

June 10, 1930.

J. T. SCHAAFF

1,763,067

PUNCHING DEVICE

Filed Aug. 19, 1924

11 Sheets-Sheet 1

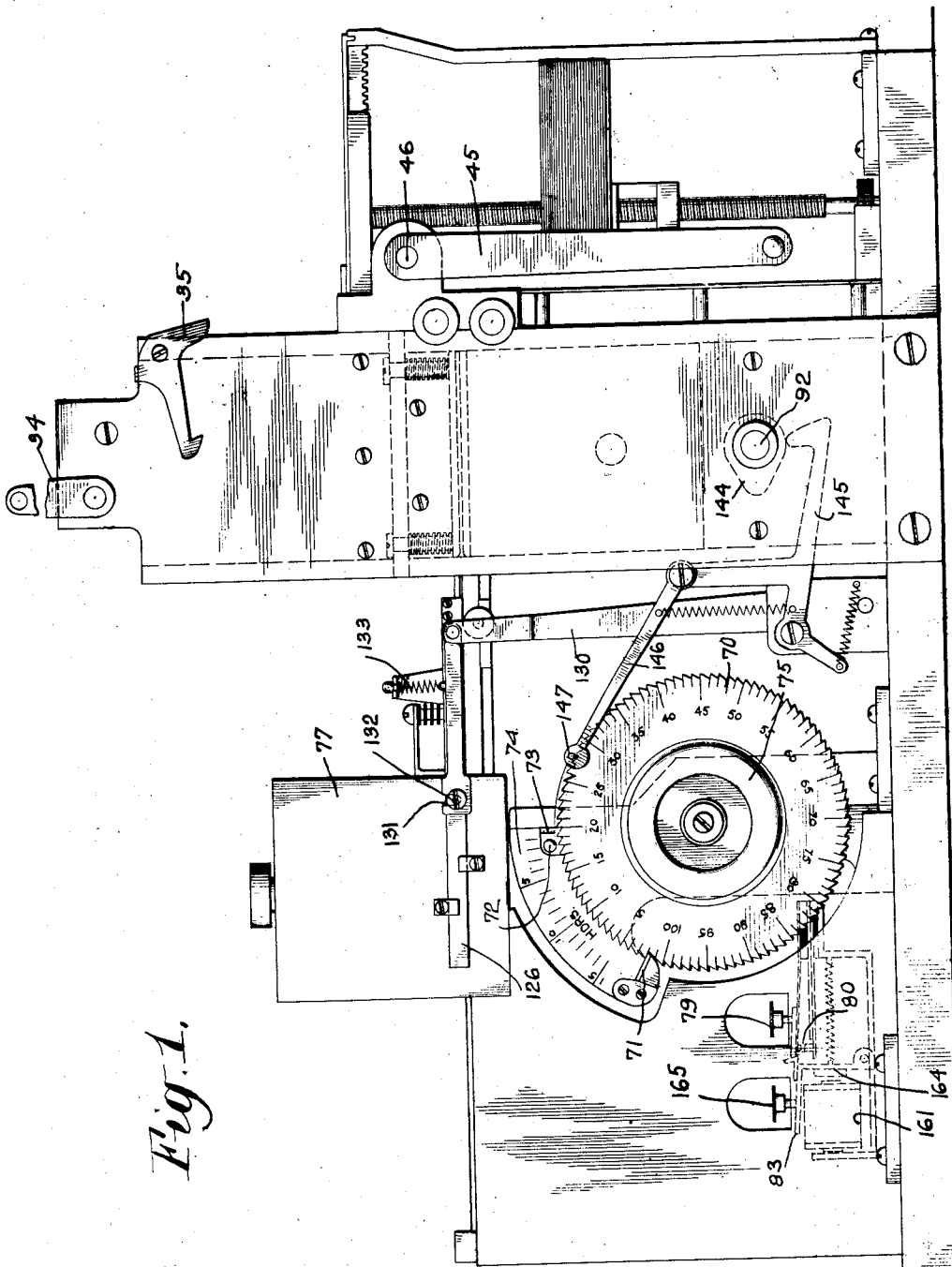


Fig. 1.

Inventor
J. T. Schaff

By his Attorneys
Cooper, Kerr & Durham

June 10, 1930.

