

July 6, 1943.

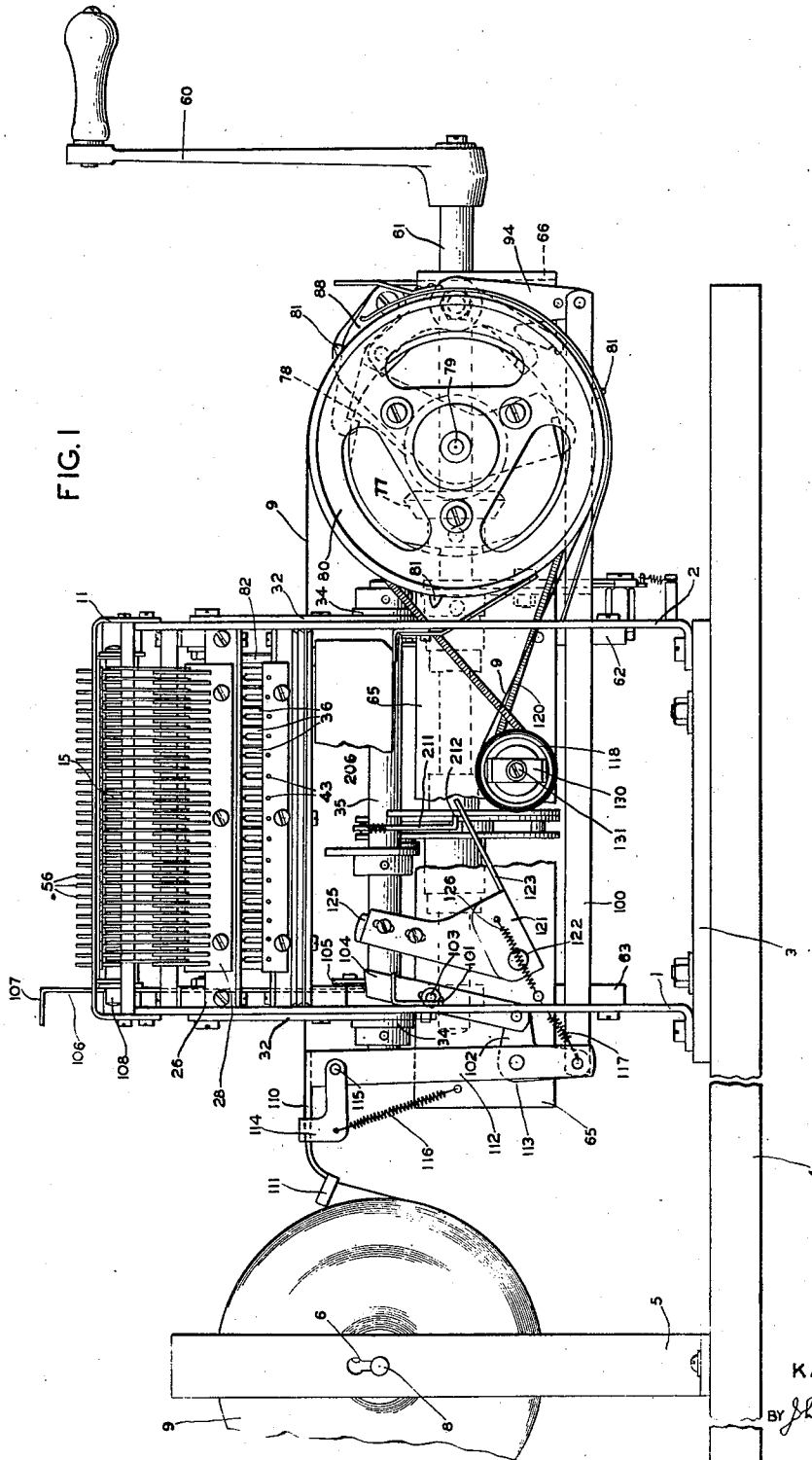
K. J. BRAUN

2,323,790

PUNCHING MECHANISM

Filed May 7, 1942

4 Sheets-Sheet 1



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PUNCHING MECHANISM

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4 Sheets-Sheet 2

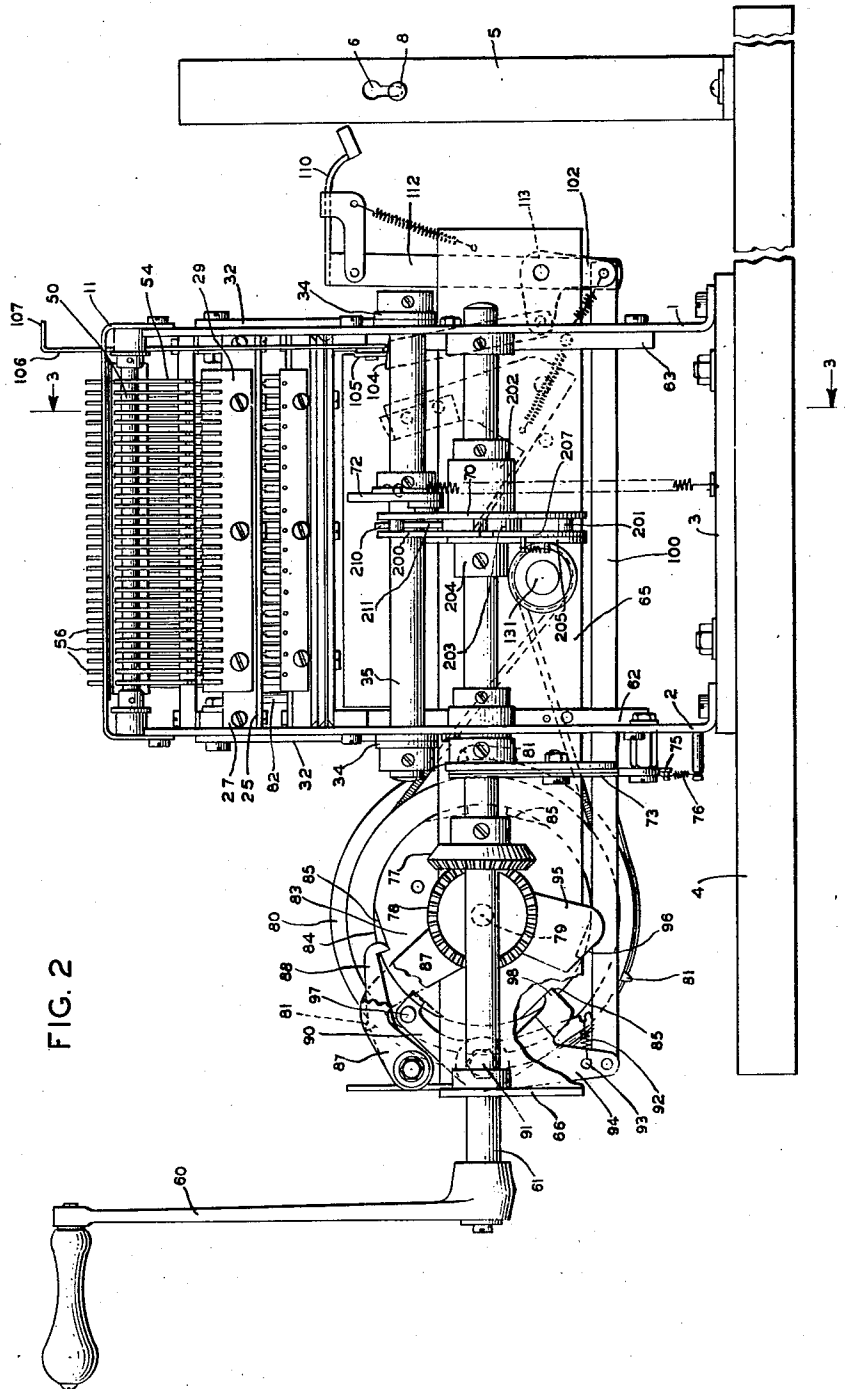


FIG. 2

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**July 6, 1943.**

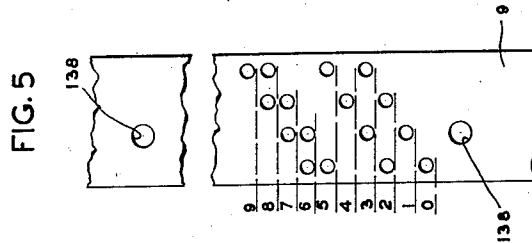
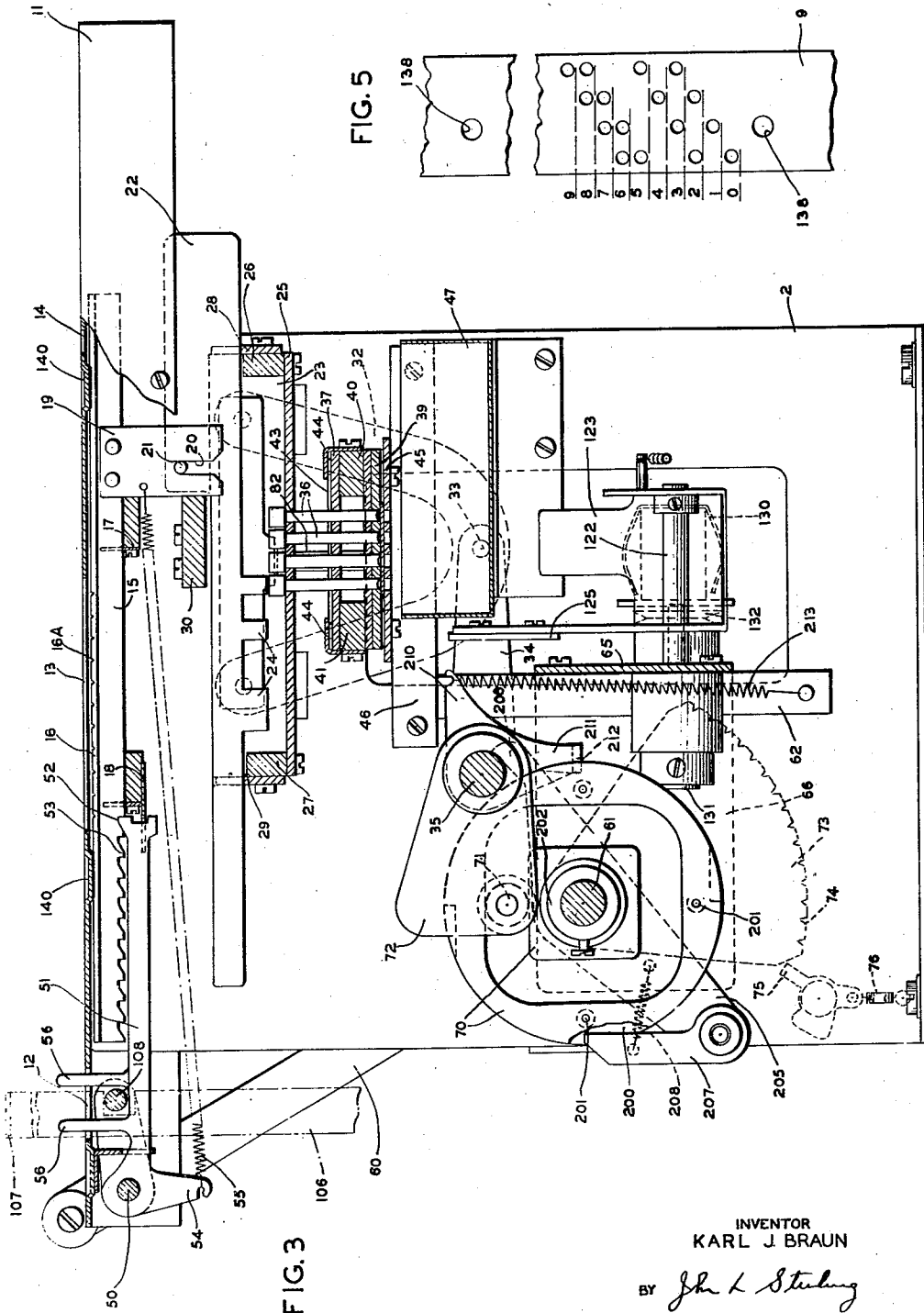
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**2,323,790**

## PUNCHING MECHANISM

Filed May 7, 1942

4 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,323,790

## PUNCHING MECHANISM

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Application May 7, 1942, Serial No. 442,053

5 Claims. (Cl. 164—111)

This invention relates to punching machines, and particularly to machines for punching holes in tapes according to various codes.

The present machine was designed primarily for use in large institutions, such, for example, as department stores, wherein each sales girl, or group of sales girls, may employ one of these punches to record itemized sales, etc., upon a roll of tape, so that at the ends of given periods these tapes may be collected, and run through a machine which will interpret the punchings on the tapes, and transfer the data to statistical cards. Thereafter the cards may be used with standard tabulating equipment.

One object of the present invention is the recording of data upon a tape by means of a simple punching mechanism.

Another object is the punching of special holes in a tape, which holes may be employed to feed and guide it.

A third object is to accomplish feeding of a tape through a punching machine by mechanism which is simple and yet positive in action.

Other objects and structural details of the invention will be apparent from the following description when read in connection with the accompanying drawings, wherein

Fig. 1 is a front elevation of the punching machine with the base plate shortened for convenience of showing;

Fig. 2 is a rear elevation of the machine;

Fig. 3 is a sectional elevational view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a plan view of the punch mechanism; and

Fig. 5 shows a portion of the perforated tape.

