No. 847,535 PATENTED MAR. 19, 1907.

J. WYTMAN.

PUNCHING MACHINE.

APPLICATION FILED MAR. 10, 1906.

3 SHEETS—SHEET 1.

FIG. 8

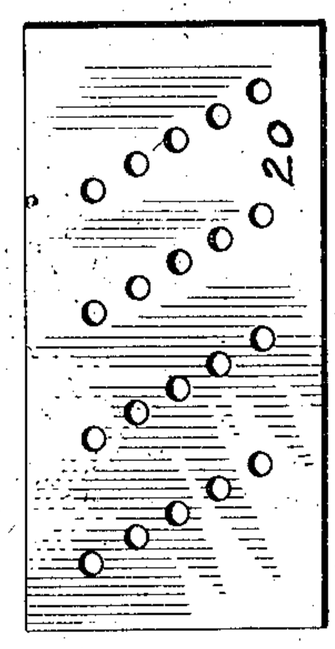

FIG. 7

FIG. 1

WITNESSES.

J. R. Keller

H. W. Kay

INVENTOR.

Jas. Wytman

By Kay Fothergill & Wales

Attys.

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3 SHEETS—SHEET 2.

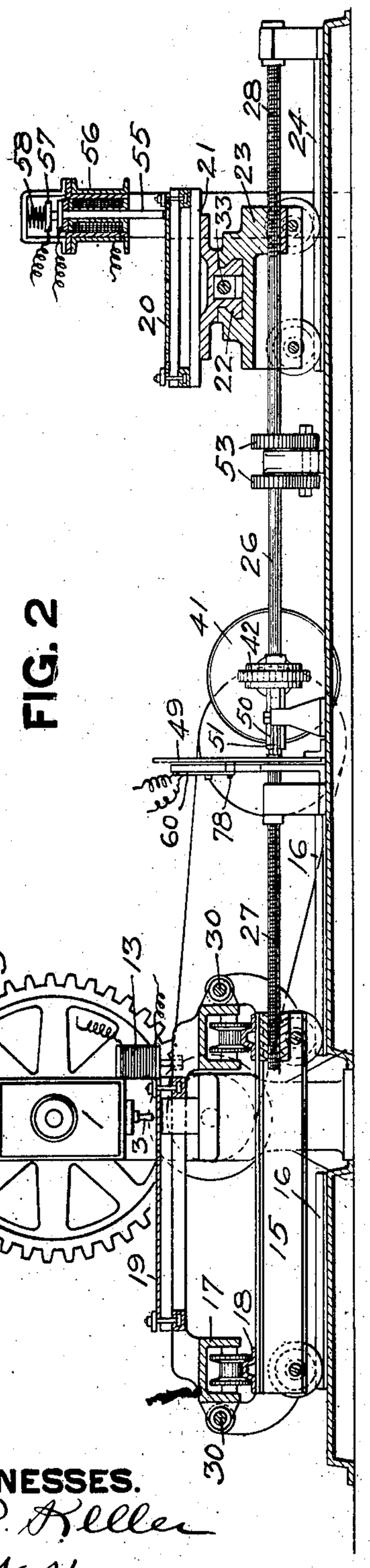

FIG. 2

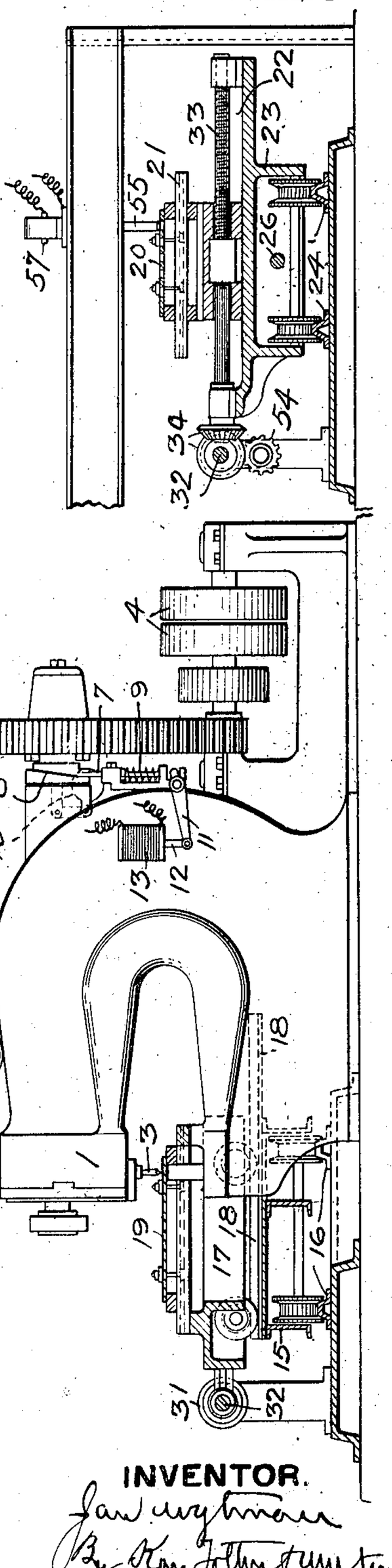

FIG. 4

FIG. 3

WITNESSES.

J. R. Keller

H. W. Kay

INVENTOR.

James Wytman

By Kay Fothergill & Hunter

Attys

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3 SHEETS—SHEET 3.