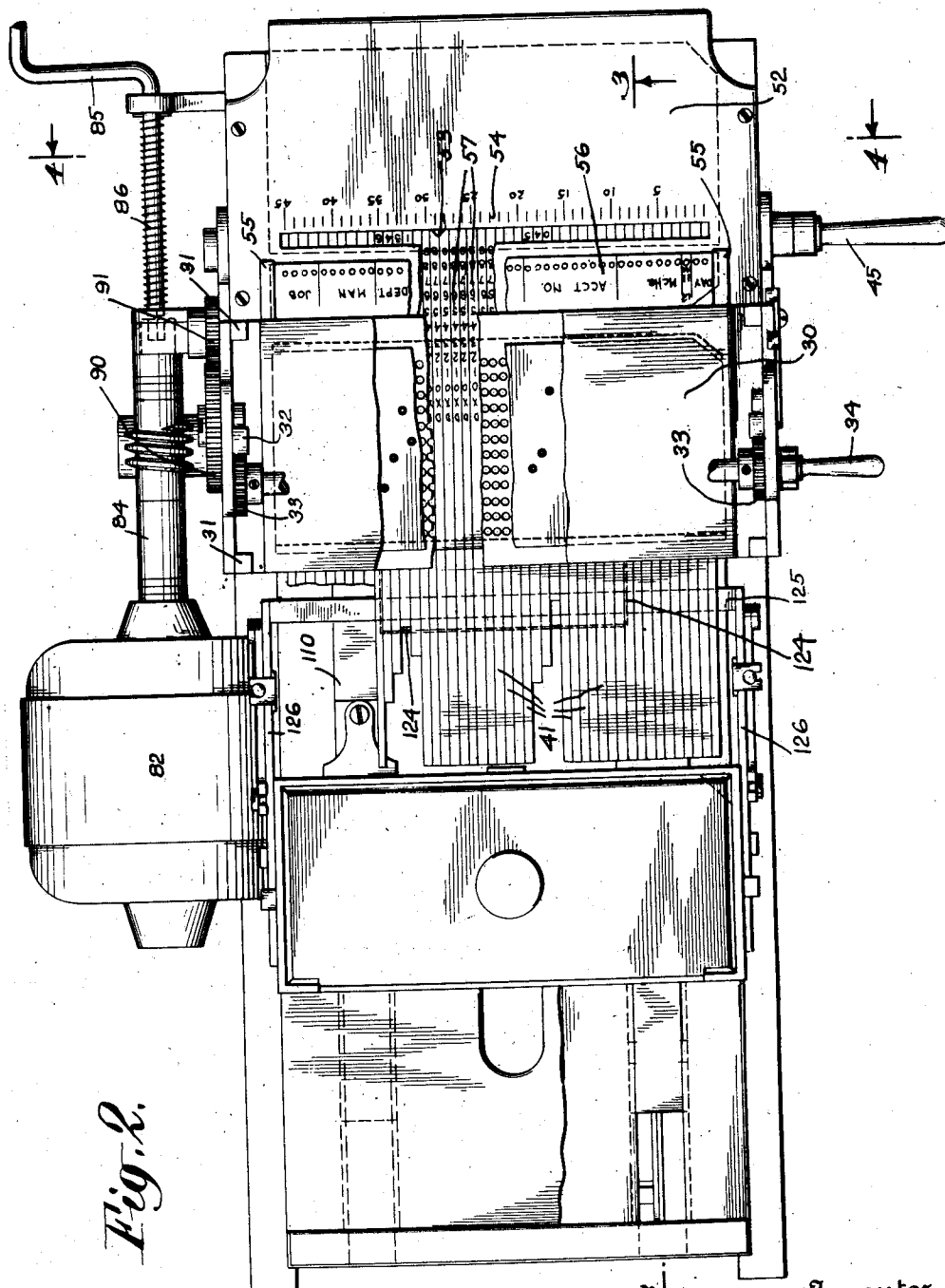
J. T. SCHAAFF

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11 Sheets-Sheet 2



Inventor

J. J. Schaaff

By his Attorneys

By his Attorneys
Cooper, Kerr & Drumham

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J. T. SCHAAFF

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11 Sheets-Sheet 3