In the following description the expressions "right-hand" and "left-hand" etc., refer, respectively, to the right and left hands of an operator facing the front of the machine.

Referring to Fig. 1, the framing of the machine consists generally of two upright brackets or main frames 1 and 2 screwed or otherwise secured to a base plate 3, which, in turn, is fastened to a larger base 4. Mounted upon the base 4, and to the left of the machine itself, is a pair of adjustable uprights 5 slotted with keyhole slots at 6 and 7 to accommodate between them a formed pin 8, upon which may be mounted a roll of blank tape 9.

The punch section of the present device is in many respects similar to that shown and described in the Patent No. 1,086,397, issued to James Powers on February 10, 1914. Unlike the punch mechanism disclosed in the Powers patent,

however, the present mechanism is designed particularly for punching coded perforations in a tape, rather than for punching them directly in a statistical card.

#### Punch setting and punching mechanism

The present machine, insofar as the punching mechanism itself is concerned, operates in much the same fashion as the mechanism shown and described in the above mentioned patent, that is, the machine operator sets marked setting slides manually to, in turn, set punch controlling slides and position them differentially over the punches. Thereafter, in the instant device, contrary to the action in the above Powers patent when the machine is operated the controlling slides and punches are lowered to force the punches through the tape and are then raised. During this raising operation retract mechanism is effective to permit the return of the setting slides to normal position. Referring to Figs. 1, 3, and 4, the machine is equipped with a top cover plate 11 which has generally the shape of an inverted U, and is fastened by screws to the main frames 1 and 2. The plate 11 is recessed in three places, namely, at 12, 13, and 14 (Fig. 4). The recess 12 is to permit projections of the setting-slide detents to protrude so that the operator may manually retract any setting slide at will. The recess 13 constitutes an opening beneath which may be seen the faces of the setting slides, each of which faces is numbered from 0-9, inclusive. It is through this opening that the operator inserts a stylus in notches in the various setting slides and pulls them down differentially to set positions. The recess 14 is merely a sight opening for disclosing to the operator in a convenient fashion the amounts which have been set up on the slides. A detailed description of these setting slides on their associated punching mechanism now follows:

Lying directly beneath the cover plate 11 is a plurality of manually operable setting slides 15 (Fig. 3), each of which has riveted or otherwise suitably secured thereto, at right angles to its top, a narrow strip 16 upon which there are engraved or otherwise suitably marked two sets of numerals from 0-9, inclusive. One set of these numerals appears in the opening 13, while the other set of numerals is so positioned as to appear in the sight opening 14. The sight opening 14, however, is only large enough to show one numeral at a time. Strips 16 are equipped with small notches 16A (one for each numeral) into

which notches the operator inserts a stylus. She then pulls the stylus down until it limits on the bottom of the opening 13, which positions the same numeral under the sight opening 14, as can be seen at the very bottom of the opening 13. It is to be understood, of course, that the setting slides 15 are movable differentially in this manner, so that they may be set to show any numeral from 0 to 9. Each setting slide 15 is supported and guided by a comb bar 17 and a comb bar 18. These comb bars extend from side to side of the machine and are fastened to the main frames 1 and 2. Riveted to the left hand faces of the setting slides 15, as seen from the front of the machine, are connecting pieces 19, each formed with a slot 20 therein, which cooperates with a pin 21. The pins 21 are made fast in the control slides 22 so that any movement, forward or rearward in the machine, of the setting slides 15 will cause a corresponding movement in the same direction of the control slides 22. During the actual punching operation the control slides 22, together with the punches, are lowered, while the setting slides 15 are not permitted such movement. Thus the connection therebetween is maintained by pin 21 moving in slot 20. As is seen in Fig. 3, each control slide 22 is formed with a plurality of lugs 24 thereon, which lugs force the punches through the tape during punching operations. These lugs 24 can be made of various widths and can be variously spaced according to the particular code it is desired to use. In the present instance a two-hole combinational code is employed. Control slides 22 are mounted for forward and rearward sliding movement in a frame which consists of a lower plate 25, front and rear support bars 26 and 27, front and rear guide combs 28 and 29 fastened respectively to bars 26 and 27, an upper retaining bar 30 which serves not only to hold the control slides in the punch frame, but also as a limit stop for the rearward motion of these slides, and a pair of end plates 23. The entire punch frame is supported at each side of the machine upon a U-shaped link 32 (see also Figs. 1 and 2), each link being pivotally connected at 33 to forwardly extending rock arm 34 mounted on a rock shaft 35, which, as can best be seen in Fig. 2, is journaled in the side frames 1 and 2. It is to be understood at this point that each time the shaft 35 is rocked a lowering and raising of the punches and associated control slides is effected. As is best shown in Fig. 3, four rows of punches 36 extend through the plate 25 and downwardly through plates 37 and 38 into a plate 39 to a position normally above the tape 9. The plates 37, 38, and 39 are all fastened upon two cross rails 40 and 41, which cross rails are fastened to the main frames 1 and 2 of the machine. The punches 36, as is old and well known, are notched to permit wires 43 to pass therethrough, and thus prevent displacement of the punches 36 on the upstroke of the punching frame after punching has been accomplished. Wires 43 are retained in place by the brackets 44. Directly beneath the plate 39 is mounted a die plate 45, upon which the tape 9 rests. This plate 45 is fastened to over-turned portions of brackets 46, which brackets are fastened upon the main frames 1 and 2. A removable box 47 is provided for the purpose of catching the punchings. In the present machine the normal position of control slides 22 is that shown in Fig. 3, wherein the foremost lug 24 is positioned over the rearmost or zero punch 36. One step of movement forward