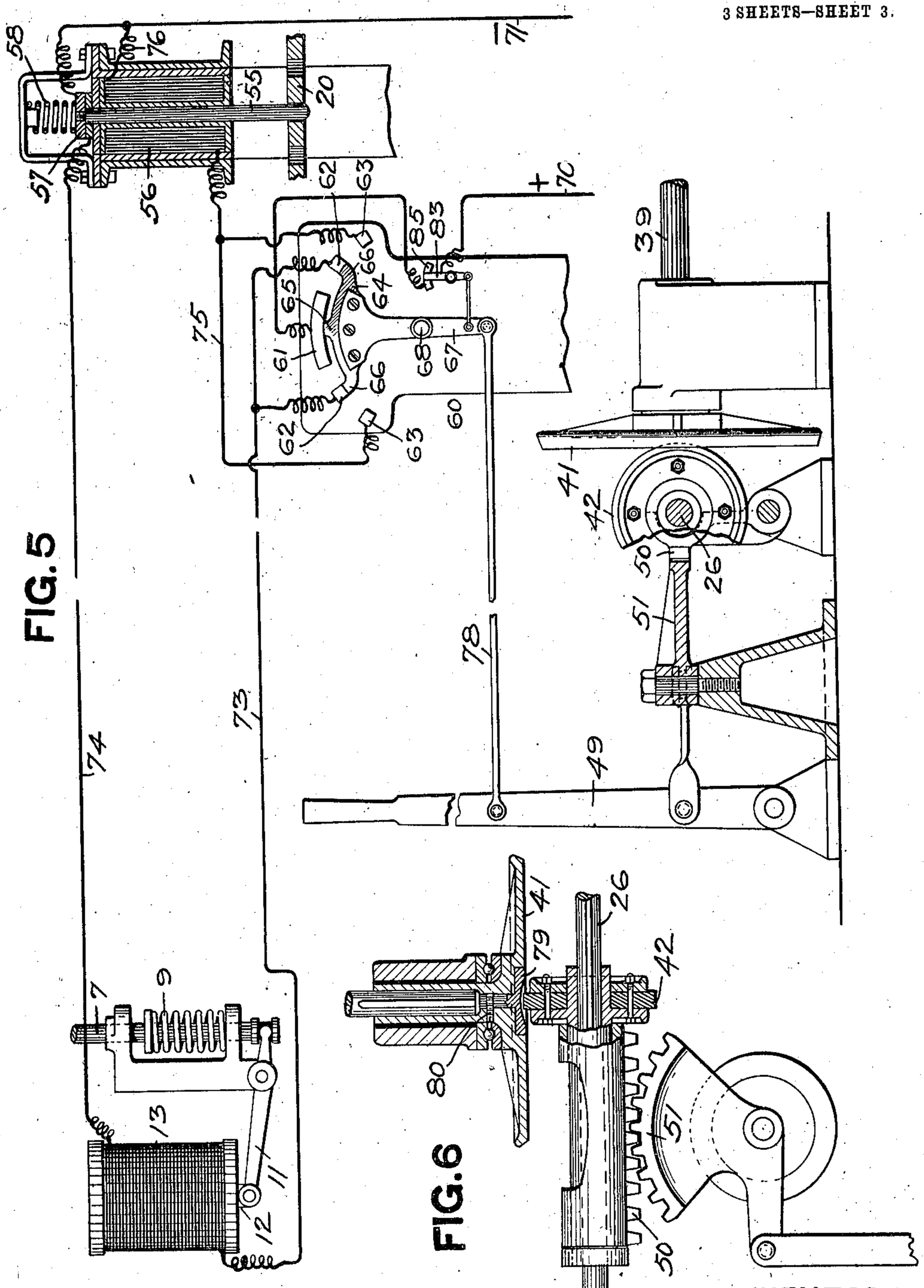

FIG. 5

FIG. 6

WITNESSES.

J. R. Keller

F. W. Kay

INVENTOR.

Jan Wytman

By Kay Lothrop Hunter & Kay Attys

UNITED STATES PATENT OFFICE.

JAN WYTMAN, OF AVALON, PENNSYLVANIA.

PUNCHING-MACHINE.

No. 847,535. Specification of Letters Patent. Patented March 19, 1907.

Application filed March 10, 1906. Serial No. 305,290.

To all whom it may concern:

Be it known that I, JAN WYTMAN, a resident of Avalon, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Punching-Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

This invention relates especially to punching mechanism, although it may be applied to other metal-working tools wherein operations are to be performed on a blank at intervals.

The present invention is designed for punching a series of holes in a plate or other blank; and its object is to greatly expedite the work, to dispense with laying out the holes to be punched on the blank, and to more accurately position the punched holes.

In many kinds of structural ironwork it is necessary to punch a considerable number of rivet or bolt holes in a plate or other blank, which holes must be quite accurately positioned, so as to rivet together with another member or members similarly punched. Heretofore this work has been done by laying out the positions of the holes to be punched directly on the blank and then punching the same. This requires a large amount of labor, as the laying-out operation has to be repeated on each blank. Furthermore, the punch operators are liable not to punch the holes exactly on center, so that more or less deviation from the true positions of the holes generally occurs, and this necessitates considerable labor in reaming said holes.

My invention is intended to overcome these defects; and it consists, generally stated, in using a templet in connection with the punching-machine, which templet does away with the necessity of laying off the holes on the blank and serves the function of positioning the work, so that greater accuracy in the positions of the punched holes is secured. In the mechanism designed the templet and work-holding table are arranged to be moved in unison both laterally and longitudinally, these movements being effected by easily-controllable mechanism, so that the parts can be moved to the desired position. Coöperating with the templet is an index-pin or some member which when it registers with a hole or contact on the templet closes a circuit, which either operates the punch or renders the punch-actuating mechanism operative, so as to punch the hole.

The invention also comprises other features of invention, such as reducing-gearing, which enables the use of a small templet with large plates, and an arrangement or controlling levers and switches whose manipulation effects the necessary movements of all parts of the mechanism, thus enabling a single workman to perform the work which heretofore has required several.