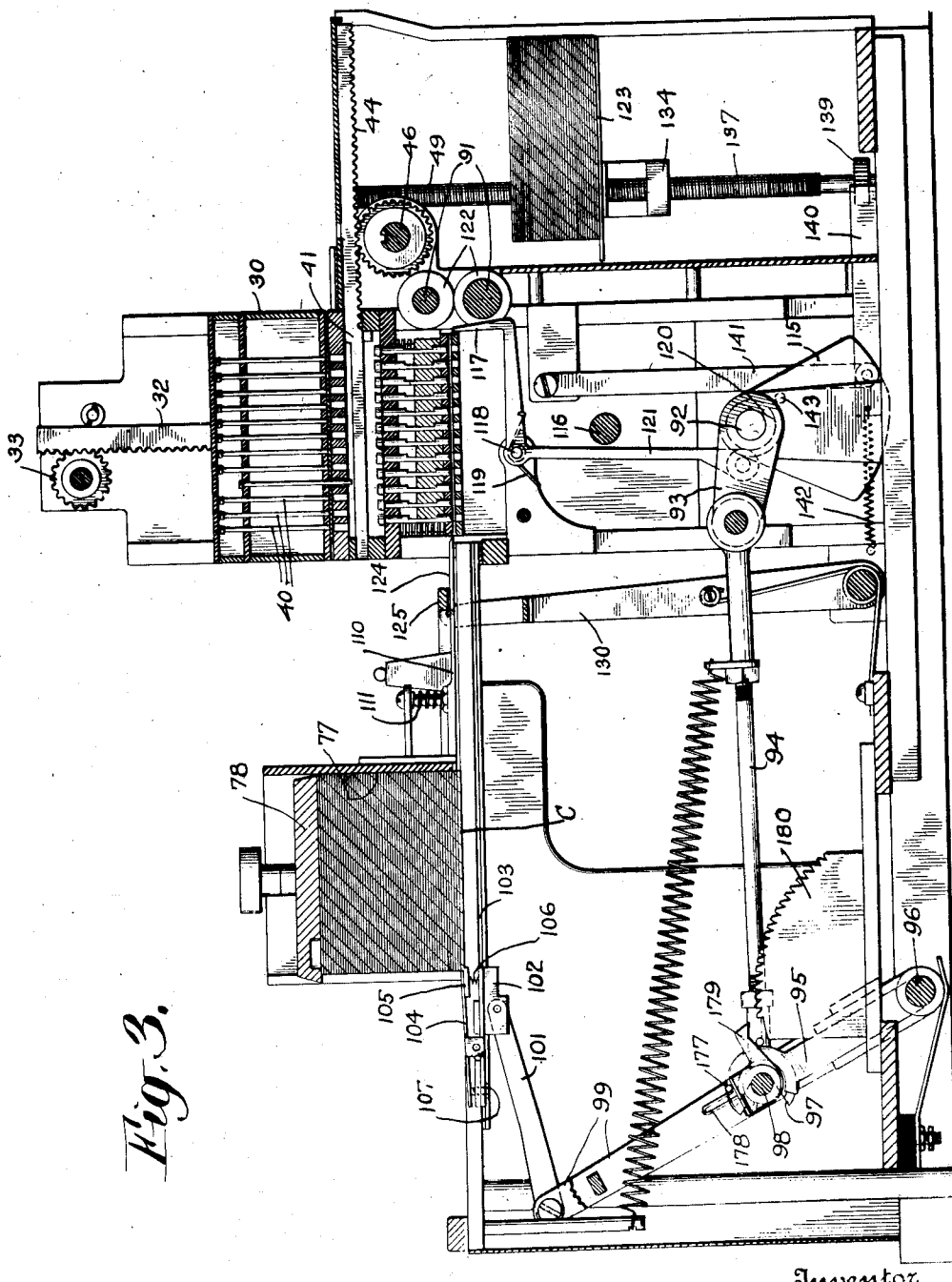


Fig. 3.

Inventor
J. T. Schaff
By his Attorneys
Cooper, Kerr & Dunham

June 10, 1930.

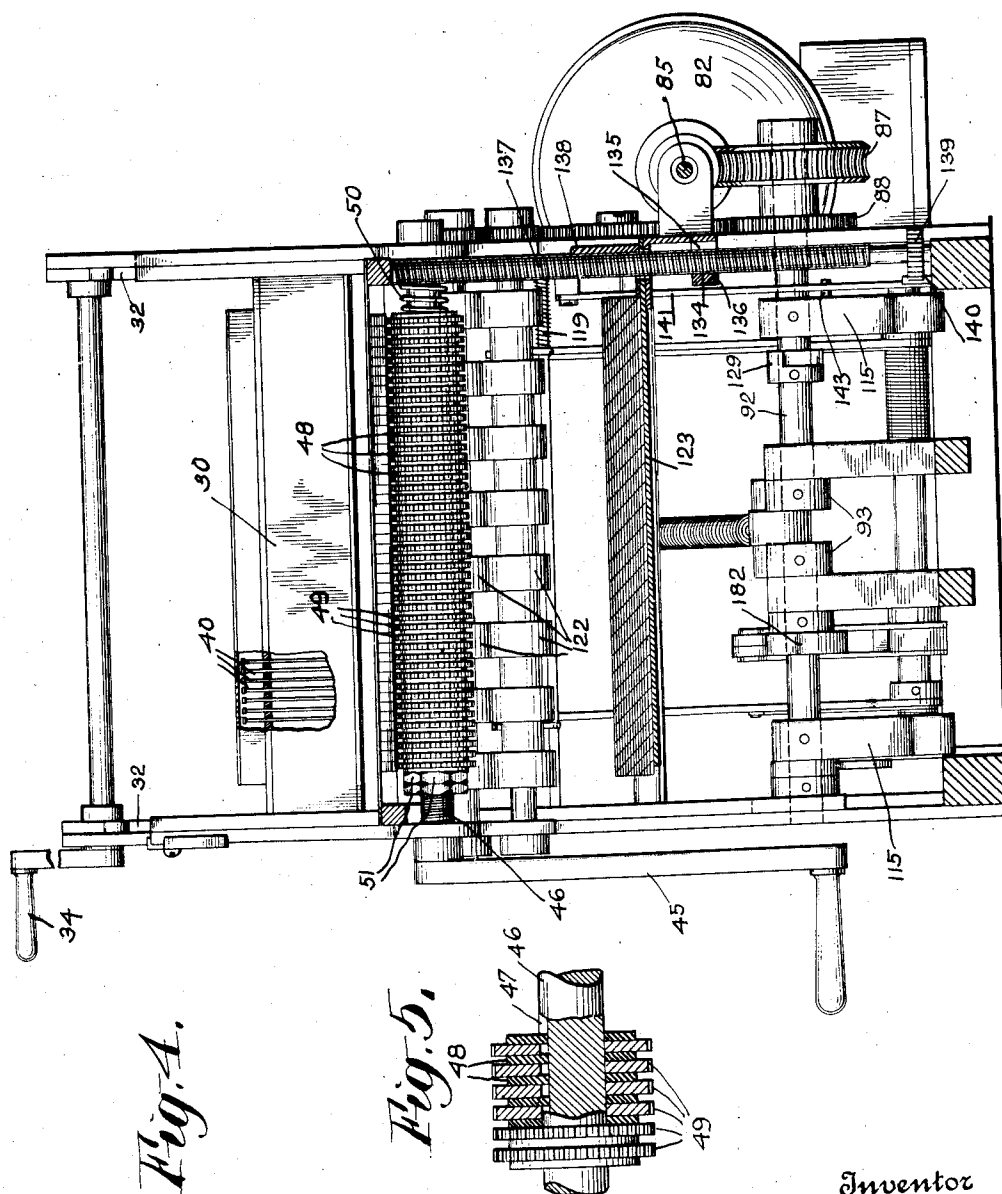
J. T. SCHAAFF

1,763,067.

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11 Sheets-Sheet 4



Inventor
J. T. Schaaff

By his Attorneys
Cooper, Kerr & Durham

June 10, 1930.

