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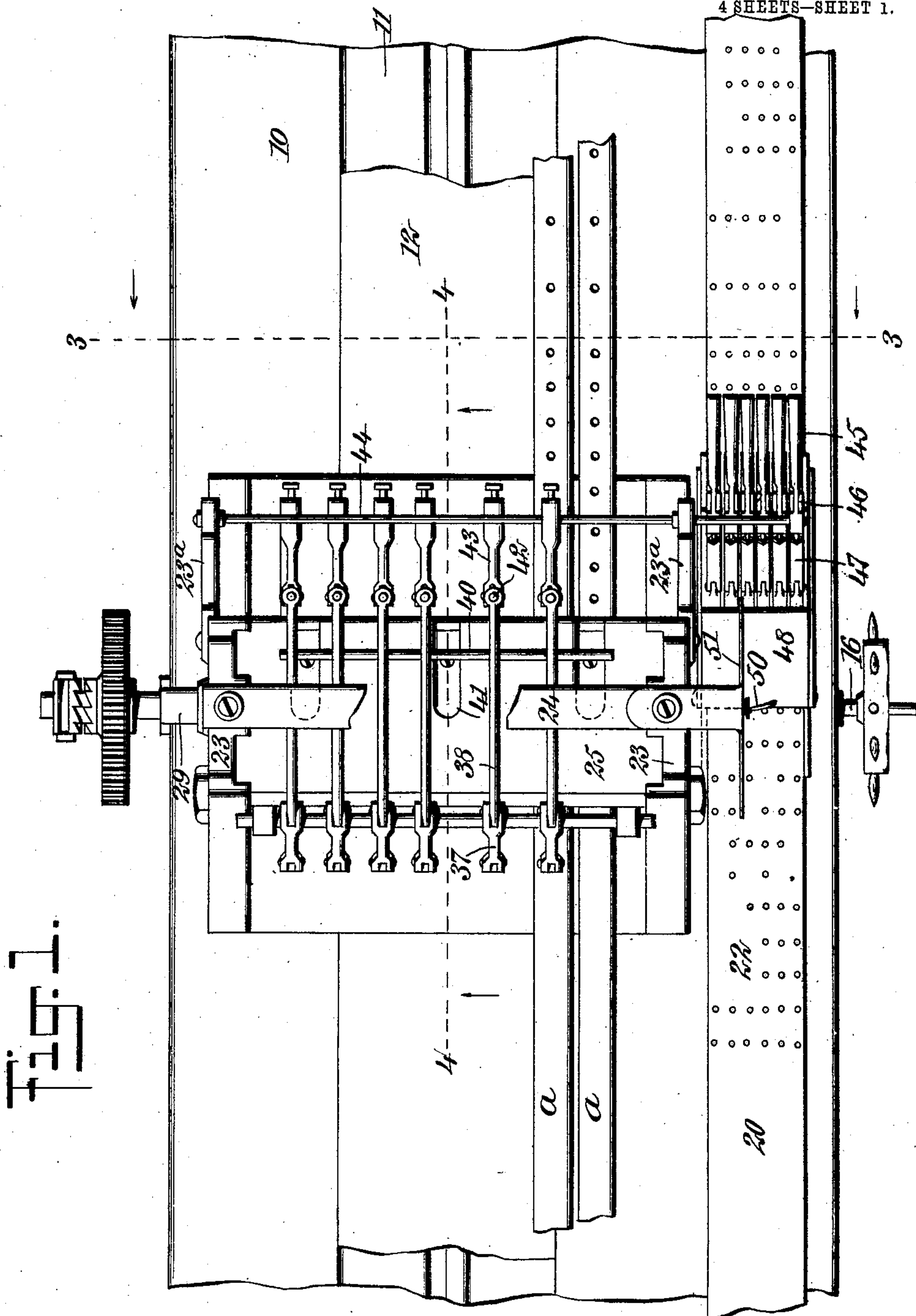
PATENTED AUG. 6, 1907.

F. C. M. & E. F. SILVERS.

MULTIPLE PUNCH.

APPLICATION FILED APR. 11, 1906.