The invention also comprises certain details in the arrangement or mechanism hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan view of my invention, showing it applied to punching mechanism. Fig. 2 is a vertical longitudinal section of the same on the line 2 2, Fig. 1. Fig. 3 is a transverse section on the line 3 3, Fig. 1. Fig. 4 is a similar view on the line 4 4, Fig. 1. Fig. 5 is a detailed view of one of the controlling-levers and showing in diagram the switch and circuits controlled thereby. Fig. 6 is a detailed sectional view of the friction driving mechanism and its actuating parts. Fig. 7 is a diagrammatic view illustrating a templet for punching holes in a straight line, and Fig. 8 is a view of the work corresponding to the templet shown in Fig. 7.

In the drawings a punching-machine is shown at 1, this comprising a suitable work holder or support 2 and punch 3, which latter is vertically reciprocated by means not shown. The driving means for the punch is shown as belt-pulleys 4, geared to a wheel 5 on the punch-actuating shaft. A suitable clutch 6 connects the gear 5 to the punch-actuating shaft. Normally the clutch is held out of engagement by means of a pin 7, which is normally held in engagement with a cam-face 8 on the clutch by a spring 9. To render the punch active, the pin 7 must be drawn downwardly against the tension of the spring, thus permitting the counterweight 10 to throw the clutch in. For accomplishing this I have provided a lever 11, connected at one end to the pin 7 and its opposite end to the core or armature 12 of a solenoid 13 or other electromagnet.

The work support or table is in the form of a double carriage, the lower carriage 15 being longitudinally movable on the ways or rails 16, while the upper carriage 17 is movable transversely on suitable ways 18 on the lower carriage 15. By this arrangement the work-table 2 can be moved both longitudinally and transversely, so as to bring all parts

of the plate 19 or other blank underneath the punch 3.

Coöperating with the work-table I provide a suitable templet 20, which will be provided with holes, recesses, or contacts corresponding to the holes to be punched in the plate 19. This templet is carried by a suitable support or table 21, which also is mounted to move both transversely and longitudinally, corresponding to the movements of the work-supporting table. As shown, the table 21 is movable transversely in ways 22, formed on a carriage 23, which is movable longitudinally on the track 24.

Suitable mechanism is provided for moving the work-table and templet-table in unison. Various forms of mechanism will adapt themselves for this purpose. The specific mechanism shown in the drawings comprises a longitudinal shaft 26, mounted in suitable bearings and having a screw 27 engaging the longitudinally-movable work-supporting carriage 15 and another screw 28 engaging the longitudinally-movable templet-supporting carriage 23. The transversely-movable work-supporting carriage 17 is engaged by two screws 30, which are connected by suitable beveled gears 31 with a longitudinal shaft 32, and the transversely-movable templet-supporting carriage 21 is similarly engaged by a screw 33, which is connected to the same shaft 32 by beveled gears 34. It is obvious that the rotation of the shaft 26 moves both the work-support and the templet-support longitudinally, while a rotation of the shaft 32 moves said supports transversely.

Mechanism is provided for securing the longitudinal and transverse movements independently. The particular mechanism shown comprises a shaft 36, belted to the main drive-shaft 4 or driven from any other source of power and geared to two shafts 39 nad 40, respectively. The shaft 39 carries a friction-disk 41, with which meshes a friction-wheel 42 on the shaft 26. The shaft 40 likewise carries a friction-disk 43, which engages a friction-wheel 44 on a counter-shaft 45, geared to the shaft 32. The friction-wheels 42 and 44 are movable on their respective shafts, so that they can be moved either to the center of their respective disks or to either side of said centers, so that thereby either or both of the shafts 26 or 32 may remain stationary or driven in either direction.

The movements of the friction-wheels 42 and 44 are effected by ordinary levers or by power. As shown, a lever 48 is provided for moving the friction-wheel 44, while a similar lever 49 is connected to the friction-wheel 42. Consequently the transverse and longitudinal movements of the templet and work supports are independently controlled. The levers are connected to the friction-wheels by means of racks 50 and segments 51. In order that a small templet may be used, suitable reducing-gearing is introduced in both the shafts 27 and 32, these being indicated, respectively, at 53 and 54. This reducing-gearing may be of any type suitable for reducing the travel of the templet-support. It does not, however, interfere with the templet-support being moved in the same direction and in unison with the work-support.