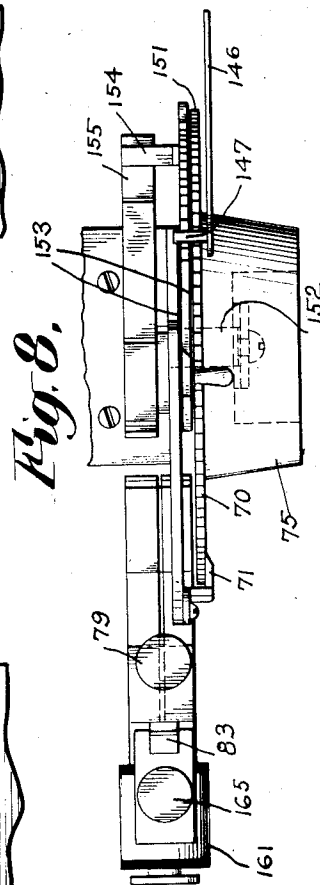
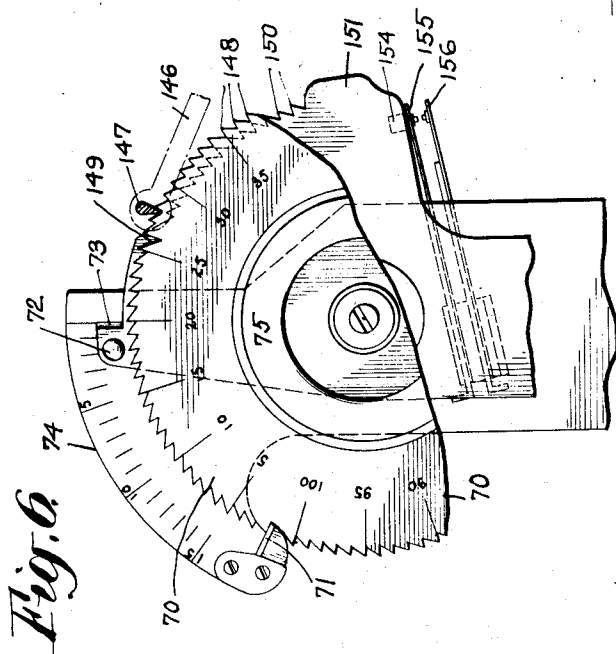
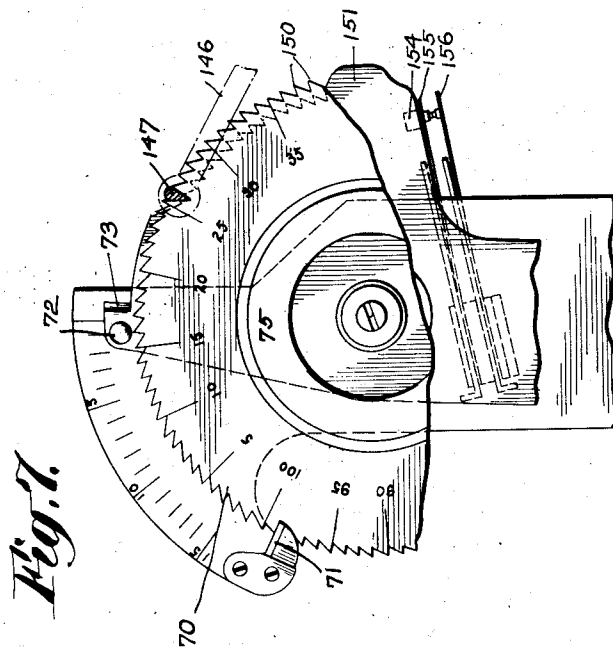
J. T. SCHAAFF

1,763,067

PUNCHING DEVICE

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Inventor
J. T. Schaaff
By his Attorneys
Cooper, Kerr & Dunham

June 10, 1930.

J. T. SCHAAFF

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11 Sheets-Sheet 7

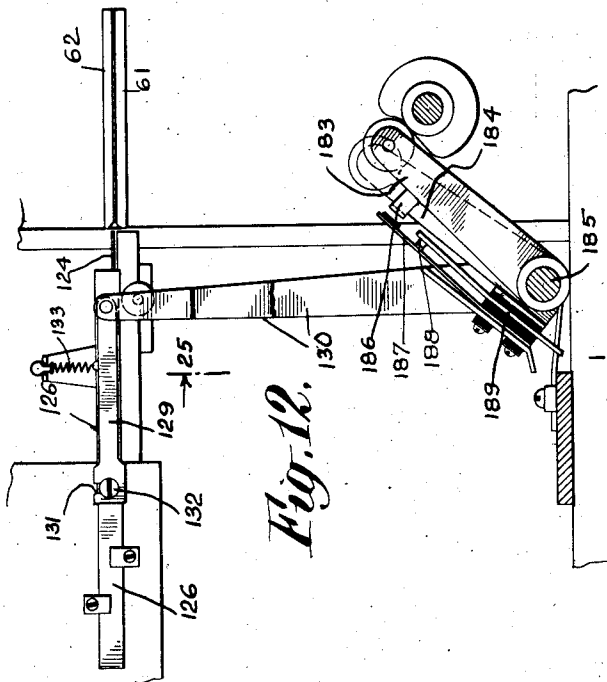
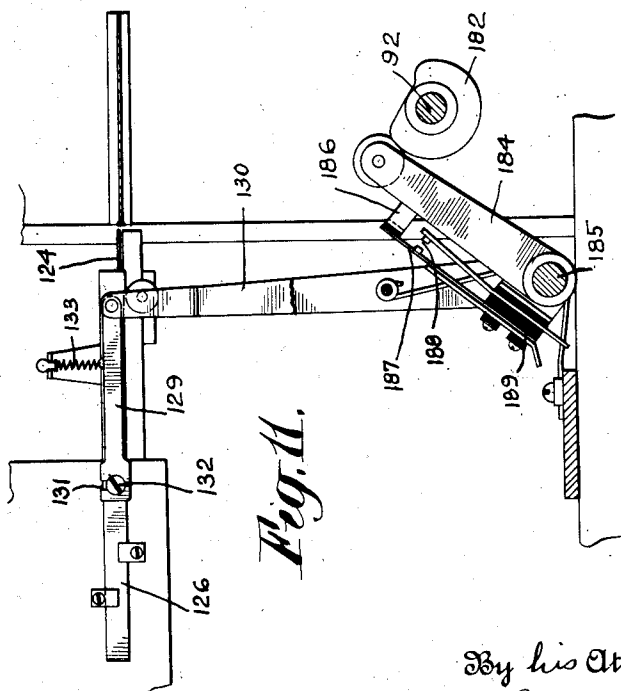
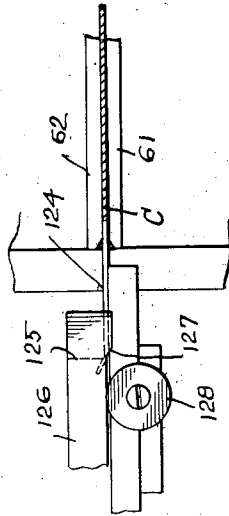


Fig. 12.