of any of the control slides 22 is equivalent to the distance between the center lines of any two punches 36.

In order to hold the setting slides 15 and control slides 22 in the positions to which they may be differentially set by the machine operator, a detent mechanism is provided which will now be described.

Pivoted upon a cross shaft 50 (see particularly Fig. 3) there is a plurality of detents 51, one for each slide 15. The detents are formed at their forward ends with toes 52, which engage with teeth 53 cut in the slides 15. The toes 52 are suitably guided in the comb bar 18. Each detent 51 is formed with a depending arm 54 to which is anchored one end of a spring 55, the opposite end of which is anchored in the associated connecting piece 19. Each spring 55 serves a two-fold purpose in the present machine, viz., to urge its associated slides 15 and 22 toward their normal or rearward positions and to urge the toe 52 of an associated detent 51 into the teeth 53 of a slide 15. Each detent 51 is also provided with a pair of upright finger pieces 56 which, as was previously mentioned, extend through the opening 12 in the plate 11. Thus, should the operator incorrectly set a slide 15, she need only press the finger piece 56 to disengage the detent from the slide and permit the spring 55 to return it to normal. During punching operations of the machine, all the detents 51 are withdrawn from their associated slides 15, as soon as punching itself has taken place, by an automatic retract mechanism, which will later be described.

#### *Drive mechanism*

The present machine is driven by a manually operated crank 60, which, as can best be seen in Figs. 1 and 2, is fast upon the right-hand end of a main rock shaft 61. The crank 60 is pulled toward the front of the machine and returned to effect a punching and tape feeding operation. It is to be understood, however, that the machine can just as well be motor driven. Fastened by screws or other suitable means to support bars 62 and 63, which bars are fastened respectively to the main frames 2 and 1, is a supporting plate 65, which runs laterally across the front of the machine and has an ear 66 bent rearwardly therefrom. The main shaft 61 is journaled in the ear 66 and in the frames 1 and 2, and is held against lateral movement by suitable collars as shown. Mounted upon the shaft 61 are the driving devices for four separate mechanisms, namely, the automatic retract mechanism, the punch lowering and raising mechanism, the full stroke mechanism, and the tape feeding mechanism. These mechanisms will now be described in detail, beginning with the mechanism for raising and lowering the punches.

Referring to Figs. 2 and 3, there is fast on the main shaft 61 a two piece box cam 70, in which there rides a roller 71 pivoted upon a rock plate 72, which plate is fast upon the rock shaft 35. It will be recalled that an arm 34, also fast upon this shaft 35, is connected to each of the U-shaped links 32, which, in turn, are connected to the frame which carries the punches 36. As the main shaft 61 is rocked forward and rearward, box cam 70 is moved 90 degrees, and, as a result, the roller 71 is forced first up and then down and this in turn results in lowering and raising the arms 34 and links 32 to force the punches 36 through the tape 9 and then up to normal posi-

tion. The means for turning the box cam 70 to effect this is as follows:

As is shown in Figs. 2 and 3, the outer portion of the box cam 70 is fastened to and spaced from a four toothed ratchet wheel 200 by studs 201. The inner portion of the box cam 70 is fastened to one face of the enlarged portion 203 of a shouldered hub 202 (see Fig. 2).

