined positions with respect to the punching mechanism and distance determining means controlling the action of said engaging means, said distance determining means including a distance record device.

23. A machine for punching structural shapes including in combination punching mechanism, means for supporting a shape and progressing it relatively to the punching mechanism, and comprising means engaging the shape at its side to permit and prevent its progression to stop the shape in successive predetermined positions with respect to the punching mechanism and settable distance determining means controlling the action of said engaging means.

24. A machine for punching structural shapes including in combination punching mechanism, means for progressing a shape past said punching mechanism, a pair of rolls pressing against opposite sides of the shape, said rolls being connected to rotate together, and means acting automatically to stop said rolls after predetermined distance of travel of the shape.

25. A machine for punching structural shapes including in combination punching mechanism, means for progressing a shape past said punching mechanism, a pair of rolls pressing against opposite sides of the shape, said rolls being connected to rotate together, and means acting automatically to stop said rolls after predetermined distance of travel of the shape, said means including a preliminarily prepared distance record device.

26. A machine for punching structural shapes including in combination work progressing and stopping means including a stationary electro-magnet acting directly on the shape.

27. A machine for punching structural shapes including in combination work progressing and stopping means including a stationary electro-magnet acting to brake the shape and having the magnetizing circuit controlled by a distance record device.

28. A machine for punching structural shapes including in combination work progressing and stopping means including driven rolls for progressing the work and electro-magnetic braking devices acting directly to stop the work.

29. A machine for punching structural shapes including in combination work progressing and stopping means including driven rolls for progressing the work and a stationary electro-magnet acting directly upon the work to stop it, and a distance record device control therefor.

30. A metal punching machine including in combination means for punching the shape and means for successively progressing and stopping the shape relatively to the punching means, said progressing means including a distance determining device comprising members having travel proportional to the work and having settable devices representing distance denominations and values, and connections through said traveling members and settable devices for stopping the progress of the work.

31. A metal punching machine including

in combination means for punching the shape and means for successively progressing and stopping the shape relatively to the punching means, said progressing means including a distance determining device comprising members having travel proportional to the work and having settable devices representing distance denominations and values controlled by a distance record sheet, and connections through said traveling members and settable devices for stopping the progress of the work.

32. A metal punching machine including in combination means for punching the shape and means for successively progressing and stopping the shape relatively to the punching means, said progressing means including a distance determining device comprising members having travel proportional to the work and having settable devices representing distance denominations and values, electrical connections through said traveling members and settable devices for stopping the progress of the work.

33. A metal punching machine including in combination means for punching the shape and means for successively progressing and stopping the shape relatively to the punching means, said progressing means including a distance determining device comprising members having travel proportional to the work and having settable devices representing distance denominations and values controlled by a distance record sheet, and electrical connections through said traveling members and settable devices for stopping the progress of the work.

34. A machine for punching structural shapes including in combination punching means and means for successively traveling and positioning the shape relatively to the punching means, comprising a pair of driven rolls pressing against the shape and connected to rotate together, driving means therefor, and distance determining means controlling the rotation and stopping of said rolls.

35. A machine for punching structural shapes including in combination punching means and means for successively traveling and positioning the shape relatively to the punching means, comprising a pair of driven rolls pressing against the opposite sides of the shape and connected to rotate together, means for varying the distance between the rolls for shapes of different sizes, driving means therefor, and distance determining means controlling the rotation and stopping of said rolls.

36. A machine for punching structural shapes including in combination punching means and means for successively traveling and positioning the shape relatively to the punching means, comprising a pair of driven rolls pressing against the opposite sides of the shape and connected to rotate together, means for varying the distance between the rolls for shapes of different sizes, means for exerting spring pressure of said rolls against the shape, driving means therefor, and distance determining means controlling the rotation and stopping of said rolls.

37. In a metal working machine tool equipped means, means for successively traveling and stopping the work relatively thereto, said means comprising a plurality of circuit gaps, one at each distance denomination and submultiple thereof, and means for simultaneously closing all of said gaps only at the selected distance.

38. In a metal working machine tool equipped means, means for successively traveling and stopping the work relatively thereto, said means comprising a plurality of circuit gaps, one for each value in each denomination and submultiple thereof, means for selectively energizing one contact in each denomination and submultiple group for the desired selected value in each, and means for simultaneously closing all of said gaps only at the selected distance.

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,
WILLARD L. HOAGLAND.

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