Fig. 14.



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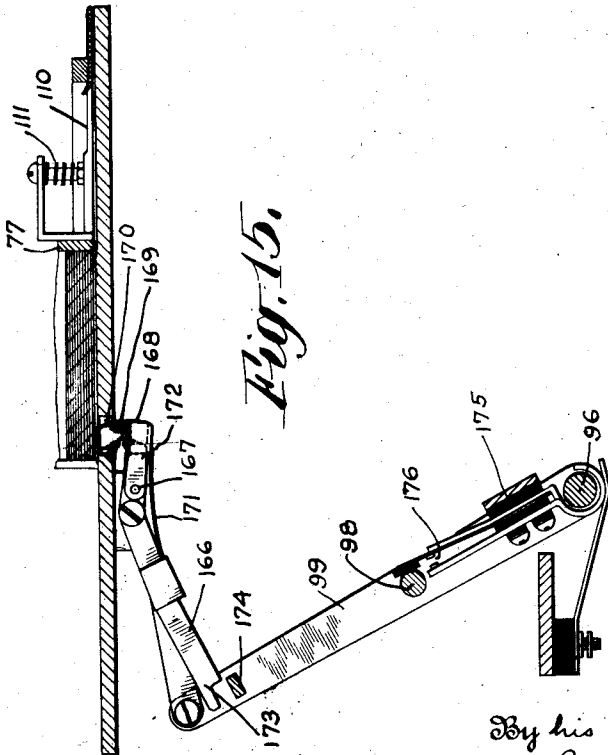


Fig. 15.

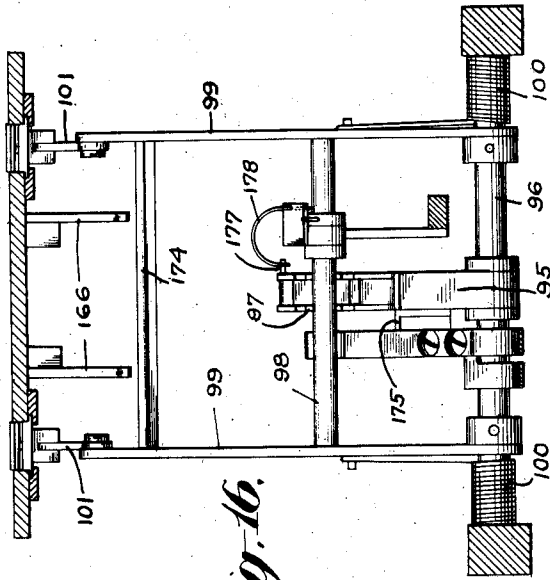


Fig. 16.

Fig. 17.

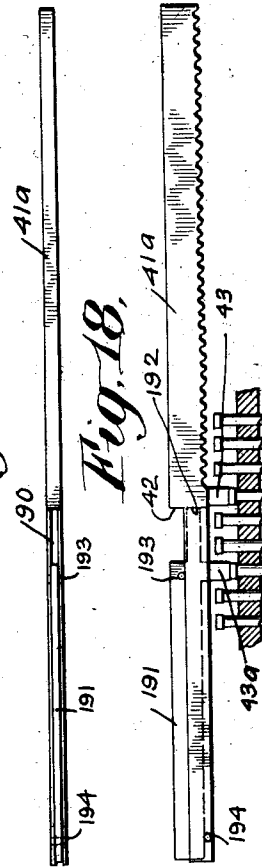


Fig. 18.

Inventor
J. T. Schaff
By his Attorneys
Cooper, Kerr & Drunkham

June 10, 1930.

J. T. SCHAAFF

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Fig. 20.

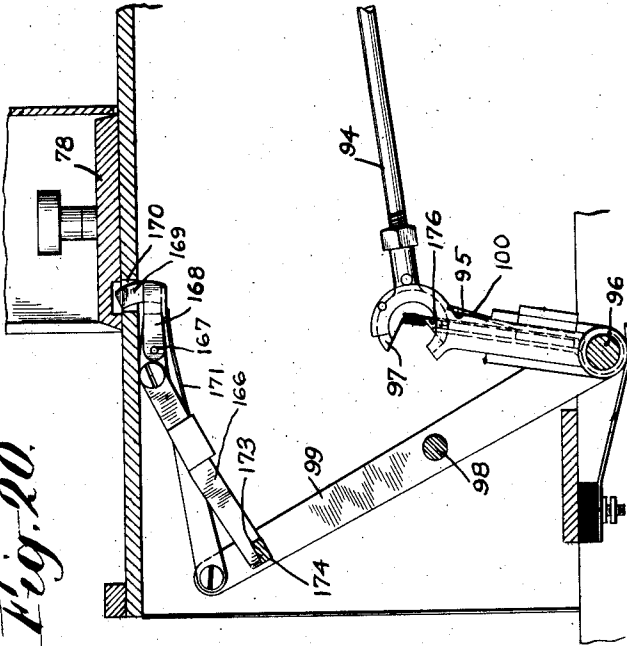


Fig. 21.