4 SHEETS—SHEET 1.



WITNESSES

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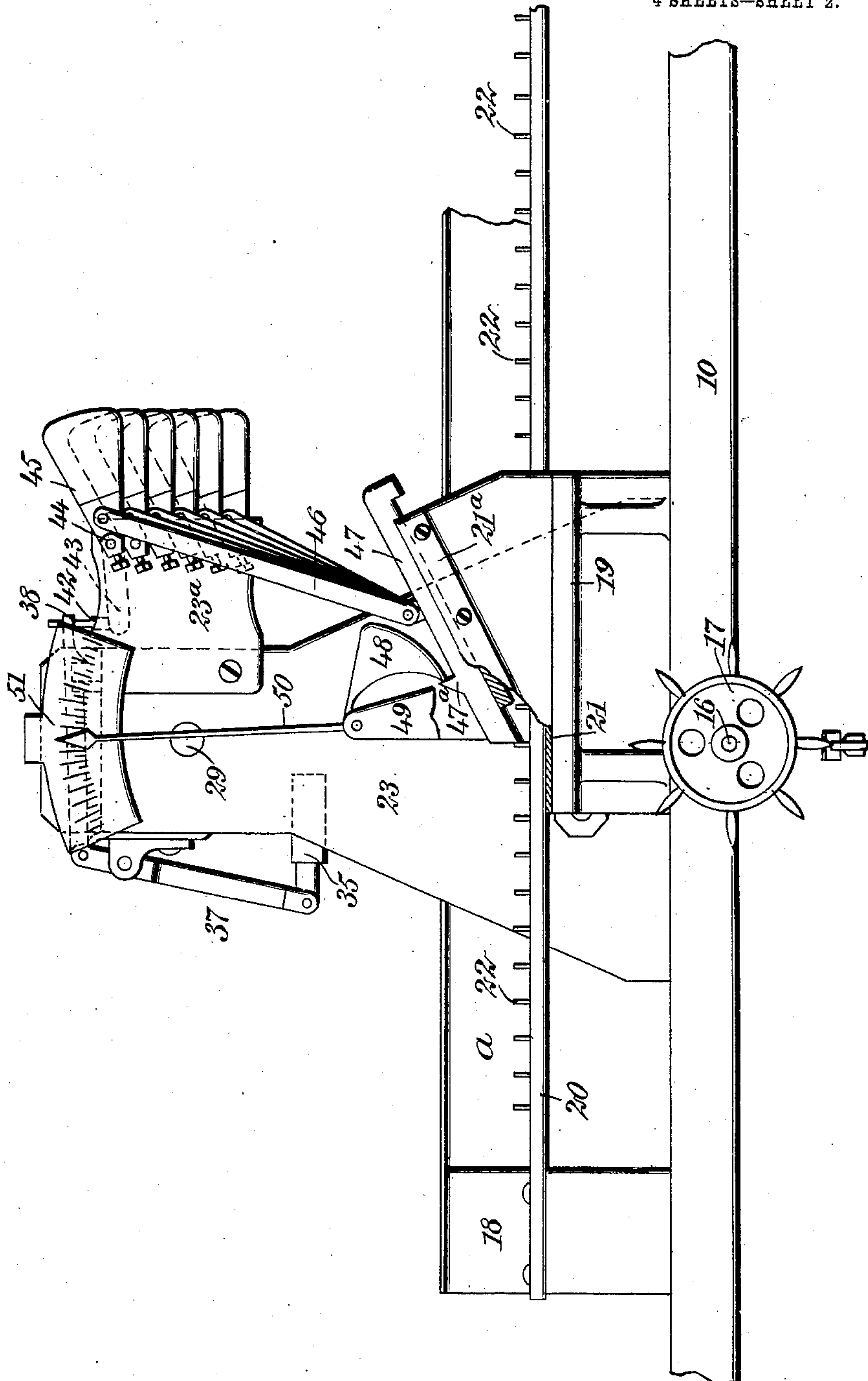
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4 SHEETS—SHEET 2.

FIG. 2.