Fastened to the opposite face of the enlarged hub portion 203 is the four toothed ratchet wheel 200. Thus, the entire assembly 200, 201, 202, and 203, which is loose upon shaft 61, turns as a unit. Fastened to shaft 61 by a hub 204 (Fig. 2) is a two armed lever 205 (Fig. 3). The forward end of this lever terminates in a finger 206 which coacts with shaft 35 to limit the return movement of shaft 61, and arm 205. The rearward end of lever 205 has pivoted thereupon a pawl 207 which is urged into the teeth of ratchet 200 by a spring 208, which is anchored in arm 205. Loosely mounted upon shaft 35, there is a detent 210 having a depending arm 211, the lower end of which is bent off toward the right-hand side of the machine into a lug 212 (Fig. 3). The lug 212 is urged into the teeth of ratchet 200 by a spring 213.

From the foregoing it is seen that when the operating handle 60 is pulled forward, pawl 207 will rotate box cam 70 and ratchet 200 ninety degrees, and detent 210 will ride the periphery of ratchet 200 and drop into the next tooth. This 90 degree movement results in moving the roller 71 up and down, thus lowering and then raising the punches 36. On the return of handle 60, detent 210 holds the box cam 70 while pawl 207 returns to starting position and engages a new ratchet tooth.

In order to insure the complete rocking of shaft 61 in each direction, a well known full-stroke mechanism is employed. Fast upon the shaft 61 there is a full-stroke sector 73 which is formed with teeth 74 (see Fig. 3) therein. A pawl 75 is constantly urged to its normal position (Fig. 3) by a spring 76. Thus, when the shaft 61 is rocked in either direction, the pawl 75 clicks past the teeth 74 enforcing a full movement of the shaft 61, as is old and well known.

The means operable by the main shaft 61 for feeding the tape 9 through the punch will now be described.

Referring to Figs. 1 and 2, and particularly to Fig. 2, there is mounted a little to the right of the center of shaft 61 and fast thereupon a beveled gear 77, which meshes with a bevel gear 78 pivoted upon a stub shaft 79, which shaft is mounted upon the cross brace 65. Loosely mounted upon the stub shaft 79, in front of the gear 78 and cross brace 65, is a drum 80 equipped with three feeding teeth 81 spaced 120 degrees apart. These teeth 81 engage holes 133 in the tape 9 (Fig. 5), which holes are made by a special punch 82, at the same time that the code punchings are impressed upon the tape. Fast to the drum 80 and lying between the drum and the cross brace 65 are two ratchets 83 and 84. Each ratchet has cut in its periphery four evenly spaced teeth 85, the teeth 85 of one ratchet facing in the opposite direction from the teeth of the other. Fast to the hub of gear 78 is an arm 87, upon the end of which there is pivoted a pawl 88. As is best seen in Fig. 2, this pawl 88 is normally in engagement with one of the teeth 85 of ratchet 83. From the foregoing it is seen that whenever the operating crank 60 is pulled toward the front of the machine, the gear 77 will rotate

the gear 78 clockwise (Fig. 2) and cause the pawl 88 to ride over the periphery of its associated ratchet 83 until it engages the next adjacent tooth 85 thereon. On the return stroke of the operating handle, the pawl 88 rotates the ratchet 83, and consequently, ratchet 84 and the drum 80 counterclockwise, as seen in Fig. 2, and this causes the teeth 81 of drum 80 to draw the tape 9 out of the punch chamber. It is to be understood that the punches are forced through the tape 9 during the time the pawl 88 travels from its normal position to its mid-position or, in other words, during the forward stroke of the operating handle 60.

There is provided a detent pawl 90 pivoted at 91 upon the cross brace 65. This pawl 90 co-operates with the teeth of the ratchet 84 and prevents a counter-clockwise (Fig. 2) rotation of the drum 80 at such times as the operating handle 60 is in normal position, thus preventing overthrow of drum 80. The pawl 90 is urged against the periphery of the ratchet 84 by a spring 92 anchored upon the lower arm of the pawl 90 and upon a pin 93 fast in a rock arm 94, which rock arm is also pivoted at 91. The arm 87, fast to the hub of gear 78, is formed with a depending portion 95 having a cam surface 96 thereon. At the end of each forward stroke of the operating handle 60, the cam surface 96 engages a pin 97 on pawl 90 and lifts the pawl free of the teeth of the ratchet. On the return stroke of the handle 60 the ratchets 83 and 84, together with the associated drum 80, began to move counterclockwise (as seen in Fig. 2), before the cam surface 96 releases the pawl 90, in consequence whereof, the pawl 90 rides the periphery of ratchet 84, until the return stroke has been completed, at which time it drops into the next adjacent tooth of said cam.

The mechanism for automatically retracting all of the detents 51, which hold the setting slides 15 in place after they are set, will now be described.