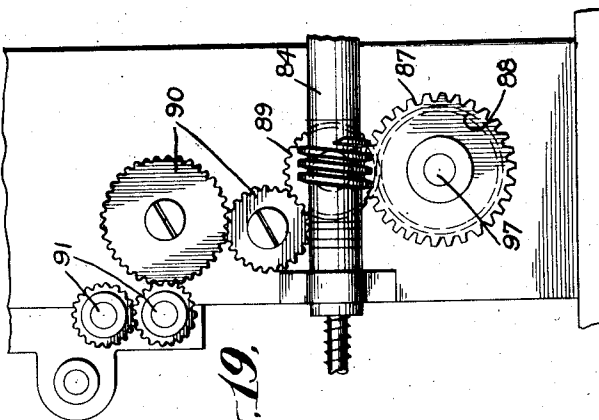
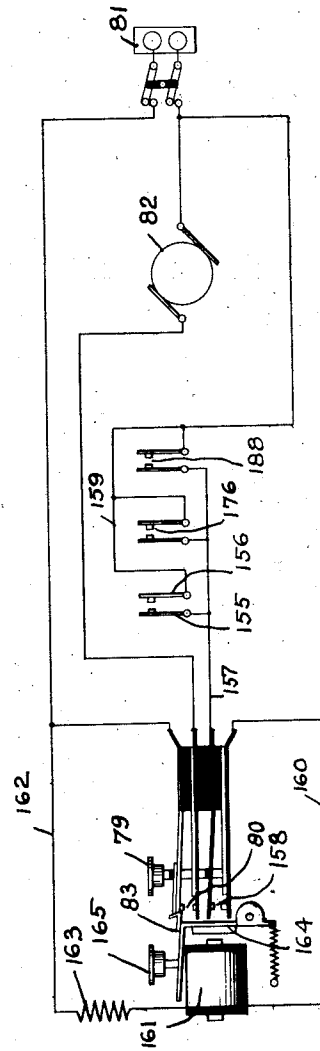


Fig. 19.

Inventor
J. T. Schaaff
By his Attorneys
Cooper, Kerr & Dunham

June 10, 1930.

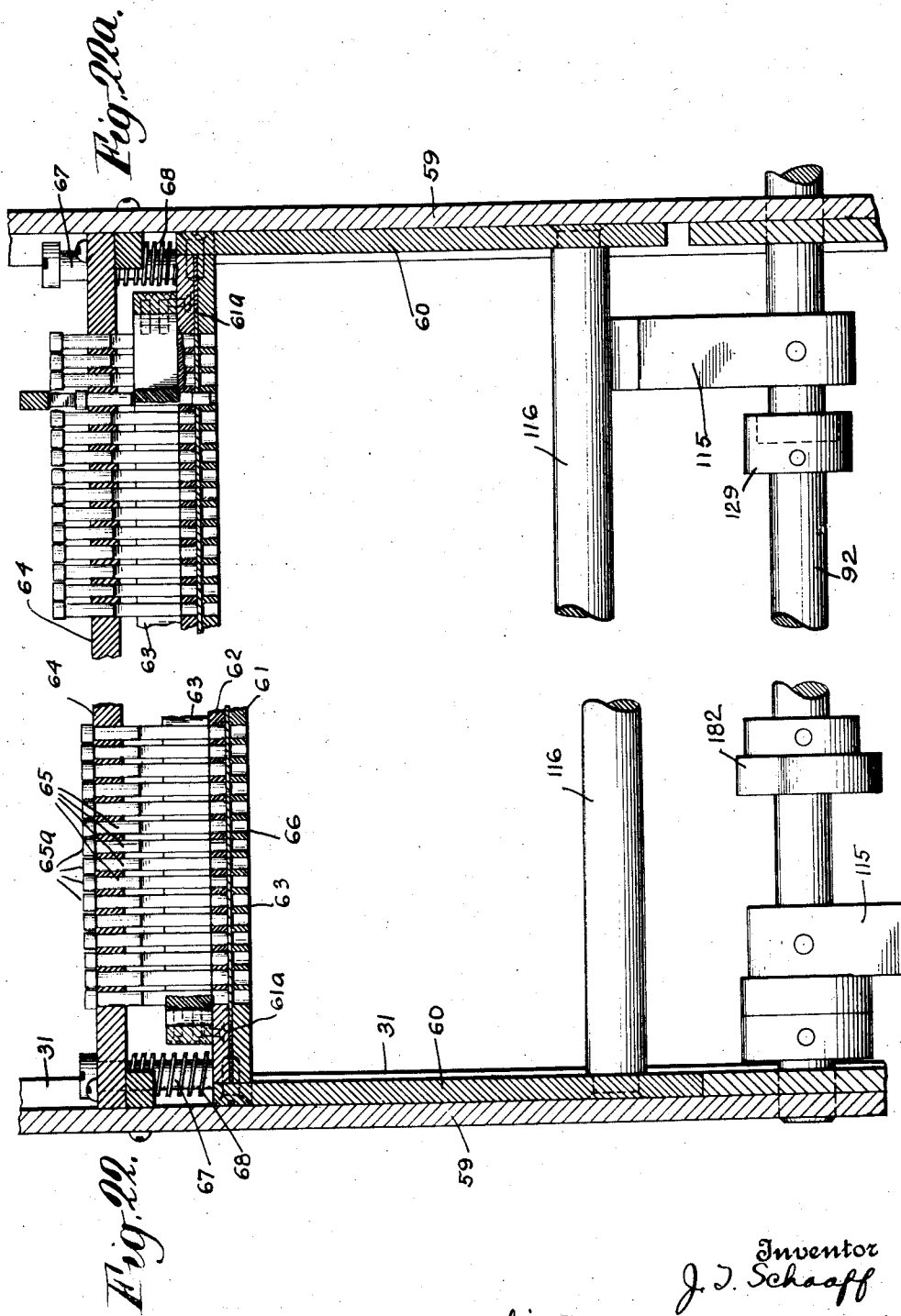
J. T. SCHAAFF

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Inventor
J. J. Schaaff
By his Attorneys
Cooper, Kerr & Drumham

June 10, 1930.