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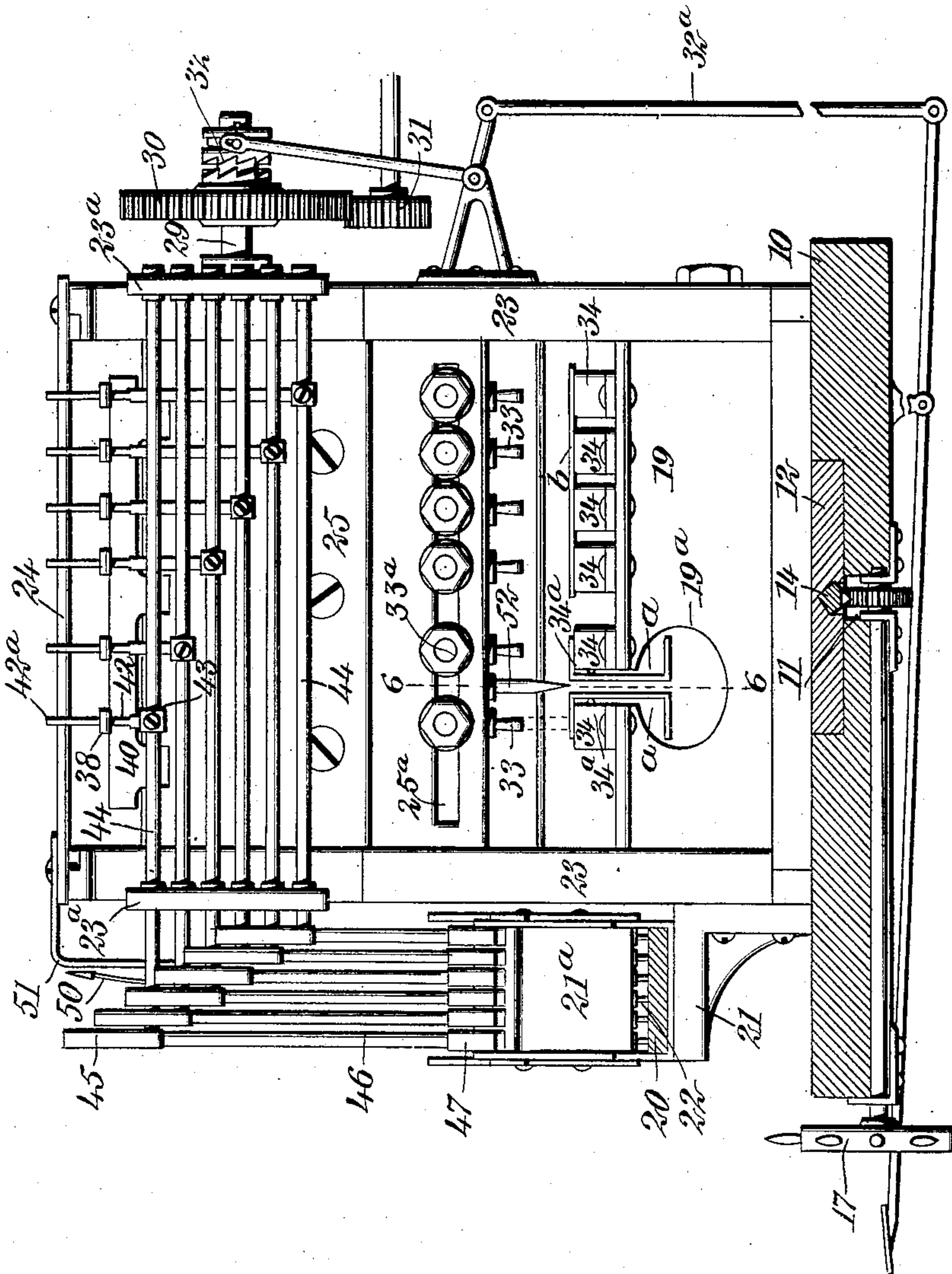
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4 SHEETS—SHEET 3.

Fig. 3.



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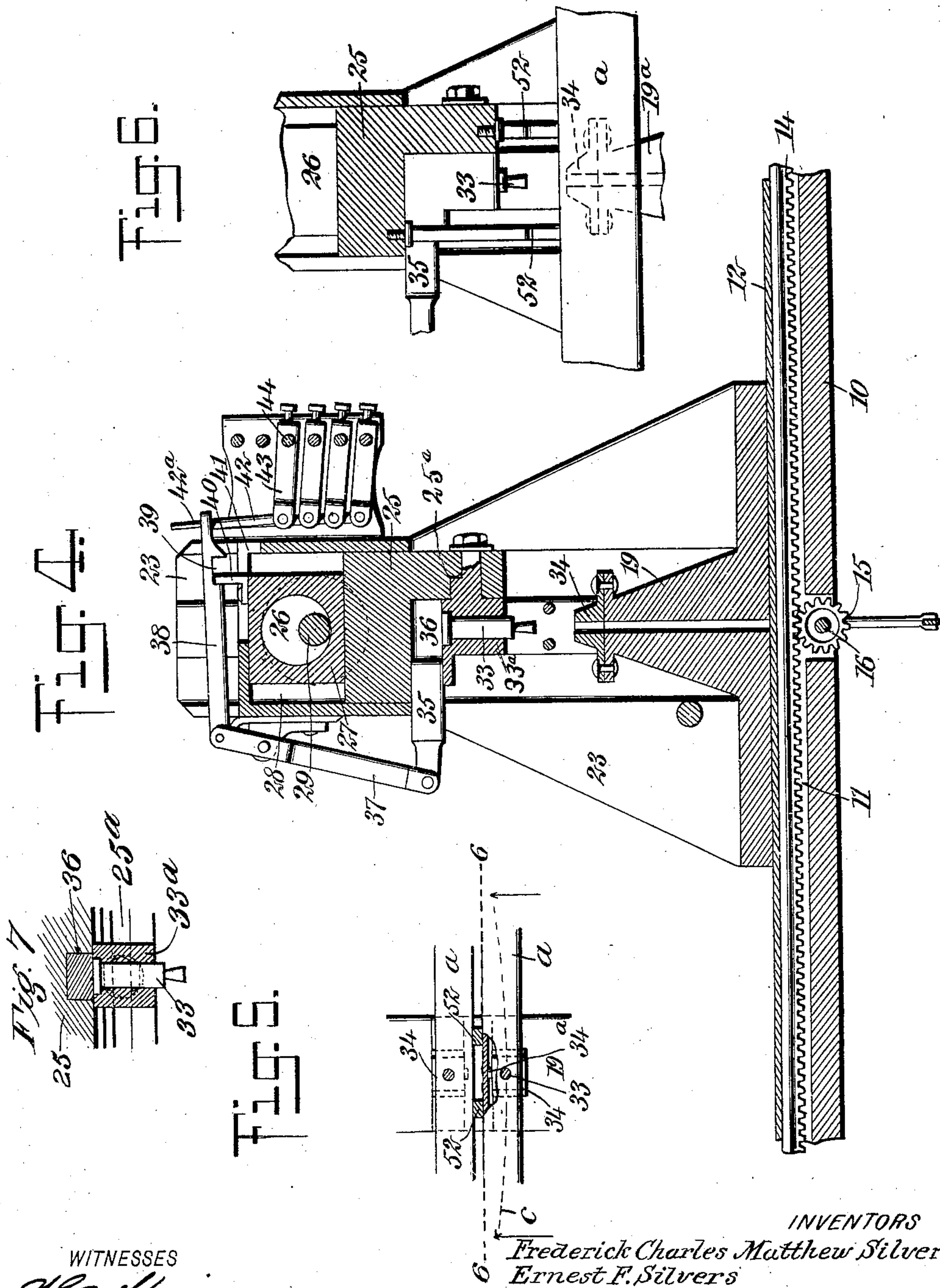
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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MULTIPLE PUNCH.