Coöperating with the templet is a suitable index-pin 55, adapted upon proper movement of the templet to drop into one of the several holes in said templet. When this occurs, it indicates that the work-support is in proper position for punching. I provide means whereby the index-pin serves to render the punch-operating mechanism active. This comprises an electric circuit arrangement and switch. (Shown in Fig. 5.) As shown in said figure, the index-pin 55 is the core or armature of a solenoid or other electromagnet 56. At its upper end the index-pin carries circuit-closing devices 57, and said pin is normally held downwardly by means of a spring 58. Normally, however, the end of the pin rests on the templet, so that the contacts 57 are held open; but when the pin drop into a hole the circuit is closed at this point. In conjunction with the solenoid is a suitable switch 60, which comprises a central contact 61, two side contacts 62, and two end contacts 63, all of said contacts being set on an arc of a circle, as shown. Coöperating with these contacts is a suitable circuit-closer 64, having a central contact-point 65 and two side contact-points 66. The circuit-closer 64 is secured to a suitable lever 67, pivoted at 68.

The current may be derived from any suitable source, such as the positive main 70 and negative main 71. The positive main 70 is connected to the central contact 61. The side contacts 62 are connected by a wire 73 with the solenoid 13. Said solenoid is also connected by the wire 74 with one of the contacts of the circuit-closer at 57, while the other of the contacts of said circuit-closer is connected to the negative main 71. The end contacts 63 are connected by the wire 75 with the solenoid 56, and said solenoid is also connected by wire 76 to the negative main 71, as shown.

The switch 60 is adapted to be actuated from one of the controlling-levers 48 or 49, being shown as connected to the lever 49 by means of a connecting-rod 78, so that said switch is operated in unison with the friction-wheel 42. In actual practice a similar switch will preferably be connected to the lever 48, the two switches being connected in parallel, so that the electrical connections may be effected from either lever.

The friction-disk 41 at its central portion is provided with an inactive zone, such as the freely-rotatable disk 79, set into the same and

held against displacement by set-screw 80. When the friction-wheel 42 rests upon the disk 79, it is not rotated, and it is only when it is moved to the disk-face at either side of said central zone that the shaft 26 is rotated. In practice the friction-disk 43 may be provided with a similar inactive zone. The arrangement is such that only while the wheel 42 is in the inactive zone of the disk 41 is the electric system operative. This is accomplished by providing in the main circuit a suitable switch 83, which is actuated by the rod 79 and which switch comprises a suitable switch-lever coöperating with a contact 85, said contact being of such length that the circuit is closed only when the friction-wheel 42 is in the inactive zone 79 of the disk 41. This inactive zone is of sufficient size to permit a considerable movement of the lever 49 and through the same of the switch 61 without rotating the shaft 26, so that the necessary movement of the switch 61 to effect the several changes of circuit necessary for the operation of the machine may be performed while the work and templet supporting tables are at rest.