J. T. SCHAAFF

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11 Sheets-Sheet 11

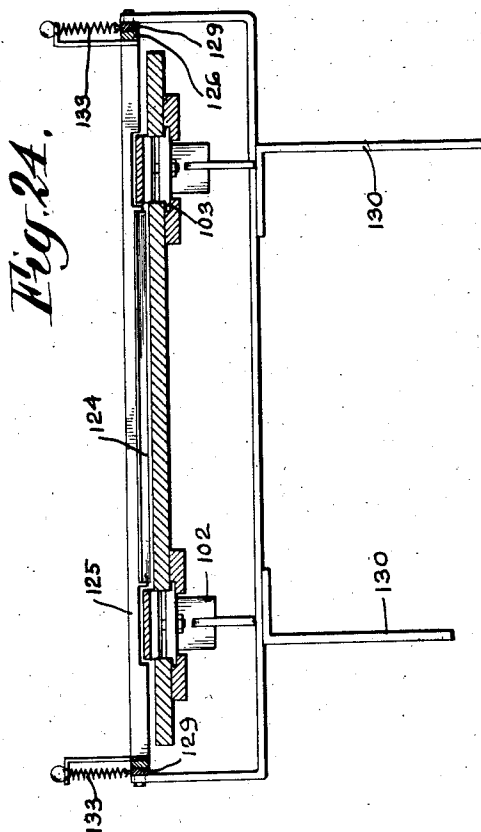
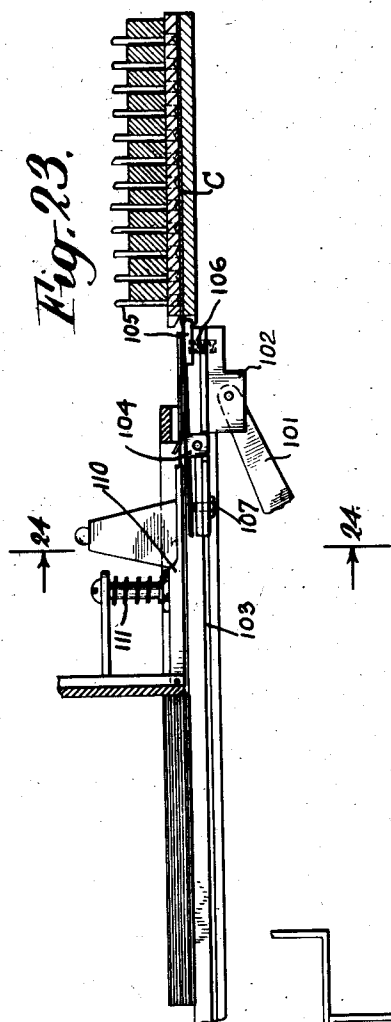
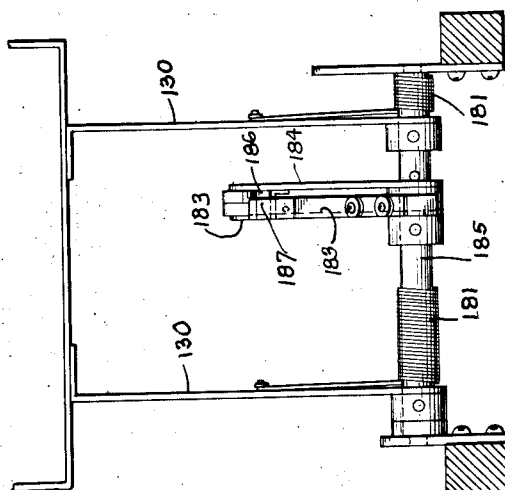


Fig. 25.



Inventor
J. T. Schaaff

By his Attorneys
Cooper, Kerr & Dunham

UNITED STATES PATENT OFFICE

JOHN T. SCHAAFF, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE TABULATING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

PUNCHING DEVICE

Application filed August 19, 1924. Serial No. 732,933.

The present invention is directed to the provision of an improved machine for performing so-called gang punching operations upon tabulating cards.

5 Gang punches as heretofore constructed for such purposes have either had a limited range being only able to handle a limited field upon the cards or they have been extremely complicated and expensive and slow in operation.

10 The present invention is directed to the provision of a simplified form of gang punch in which the setting of the punches for simultaneously gang punching is derived from
15 a pattern card instead of utilizing individual setting levers or a set-up mechanism controlled by keys, as heretofore. The pattern card may be previously punched in any way and in any selected fields in which gang
20 punching of a number of cards is desired. Thereafter the pattern card may be placed in the machine and a card reading pin box adjusted to allow pins to pass through the perforated index points in the pattern card.
25 The pins in turn serve as stops for punch selecting devices preferably in the form of interposer bars which may be simultaneously set into cooperation with the pins. The interposer bars in turn select the punches for
30 operation. Provision is made for automatically effecting the gang punching of any desired number of cards as selected by the operator. After the particular run of cards have been punched the machine is automatically
35 stopped whereupon the operator may remove the pattern card, replace it with another and then set the machine for gang punching another run of cards.

40 A further object of the present invention resides in the provision of means for permitting a direct numerical reading to be taken of the setting of the punch selecting mechanism. This obviates the necessity of checking the first punched card produced by
45 the machine.