No. 862,516.

Specification of Letters Patent.

Patented Aug. 6, 1907.

Application filed April 11, 1906. Serial No. 311,113.

To all whom it may concern:

Be it known that we, FREDERICK CHARLES MATTHEW SILVERS and ERNEST F. SILVERS, both citizens of the United States, and residents of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Multiple Punch, of which the following is a full, clear, and exact description.

The invention relates to certain improvements in the punch selecting mechanism of multiple punches used especially for punching beams, girders and the like in architectural and other engineering work.

Primarily the object of our invention is to dispense with the employment of skilled labor in the operation of the machine and construction of the patterns, and to insure accurate and speedy work.

Punches of the class to which our invention is applicable are usually provided with a head which is suitably actuated to reciprocate toward and from the work table or dies, and which carries a number of loosely arranged punching tools. These tools are rendered active or inactive by "gags" or blocks which may be moved at will back of the loosely mounted tools, thus rendering them fast in the head and causing them to act on the work as they are moved with the head toward the die table.

Our invention contemplates the automatic selection of these gags or other devices for rendering the tools active and this is effected by the provision of a pattern plate mounted to move with the work carriage, and actuating a number of members which are in connection by certain peculiar devices with the respective gags, so that as the pattern plate moves with the work, it automatically and with machine-like accuracy sets the selected gag operating devices to bring into operation the proper punching tools. We also prefer to employ an indicator which is operated from the said members, whereby to show when the parts are in true punching position thus relieving the operator of all work but the mere throwing of the clutch or other means for starting the movement of the punch head and enabling us to operate the machine with unskilled labor.

Our invention also contemplates improvements in the devices for punching channel and angle irons, especially the devices for punching said irons in pairs, according to which the dies are provided with adjustable lugs or the like to set the position of the irons with respect to the punches, and the punch head is provided with work retainers, preferably in the form of tapered or wedge shaped pins, which, as the punches move into action, enter between the two sections of angle or channel iron, or otherwise act on the work to prevent it from being sprung or bowed by the strains due to the punching operation.

Various other features of major or minor importance are involved, and all will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings which illustrate as an example the preferred embodiment of our invention, in which drawings

Figure 1 is a plan view of a multiple punch having our invention applied thereto; Fig. 2 is a side elevation of the same, illustrating the pattern, the devices actuated therefrom for operating the punch selecting means, and the gage or indicator, parts of the framing in said view being broken away; Fig. 3 is a sectional elevation on essentially the line 3—3 of Fig. 1; Fig. 4 is a fragmentary longitudinal section on the line 4—4 of Fig. 1, showing the punch head, its operating mechanism, the punches, the punch gags, die table, and the means for moving the carriage; Fig. 5 is a fragmentary detail with parts in section showing the operation of punching two channel irons, and illustrating the work retainers in action whereby to prevent bowing of the work; and Fig. 6 is a fragmentary longitudinal section on the line 6—6 of Figs. 3 and 5, and showing the action on the channel irons and the operation of the work retaining pins or wedges. Fig. 7 is a vertical cross section taken through one of the gags and the contiguous parts, and illustrating the lateral adjustability of the punching tools beneath the gags.

10 indicates the bed of the machine, in the longitudinal groove 11 of which a carriage 12 is movable. The carriage is provided on its under side with a rack 14, and in mesh with the rack is a pinion 15 mounted on a shaft 16 extended transversely on the bed 10, and provided with a wheel 17 or other means for intermittently rotating the shaft so as to advance the carriage with a step-by-step motion.