Referring to Fig. 1, the rock lever 94 has pivotally mounted thereon the right-hand end of a link 100, the left-hand end of which is pivotally attached to the depending arm of a bell-crank 102. The other arm of the bell-crank 102 is pivotally attached to the lower end of a link 104, which link is slotted at 101 and is mounted thereby upon a fixed pin 103. Whenever the link 100 is pulled toward the right-hand side of the machine, as will be fully explained hereinafter, bell-crank 102 is rocked counterclockwise, which results in the raising of the link 104. The link 104 constantly underlies the forward end of a centrally pivoted rock lever 105, the rear end of which is pivotally connected to an upright link 106, which terminates in a finger piece 107. Near its upper end the link 106 is notched (dot-dash outline Fig. 3) to embrace a retract bail bar 108, so that each time the link is depressed the retract bail 108 is pulled down and rocks all the detents 51 out of engagement with the teeth 53 and their associated racks 15, permitting springs 55 to return the racks to normal position. The link 106 is depressed in either one of two ways. First, it can be depressed by merely pressing the finger piece 107 down, and, second, it can be depressed by action of the linkage 100-104, the raising of link 104 effecting depression of link 106 through the centrally pivoted lever 105. Returning to Fig. 2, it is seen that the rock arm 94 is also provided with a tooth 98 which tooth, in the normal position of the ma-

chine, engages a tooth 85 of the ratchet wheel 83 and prevents clockwise rotation, as seen in Fig. 2, of ratchets 83 and 84 during the forward stroke of the operating handle 60 at a time when the pawl 88 is moving toward a new tooth 85. Also, as the pawl 88 begins its return stroke moving ratchet 83, this ratchet acting upon the tooth 98 of rock arm 94, cams the rock arm clockwise, and this pulls the link 100 toward the right to operate the retract mechanism just described, and holds it operated until almost the very end of the return stroke of handle 60.

As is best seen in Fig. 1, the tape 9 is fed from the bottom of the roll over a guide piece 110 having ears 111 bent up therefrom. This piece 110 is made in the shape of a bail having a pair of depending arms 112, which arms are pivoted upon a stud 113 fast on the frame plate 65. A second bail 114 pivoted at 115 upon the depending arms 112, is drawn down upon the top of the tape 9. A spring 117 anchored upon one of the arms 112 and upon a fixed frame stud urges the entire guide piece 110 counter-clockwise. Since the tape 9 passes under bail 114, through the punch chamber, and then out on to the periphery of drum 80, it is seen that the springs 116 and 117 keep, at all times, a slight tension upon the tape 9. After passing about the drum 80, the tape 9 then passes on to a rewind roll 118, which roll 118 is driven in a direction opposite to that of the drum 80 by means of a belt or band 120, which band is driven directly by the drum 80.

The rewind roll 118 is carried on a U-shaped member 130, of spring metal, which is secured to the end of a stub shaft 131 mounted in plate 65 and having secured thereon a grooved pulley wheel 132. The rewind roll may be any form of cylinder of cardboard or other suitable material having a slot therein for anchoring the end of the tape. The roll is slipped over the member 130, which holds it in place in such manner that it can be easily removed. The pulley wheel 132 is engaged and driven by the belt 120 which is, in turn, driven by the drum 80. The U-shaped member is shown in Fig. 3 without a rewind roll.

In order to insure that the machine is not further operated after the rewind roll 118 becomes filled, a feeler finger 123 (Fig. 1) is provided. This feeler finger is formed integral with a rock lever 121 pivoted at 122 upon a stud fixed in the cross brace 65. The feeler finger 123 is adapted to rest upon the tape gathered on the rewind roll 118. Lever 121 is also formed with an upright adjustable blocking finger 125. A spring 126 is anchored at one end to the rock lever 121 and at its opposite end to the pin upon which the spring 117 is anchored. When the size of the rewind roll attains a certain optional maximum, the feeler finger 123, which has been gradually rocked counter-clockwise (as seen in Fig. 1), permits the over-the-center spring 126 to snap the rock lever 121 further counter-clockwise and bring the upright arm 125 thereof against the side of the centrally pivoted retract lever 105. If, after this has happened, the machine is operated, then at the end of the forward stroke the link 104 will raise the forward end of lever 105 and permit the upright arm 125 to pass in under lever 105. This, of course, results in the retract mechanism remaining operated from that point on, so that the setting slides, while they can be pulled down, cannot remain set and the operator is thus notified that the rewind roll must be removed, and the lever 121 reset to the position shown in Fig. 1.