The operation of the mechanism is as follows: The main drive-shaft and gear 5 of the punch-actuating shaft, shafts 36, 39, and 40, with friction-disks 41 and 43, rotate continuously. The pin 7 normally holds the clutch 6 open, so that the punch will not be actuated. The friction-wheels 42 and 44 likewise will be held at the centers of their disks 41 and 43, so that they receive no rotary movement, and the work and templet supporting tables will be stationary. The spring 58 normally presses the index-pin 55 down onto the templet. The work having been clamped on the work-supporting table, the operator then manipulates either one or both of the levers 48 and 49 to secure the necessary movements and in the required direction of both the templet and the work By means of the lever 48 the friction-wheel 44 may be moved to either side of the center of the disk 43, thus effecting the transverse movement of both the templet and work support and in either direction, depending upon which side of the center of the disk 43 the wheel 44 has been moved. In a similar way by means of the lever 49 the friction-wheel 42 may be moved to either side of the center of the disk 41, thus effecting the longitudinal movement of the templet and work support and in either direction By proper manipulation of these levers the templet-support is moved until a hole in the templet is brought under the index-pin 55. The operator watches only the movement of the templet, so as to get a hole therein underneath the index-pin. As soon as this is effected the pin drops down into the hole, and the operator then knows that the work-support has been moved in the same directions and corresponding distances to the templet-support and is in position for punching. He immediately moves the wheels 42 and 44 to the centers of their respective disks, thus stopping any further movement of either the templet or the work. In dropping into the hole in the templet the pin 55 has closed the circuit at the contacts 57, and as soon as the lever 49 has been moved far enough to bring the wheel 42 into the neutral or inactive zone in the disk 41 the circuit will also be closed at 83. The operator can then move the lever 49 within the limits of the inactive zone in the disk 41 in order to effect the necessary circuit changes. He moves the lever 49 to its central position, thus bringing the switch 61 to central position. (Shown in Fig. 5.) The current from the positive main then passes from contact 61 through the switch member 64 to contact 62 and thence through wire 73, solenoid 13, wires 74 to the negative main. This energizes the solenoid 13, drawing up on the core 12 and moving the pin 7 against the tension of the spring 9. This releases the clutch 6 and causes the actuation of the punch 3 to punch the hole. The operator then at once moves the lever 49 either to the right or left, so as to bring the side contacts 66 of the switch member onto one or the other of the end contacts 63. The central contact 65 of the switch member will still bear on contact 61. The circuit then is from the contact 61 through the switch-lever to one of the contacts 63 by wire 75 to solenoid 56 and thence to the negative main. As soon as the solenoid 13 has been deënergized the spring 9 throws the pin 7 into engagement with the cam-face on clutch 6, thus disengaging the clutch and stopping the punch. The energization of the solenoid 56 draws the pin 55 up, thus disengaging the same from the templet and permitting further movement of the templet and work support. The operator then moves the templet and work support by proper manipulations of the levers 48 and 49 and brings another hole in the templet underneath the index-pin 55, when the foregoing operations will be repeated.

By means of the mechanism described a single operator is enabled to punch a plate or other blank with accuracy and without the necessity of laying off the work on each blank. The amount of labor is very greatly reduced over existing practice and the holes are also positioned with much greater accuracy, thus doing away with the reaming which is always necessary with blanks punched in the old way. The templet will of course be formed with accuracy and can be used over and over again. The templet may be of non-conducting material provided with contacts corresponding with the holes to be punched, so that when the pin 55 comes onto a contact it will close the circuit through the solenoid 56.

When punching a row of holes on a very long bar, as shown in Fig. 8, it might require a templet of prohibitive length. For such purpose I make use of a templet such as shown in Fig. 7, in which the holes are arranged on diagonal lines. In that case the work-supporting table will have longitudinal movement only, while the templet will be moved diagonally, so that the templet will traverse a diagonal line under the index-pin, and then moved straight back and again traverse another diagonal line, and so on. The gearing will be so proportioned that the longitudinal component of the distance between adjacent holes in the templet will correspond to the distance between the holes to be punched. In this way a short templet can be made to punch a very long row of holes.

The levers 48 and 49 will be located in a convenient position for observing the operation of all parts of the machine. The form of gearing shown, as well as most of the mechanical and electrical parts, may be varied within wide limits without departing from the spirit of my invention. The machine may also be adapted for drilling-machines for structural work. In this case the punch will be replaced by a drill and the clutch 6 arranged to control the feed mechanism thereof.

What I claim is—

1. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, independently-controllable mechanisms for moving the templet and work supports in unison both laterally and longitudinally, and mechanism brought into operation by the index-pin for actuating the tool.

2. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, independently-controllable mechanisms for moving the templet and work supports in unison both laterally and longitudinally, a circuit controlled by the index-pin, and tool-actuating mechanism controlled by said circuit.

3. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, hand-controlled mechanism for moving the templet and work supports in unison, gearing in said mechanism for moving the templet-support slower than the work-support, and mechanism brought into operation by the index-pin for actuating the tool.

4. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, independently-controllable mechanisms for moving the templet and work supports in unison both laterally and longitudinally, reducing-gearing in said mechanisms connected to the templet-support, and mechanism brought into operation by the index-pin for actuating the tool.

5. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving the templet and work supports in unison, means for controlling said support-moving mechanism, mechanism brought into operation by the index-pin for actuating the tool, and means controlled by the control means for the support-moving mechanism for withdrawing said index-pin.

6. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving said work and templet supports in unison, means for controlling said support-moving mechanism, an electric circuit controlled by the index-pin, tool-actuating mechanism controlled by said circuit, and a switch and electromagnet for withdrawing the index-pin.

7. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving said templet and work supports in unison, an electric circuit controlled by the index-pin, a tool-controlling magnet, a pin-withdrawing magnet, and circuit and switch connections arranged to energize said magnets in succession.

8. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving said supports in unison, an electric circuit controlled by the index-pin, tool-controlling mechanism in said circuit, a pin withdrawing magnet, a switch for controlling said magnet, and means for operating said switch and controlling the work and templet support moving mechanism.

9. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving said supports in unison, means for controlling said support-moving mechanism, a tool-controlling magnet, an index-pin-withdrawing magnet, a switch and circuit connections for energizing said magnets in succession, said circuit being controlled by the index-pin, and connections between said switch and controlling means.

10. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mech-

anism for moving said supports in unison, an electric circuit, a tool-actuating magnet and a pin-withdrawing magnet connected to the circuit, and control mechanism so arranged that when the support-feeding mechanism is active the circuit will be broken and when said moving mechanism is inactive the circuit will be closed.

11. In machines of the character specified, the combination of a templet, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving the templet and work support in unison, a hand-operated controller for said mechanism, an electric circuit closed by the pin when it registers with points on the templet, and tool-actuating mechanism controlled by said circuit.

12. In machines of the character specified, the combination of a templet, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving the templet and work supports in unison, a controller for said mechanism, an electric circuit arranged to be closed by the pin when it registers with points on the templet, tool-actuating mechanism controlled by said circuit, and a switch in the circuit arranged to be closed only when the controller for the work-support and templet moving mechanism is brought to neutral position.

13. In machines of the character specified, the combination of a templet, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving said templet and work support in unison, a controller for said mechanism, an electric circuit closed by the pin when it registers with points on the templet, a pin-withdrawing magnet, circuit connections thereto, and a switch for said circuit arranged to close the circuit only when the controller is in neutral position.

14. In machines of the character specified, the combination of a templet-support, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, independently-controllable mechanisms for moving the templet and work supports in unison both laterally and longitudinally, friction-gears in said mechanisms, and mechanism brought into operation by the index-pin for actuating the tool.

15. In machines of the character specified, the combination of a templet, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving the templet and work support in unison, said mechanism including a friction-wheel movable over the face of a disk having a neutral zone, means for moving said wheel, mechanism controlled by the index-pin for actuating the tool, and pin-withdrawing means actuated from the wheel-moving means when said wheel is in the neutral zone on the dsik.

16. In machines of the character specified, the combination of a templet, an index-pin coöperating therewith, a work-support, a tool coöperating therewith, mechanism for moving the templet and work support in unison, said mechanism including a friction-wheel movable over the face of a disk having a neutral zone, means for moving said friction-wheel, a circuit arranged to be closed by the index-pin when it registers with points on the templet, a tool-actuating magnet in said circuit, a pin-withdrawing magnet, and switch mechanism controlled from the friction-wheel-moving means and arranged to close said circuits only when the friction-wheel is in the neutral zone on the disk and to close the circuit through said magnets in succession.

In testimony whereof I, the said JAN WYTMAN, have hereunto set my hand.

JAN WYTMAN.

Witnesses:
F. W. WINTER,
ROBERT C. TOTTEN.