At each end the carriage is provided with an elevated head block 18, one of which is shown in Fig. 2, and to these head blocks the work, indicated at *a, a*, in the drawings, is fastened, the work passing over the die table 19 of the punch, as indicated best in Fig. 3. To the head block 18 a pattern plate 20 is also fastened, said plate extending parallel with the work and running over a support or table 21 located in approximately a transverse position to the die table 19 before described, the table or support 21 serving to prevent sagging of the pattern plate at this point. Said pattern plate is provided with a number of pegs 22 which project upward from the pattern, and since the pattern is as long as the work the pegs 22 are placed along the pattern at longitudinal distances from each other exactly equal to the longitudinal distances between the holes to be punched in the work. The transverse distances between the pegs 22 do not correspond to the transverse distances between the holes to be punched in the work,

since these distances between the holes in the work are determined by the position of the punches and dies, as will hereinafter fully appear.

At each side of the die table 19 the machine is provided with vertical frame sections 23 which are rigidly connected at their top by a tie plate 24. Guided in and movable vertically between these frame sections 23 is the head 25 of the machine and this is, according to the usual method, actuated through an eccentric 26 which works in a box 27 movable horizontally in a cavity 28 formed in the head. The eccentric 26 is carried on an operating shaft 29 which is revolvably mounted in the frame sections 23, and provided with suitable mechanism for driving and starting and stopping the shaft at will, this mechanism according to the preferred embodiment of our invention being controllable from the side of the machine at which the pattern plate 20 is located. As here shown, such mechanism comprises a gear 30 loose on shaft 29 and driven by a gear 31 with clutch mechanism 32 for securing the gear 30 to the shaft 29 at will, the clutch mechanism being connected to a linkage or treadle device 32^a, extending under the bed 10 to the opposite side of the machine adjacent to the table or support 21 before referred to. The head 25 carries loosely punching tools 33, the working ends of which project below the head respectively in position to enter the dies 24 which are mounted on the table 19. These punches are loosely mounted in blocks 33^a which are adjustably attached, as shown, in a slot 25^a in the head 25. As will be understood from the prior art, both the punching tools and dies are adjustable transversely with respect to each other to regulate the transverse distances between the holes formed in the work, the work passing over the dies and under the punches, as shown with respect to the parts *a* and *b* in Fig. 3.

35 indicates the gags or devices for rendering the punches active. The devices are arranged to move horizontally in cavities 36 formed in the punching head so that they may be placed back of the punching tools rendering the tools fast in the head, and further causing the tools to act. Said gags 35 are articulated to levers 37 which are fulcrumed on the punching head and extend upward above the same. These levers have links 38 pivoted to their upper ends and said links extend over the top of the punching head and are formed near their free or right hand ends (see Fig. 4) with notches 39. The sides of the notches 39 are adapted to be engaged by a bead or flange 40 carried on the eccentric box 27, the parts connecting said bead or flange with the eccentric box passing through openings 41 in the top of the punching head, as shown best in Figs. 1 and 4. When the operating shaft 29 turns to move the head 25 downward it imparts not only a downward movement to the box 27, but also a horizontal movement which causes the said box to move over from right to left (referring to Fig. 4). If one, or more, of the links 38 is lowered to the position shown in Fig. 4, the bead 40 moving with the box 27 will cause the links 38 to throw the levers 37 and the gags connected with such of the links as are in said downward position, will be moved inward from the position shown in Fig. 4 to a position back of their respective punches, thus locking the punches and causing them to operate. As the rotation of the shaft 29

continues and the head 25 begins to return to its upward position, the motion of the box 27 is reversed and by a reversal of the above described operation the gags 35 are returned to the position shown in Fig. 4. It, therefore, follows that the position of the links 38 determines which of the punches are to operate as the punching head descends.

According to our invention, the links 38 are raised into inactive position by means of fingers 42 which have reduced ends 42^a sliding freely in openings in the free ends of the links, but below these reduced portions 42^a shoulders are formed on the fingers which engage the links to lift them. Said fingers 42 have their lower ends pivoted to arms 43, and these are fastened on rock shafts 44. The rock shafts 44 are mounted in extensions or wings 23^a of the frame members 23, and the ends of the rock shafts at the side of the machine at which the pattern plate is located are provided with weighted arms 45, these arms projecting oppositely from the arms 43, as shown by the full and broken lines in Fig. 2. The weighted arms 45 having this arrangement relatively to the arms 43 tend normally to hold said arms in their raised position, and thus raising the fingers 42 to keep the links 38 normally raised so that they will not be acted on by the bead or flange 40. When, however, the weight of one or more of the weighted arms 45 is overcome, the corresponding arms 43 are thrown down thus depriving the links 38 of their support, and said links are free to fall by gravity into the active position shown in Fig. 4, and this is the operation which precedes the operation of throwing the gags into active position. The links 46 are pivoted respectively to the weighted arms 45, and said links extend down and are joined to sliding members 47. These sliding members 47 are arranged in an inclined position in the guide-way 21^a which is just over the table 21, and under which guide-way the pattern 20 passes, said members 47 being capable of sliding down the guide-way until their lower ends rest on the pattern. Said sliding members 47 are arranged so that the transverse distances between the members may be just equal to the transverse distances between the pins 22 of the pattern. The drawing shows six punches, and the sliding members 47 must correspond in number with the number of punches, and also with the maximum number of pins 22 extending transversely on the pattern. Therefore, as the pattern advances and one, or more, of its pins 22 strikes the corresponding members 47, the members thus engaged by the pins will be moved upward along the guide-way 21, this action lifting the corresponding links 46 and the arms 45 to which said links are attached, and in this manner dropping the links 38 which correspond to the pins 22 then active, and causing to be thrown into action those of the gags 35 which also correspond to the pins then active. The sliding members 47 have shoulders 47^a thereon, and these shoulders are adapted to engage a weighted member 48 which is pivoted to stanchions 49 rising from the guide-way 21^a. In connection with said weighted arm 48 is an indicator finger 50, and this extends upward outside of the adjacent frame members 23 and is arranged to play over a scale 51 which is suitably sustained at the upper part of said frame section. The parts 47^a, 48, 50 and 51 are so disposed that when one, or more, of the pins 22 strikes the corre-