In order to designate the data being entered by the individual slides, recesses 140 are provided in the cover plate 11, into which slips of any suitable material may be inserted carrying the designative data.

In summation, the setting slides 15 are first set by the operator's stylus and this sets punch control slides 22 to position them differentially over the punches 36 (see Fig. 3). The operating handle 60 is then pulled forward, which results in punching the desired code-holes in tape 9 (Fig. 5), and also in punching a feed hole 138 in this tape by means of special punch 82 (Fig. 1). On the return stroke of the operating handle, the drum 80 is rotated, thus pulling the tape 9 out of the punch chamber and on to the drum 80 and rewind roll 118. Also, on the return stroke, the automatic retract mechanism of the machine is operated through the linkage 100-106, to cause retraction of all the setting slides 15 and their associated control slides 22.

In Fig. 5 is shown a portion of the tape 9 with the code perforation from 0-9, inclusive.

While I have described what I consider to be a highly desirable embodiment of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention as hereinbefore set forth, and as hereinafter claimed.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a machine of the class described, the combination of a plurality of manually settable setting slides, a plurality of punches, means operable by said setting slides for controlling said punches, means operable to move said punches and said punch controlling means to effect code punching upon a tape, means for maintaining a tension on said tape, means for punching feed holes in said tape concomitantly with the punching of code holes therein, means cooperating with said feed holes for feeding said tape to and from said punches, means for winding said tape on a spool after each punching operation, means for holding said setting slides in the various positions to which they may be set, means for disabling said holding means to permit retraction of said slides, and means operable by said tape winding means for locking said last mentioned means in active position.

2. In a machine of the class described, the combination of a plurality of manually settable setting slides, a plurality of punches, means operable by said setting slides for controlling said punches, means operable to move said punches and said punch controlling means to effect code punching upon a tape, means including a guide piece and a gripping device cooperative therewith for maintaining a tension on said tape, means for punching feed holes in said tape concomitantly with the punching of code holes therein, means including a drum having teeth thereon for cooperation with said feed holes for feeding said tape, means operable by said drum for winding said tape on a spool after each punching operation, means for holding said setting slides in the various positions to which they may be set, means for disabling said holding means to permit retraction of said slides, and means operable by said tape winding means for locking the last mentioned means in active position.

3. In a machine of the class described, the com-



5 combination of a plurality of manually settable setting slides, a plurality of punches, means operable by said setting slides for controlling said punches, means operable to move said punches and said punch controlling means to effect code punching upon a tape, means including a spring-pressed guide piece and a gripping device cooperative therewith for maintaining a tension on said tape, a punch separate from the code punches for punching feed holes in said tape concomitantly with the punching of code holes therein, means operable by said drum for winding said tape on a spool after each punching operation, means for holding said setting slides in the various positions to which they may be set, a key operable to disable all said setting slide holding means, means manually operable to individually disable one and another of said setting slide holding means, means for automatically disabling said holding means to permit retraction of said slides after each punching operation, and means operable by said tape winding means for locking said last mentioned means in active position.

4. In a machine of the class described, the combination of a plurality of manually settable setting slides, a plurality of punches, means operable by said setting slides for controlling said punches, a main operating shaft, means operable by said main shaft during the forward stroke thereof to move said punches and said punch controlling means to effect code punching upon a tape, means for maintaining a tension on said tape, means for punching feed holes in said tape concomitantly with the punching of code holes therein, a drum, means operable on the return stroke of said main shaft for turning said drum to feed said tape, means for winding said tape

on a spool after each punching operation, means for holding said setting slides in the various positions to which they may be set, means for disabling said holding means to permit retraction of said slides, and means operable by said tape means for locking said last mentioned means in active position.

5. In a machine of the class described, the combination of a plurality of manually settable setting slides, a plurality of punches, means operable by said setting slides for controlling said punches, a main operating shaft, means operable by said main shaft during the forward stroke thereof to move said punches and said punch controlling means to effect code punching upon a tape, means for maintaining a tension on said tape, means for punching holes in said tape concomitantly with the punching of code holes therein, a drum, a pair of ratchets mounted on said drum, means operable on the return stroke of said main shaft for actuating one of said ratchets to turn said drum and feed said tape, a pair of detents cooperative with said ratchets to normally prevent rotation of said drum in either direction, means operable at the end of the forward stroke of said main shaft to disable one of said ratchet detents, means for winding said tape on a spool after each punching operation, means for holding said setting slides in the various positions to which they may be set, means operable by one of said ratchets on the return stroke of said main shaft for disabling said holding means to permit retraction of said slides, and means operable by said tape winding means for locking said last mentioned means in active position.

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