sponding slide members 47, and bring about the above described adjustment of the links 38, and when the work and pattern have reached a position with respect to the tools and dies corresponding accurately to the position which the holes are to occupy on the work, said indicator finger 50 will point to the central mark or to any other selected mark on the scale. In other words, owing to the above described organism of elements when the indicator 50 points to a predetermined mark on the scale the operator knows that all of the parts of the machine, the work included, are in proper position for the punching operation.

In order to render the machine capable of accommodating channel and angle irons, the die table 19 is formed with an opening 19^a which extends to the top of the die table, and two of the dies 34 are placed on opposite sides of this opening, as shown in Fig. 3. Said dies 34 are provided with adjustable lugs 34^a projecting from their adjacent faces. The channel irons indicated at *a* in the drawings are placed with their webs extending downward between the two dies and their lower flanges occupying the major portion of the opening 19^a, while their upper flanges, the ones on which the punches are to operate, are resting on top of the dies. The transverse position of the punch holes in the said upper flanges of the channel irons are regulated by the adjustment of the lugs or pins 34^a allowing the channel irons to be moved toward or from each other so as to place them in proper position with respect to the two punches which are acting on the irons. It has been found in practice that the operation of punching holes along the flanges of angle or channel irons, owing to the strains thus imposed on the irons and to the presence of the web at one side of the flange, causes the irons to be bowed or bent, a feature which is obviously extremely objectionable, and which is often so serious as to render the work unfit for subsequent use. In order to counteract these strains and retain the work in its true form, we provide the two retainers 52 shown in Figs. 3, 5 and 6. These retainers are preferably in the form of tapered or wedge-shaped pins or bars, and they are, as shown in Fig. 6, attached to the punch head and projected downward therefrom, one forward and the other rearward of the transverse line in which the punches and dies are situated. Said retainers are arranged in longitudinal alinement with each other and equi-distant between the two punches which act on the angle irons, so that when the punching head descends and the two punches go into operation the retainer pins 52 are entered between the two angle irons or otherwise engaged with the work, so as to prevent the work from being sprung laterally and its proper form destroyed. This operation may be made clear by reference to Fig. 6, where the broken line *c* may be taken to indicate with more or less exaggeration the spring or bow which the punching of angle irons ordinarily causes therein, and it will be seen from this figure that the retainers 52 engaging the work, as shown and described, will resist this bowing or bending tendency, with the result that the work passes through the machine without changing its straight form. The retainers 52 move upward with the punches and thus disengage the work so that the work may be fed forward for a second operation.

The operation of the apparatus may be traced as follows:—The work of whatever nature it may be, either

in the form of the channel irons *a*, plate *b*, or other material capable of being operated on, is placed on the carriage with its ends supported by the head blocks 18 and with its intermediate portion arranged to run over the dies. If desired, suitable supports may be provided for the work between the head blocks and die table to prevent the work from sagging. The pattern plate with the pins 22 previously placed therein according to the punching plan (that is to say, the diagram showing the manner in which the work is to be punched) is then placed on the head block parallel to the work so that its intermediate portion will run over the support 21. When this has been accomplished the carriage is set in motion, and this motion is continued until one, or more, of the pins 22 in transverse alinement on the pattern engages the corresponding sliding members 47 and cause said members to move upward on the guide-way 21 until the indicator 50 reaches the predetermined mark on the scale 51 and shows that the movement of the carriage has progressed sufficiently. At this time the operator should arrest the movement of the carriage. The operation so far carried out will result in the lifting of the links 46 which are in connection with the sliding members 47 that have been operated, and in the drop of the corresponding arms 43 and fingers 41 this will be followed by the movement of the corresponding links 38 downward from their normal inactive position to that shown in Fig. 4. After the carriage has been stopped, the operator through the medium of the mechanism 32, 31 and 30, or equivalent devices provided for this purpose, without leaving his station should cause the rotation of the shaft 29 to begin, and the eccentric 26 acting through its box 27 first causes those gags 35 which are connected with the links 38 that have been dropped to enter into active position, to move back of the corresponding punches 33 and next causes the downward movement of the punching head 25 to begin, so that when the punches engage the work those punches which are backed by the gags 35 will pass through the work perforating it, while the other punches will rest idly on the work and the punches first named will, owing to the mechanism which we have provided, correspond exactly to the pins on the pattern which pins have been previously referred to as engaging the corresponding sliding members 47. After this has been accomplished the continuing rotation of the shaft 29 returns the parts to the position shown in Fig. 4, after which the rotation of the shaft 29 should be arrested. The operator will then cause the table to take a second movement, and the instant this begins the pins 22 which were previously described as engaged with the members 47 will run under said members and allow the members to return to their position on the face of the pattern 20, and this is followed by the dropping of the weighted arms 45 previously sustained by the members 47 which were raised, and the upward movement of the corresponding arms 43 and fingers 42, thus causing the links 38 before active to reassume their inactive position. This leaves all of the links raised to inactive position, and as the movement of the carriage continues the next pin or transverse line of pins engages the corresponding member 47 whereupon the above described operation is repeated.

The pattern plate 20 may be constructed of wood

and may be very much narrower than the width of the punching machine or that of the work being punched, it being necessary to make said pattern plate of a width only equal to the combined width of the members 47. This enables us to construct the pattern plates at a minimum expenditure of material. The pins 22 may be fastened in the pattern in any desired manner, and since this may be easily and rapidly done it follows that the patterns may be cheaply constructed. Owing to the selection of the punches automatically and by mechanical devices we insure rapidity of action and absolutely accurate results. Heretofore where the selection of the punching tools has been effected manually, numerous mistakes have occurred resulting in much loss of work, and the accuracy which our invention insures will consequently result in considerable saving, since the entire operation is controlled by the machine and the operator has only to be guided by the indicator finger 50. It follows that a single unskilled man may be employed to operate the machine, thus greatly cheapening the cost of operation. Further, the invention saves the heretofore necessary operations of marking the work and reaming the holes to correct inaccuracies in the location thereof. And where pattern plates bolted to the work were previously employed, the cost of the lumber necessary for these patterns is saved.

Special attention is called to the feature of the lateral adjustability of the punching tools beneath the gags; this will readily be understood from an inspection of Fig. 7. The punching tools can be adjusted laterally to either side from their normal central position beneath the gags, although the gags are not adjustable and simply slide in and out.

Having thus described the preferred form of our invention, what we actually claim and desire to secure by Letters Patent is:

1. In a multiple punch, in combination, a movable punch-head, a plurality of punches carried thereby, means for adjusting said punches on said head to change the relative arrangement, members mounted to move in a fixed plane behind said punches controlling the operativeness thereof, and automatic means for controlling said members according to a pattern.

2. In a multiple punch, in combination, a movable punch-head, a plurality of punches adapted to slide longitudinally on said head whereby a change of arrangement of said punches may be effected, a plurality of gags mounted to slide in a fixed plane and adapted to render said punches operative or inoperative individually, and means for controlling said gags according to a pattern.

3. In a multiple punch, in combination, a movable punch-head having a slot therein, a plurality of blocks adjustably mounted in said head, punches carried loosely respectively by said blocks, gags slidably mounted at fixed points in said head behind said blocks to render the same individually operative or inoperative when said head descends, and means for controlling said gags according to a pattern.

4. In a multiple punch, in combination, a frame, a transversely disposed shaft mounted therein, an eccentric carried thereby, a box carried by said eccentric and having a lateral movement and a vertical movement due to said eccentric, a punch-head having a plurality of punches, means whereby the vertical movement of said box may actuate said head, and means for rendering said punches individually operative or inoperative and controlled by the said lateral movements of said box.

5. In a multiple punch, in combination, a frame, a shaft mounted therein and having an eccentric, a box on said eccentric, a punch-head guided in said frame and adapted

to be depressed by a downward movement of said box, a plurality of punches carried by said head, gags slidably mounted in said head and rendering said punches operative or inoperative, levers connected with said gags for actuating the same, links pivotally attached to said levers and adapted to be engaged by said box to actuate said gags, and means for holding said links out of engagement with said box controlled by a pattern.

6. In a multiple punch, in combination, a frame, a shaft rotatably mounted therein and having an eccentric, a punch-head, a box on said eccentric and adapted to depress said head, a plurality of punches carried in said head, a plurality of gags behind said punches and controlling the same individually, levers respectively attached to said gags, links pivotally attached to said levers respectively and having notches which may engage said box whereby the lateral movement of said box may move said gags, members connected with said links and adapted to move the same out of engagement with said box, and means for actuating said last members by a pattern.

7. In a multiple punch, in combination, a punch-head, a plurality of punches carried thereby, means for depressing said head, a pattern having pins projecting from the face thereof, a plurality of slides mounted in an inclined position and projecting into the path of said pins, means for guiding said slides to move longitudinally, and means actuated by said slides for individually controlling said punches and rendering said punches operative or inoperative.

8. In a multiple punch, in combination, a punch-head, a plurality of punches carried thereby, a plurality of slides, means for guiding said slides to move longitudinally, mechanism connecting said slides with said punches and affording means for rendering said punches operative or inoperative, and means for guiding a pattern adjacent to said slides, said slides being inclined to the path of said pattern whereby they may engage the same and allow the pattern to pass.

9. In a multiple punch, the combination of a bed, a work and pattern carriage arranged to move thereon, a vertically disposed frame, a punch head carried thereby, means for operating the punch head, independently operative punches carried by the head, means controlling the action of said punches, sliding members adapted to be actuated by the pattern, an indicator actuated by said sliding members for the purpose specified, links joined to the sliding members, weighted arms connected to the links, rock shafts on which the arms are respectively fastened, an additional arm fastened to each rock shaft, and fingers carried by said additional arms and respectively in connection with the said means controlling the action of the punches whereby to set such means automatically under control of the pattern.

10. In a multiple punch, the combination of a bed, a work and pattern carriage arranged to move thereon, a vertically disposed frame, a punch head carried thereby, means for operating the punch head, independently operative punches carried by the head, means controlling the action of said punches, sliding members adapted to be actuated by the pattern, an indicator, for the purpose specified, links joined to the sliding members, weighted arms connected to the links, rock shafts on which the arms are respectively fastened, an additional arm fastened to each rock shaft, and fingers carried by said additional arms and respectively in connection with the said means controlling the action of the punches whereby to set such means automatically under control of the pattern.

11. In a multiple punch, the combination of a bed, a work and pattern carriage arranged to move thereon, a vertically disposed frame, a punch head carried thereby, means for operating the punch head, independently operative punches carried by the head, means controlling the action of said punches, sliding members adapted to be actuated by the pattern, links joined to the sliding members, weighted arms connected to the links, rock shafts on which the arms are respectively fastened, an additional arm fastened to each rock shaft, and fingers carried by said additional arms and respectively in connection with the said means controlling the action of the punches whereby to set such means automatically under control of the pattern.

12. In a multiple punch, the combination of a bed, a work and pattern carriage arranged to move thereon, a vertically disposed frame, a punch head carried thereby, means for operating the punch head, independently operative punches carried by the head, means controlling the action of said punches, movable members adapted to be actuated by the pattern, an indicator actuated by said movable members for the purpose specified, links joined to the movable members, weighted arms connected to the links, rock shafts on which the arms are respectively fastened, an additional arm fastened to each rock shaft, and fingers carried by said additional arms and respectively in connection with the said means controlling the action of the punches whereby to set such means automatically under control of the pattern.

13. In a multiple punch, the combination of a bed, a work and pattern carriage arranged to move thereon, a vertically disposed frame, a punch head carried thereby, means for operating the punch head, independently operative punches carried by the head, means controlling the action of said punches, sliding members adapted to be actuated by the pattern, an indicator actuated by said sliding members for the purpose specified, links joined to the sliding members, weighted arms connected to the links, rock shafts on which the arms are respectively fastened, an additional arm fastened to each rock shaft, fingers carried by said additional arms and respectively in connection with the said means controlling the action of the punches whereby to set such means automatically under control of the pattern, and dies corresponding with the punches and mounted on the bed under the punching head.

14. In a multiple punch, the combination of a work and pattern carriage, a punch head, means for operating the punch head, independently operative punches carried by the head, means for controlling the operation of the punches, movable members adapted to be actuated by the pattern, devices in connection with said movable members and said means for controlling the operation of the punches whereby to set such means automatically under

control of the pattern, and an indicator operating in unison with the pattern actuated device, for the purpose specified.

15. In a multiple punch, the combination of a work and pattern carriage, a punch head, means for operating the punch head, independently operative punches carried by the head, means for controlling the operation of the punches, devices actuated by the pattern for automatically setting said means controlling the operation of the punches, and an indicator in connection with said devices, for the purpose specified.

16. In a multiple punch, the combination of a work and pattern carriage, a punch head, means for operating the punch head, independently operative punches carried by the head, means automatically controlled by the pattern for actuating the punches, and an indicator acting in unison with said last means.

17. In a multiple punch, the combination of two punches, two dies, said dies and punches serving to act on two, oppositely situated sections of work, and a work retainer acting in unison with the punches and adapted to enter between said sections of work to retain the form thereof.

18. In a multiple punch, the combination of two punches, two dies, said dies and punches serving to act on two oppositely situated sections of work, and work retainers acting in unison with the punches and arranged one at each side of the punch line, said retainers serving to enter between the work sections to retain the form thereof.

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

FREDERICK C. M. SILVERS.
ERNEST F. SILVERS.

Witnesses:

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JNO. M. RITTER.