50 A further object of the present invention resides in the provision of a simple controlling device for a machine of this class which will permit the machine to be preset to punch any desired number of cards and then to

automatically interrupt the operation of the machine.

A further object of the present invention resides in the provision of certain controlling devices for automatically suspending the operation of the machine upon abnormal operations of certain parts thereof. Provision is made for automatically suspending the operation upon the exhausting of cards from the supply magazine. Provision is also made
60 for automatically suspending the operation of the machine upon the failure of the card feeding devices to operate in a proper manner.

A further object of the present invention
65 resides in the provision of an improved card feed for machines of this class. Suitable provision is made for stopping the card feeding devices from operation upon the running out of cards from the supply magazine.

70 Further objects of the present invention will be hereinafter pointed out in the accompanying specification and claims and shown in the drawings which by way of illustration show a preferred embodiment of the invention and means for operating the punch
75 mechanism.

In the drawings,

Fig. 1 is a side elevation of the machine.

Fig. 2 is a top plan view of the machine,
80 certain parts being broken away to show the construction underneath.

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 2.

Fig. 4 is a transverse sectional view taken
85 on line 4—4 of Fig. 2.

Fig. 5 is an enlarged detail view of the pinion devices for setting the interposers and this view also shows the intermediate friction devices between the pinions.

90 Figs. 6 and 7 are views showing the parts which are set up to cause the machine to punch a predetermined number of cards and then stop. These two views show the parts in different operating positions.

95 Fig. 8 is a top plan view of the parts shown in Figs. 6 and 7.

Fig. 9 is an enlarged detail view of the punch section of the machine, which parts are shown in Fig. 3. This view also shows
100

the parts in moved position after punching a card.

Fig. 9^a is a detail sectional view on line 9^a—9^a of Fig. 9.

Fig. 10 is a part outside elevational view and part sectional view of certain of the parts shown in Figs. 3 and 9 with the sensing box elevated to permit the insertion of a pattern card.

Figs. 11 and 12 are detail views showing the card pusher and ejector mechanism in two different positions.

Figs. 13 and 14 are corresponding views of certain parts of the mechanism shown in the preceding Figs. 11 and 12.

Fig. 15 is a detail view of the mechanism for controlling and suppressing the picker action when no cards are in the storage magazine.

Fig. 16 is an end elevation view of the card picking mechanism and control devices therefor shown in the preceding figure.

Figs. 17 and 18 are respectively top plan views and side elevational views of a special interposer bar used when a plurality of holes are to be punched in a single column on a card.

Fig. 19 is an elevational view of the driving gearing for the machine.

Fig. 20 shows the controlling mechanism for the card picking devices which is adapted to render the picker devices inoperative after the passage of the last card from the card magazine. This view is similar to Fig. 15 but shows the operation of the parts with the magazine empty.

Fig. 21 is a circuit diagram of the machine.

Figs. 22 and 22^a are transverse sections showing the punches respectively in normal and moved positions, the sections of views being taken substantially on line 22—22 of Fig. 9.

Fig. 23 is a view of the picker mechanism and associated parts in moved position. The view is similar to Fig. 3 with the picker parts moved to place card in the die structure and with parts omitted.

Fig. 24 is a section taken on line 24—24 of Fig. 23.

Fig. 25 is a detail end view of the card pusher devices shown in Figs. 11 and 12. The view is shown looking to the right as indicated by the arrows 25—25 on Fig. 12.

The first step in the operation of this machine is to place a pattern card having the data which is desired to be duplicated punched therein, in the machine. Before the card can be placed in position the card sensing means must be lifted up. The card sensing means comprises a box-like frame 30, which frame is vertically guided at the corners by posts 31 (see Figs. 2 and 3). Fast to the box-like frame are racks 32 which mesh with pinions 33 fixed to a shaft provided with a crank 34. By rotating the crank the box

can be elevated to the position shown in Fig. 10. The box when in this position is retained elevated by means of a pivoted dog 35 which engages a pin 36 upon the crank arm. A pattern card P with suitable perforations therein is then placed under the sensing box. The card is abutted against stop posts 38 so that the perforations in the card properly align with the openings of a perforated plate 39 upon which the card is supported.

The means for sensing the perforations in the card comprise a plurality of shouldered pins 40. These fit loosely in guiding perforations in the lower intermediate plates of the box-like frame 30 and upon the frame being lowered, such of the pins 40 as find perforations thereunder pass through the perforations in the pattern card and drop downwardly with their lower ends below the lower face of plate 39. This condition of parts is shown in Fig. 9. It will be understood that with tabulating cards only one perforation is usually placed in a column. Consequently, only one pin in each column will project through the card. In some instances there may be dual perforations in the column, in which case two pins will project through. With two pins projecting a special arrangement of the devices cooperating with the pins is required as will be hereinafter described. It will be seen that by lowering the sensing pin box which may be effected by releasing latch 35 and either permitting the pin box to descend by gravity or lowering it by the crank, that a set-up of the perforated pattern card will be made on the pins 40. This set-up is utilized to control the positioning of interposer bars which in turn control the selection of the punches. Fig. 9 shows one of the interposer bars 41 for one of the columns of pins 40. This interposer bar 41 is in the form of a long bar having a shoulder 42 thereon and a projecting block or abutment 43 and rack teeth 44. Each of the interposer bars is identical, one being provided for each column of pins on the card, as clearly shown on Fig. 2 of the drawings.

Setting device for the interposer bars

As shown in Fig. 9 the interposer bar 41 has moved to a position in which shoulder 42 has contacted with the lowered pin 40 thus disposing projection 43 over the fourth punch corresponding to the lowered pin in the corresponding column. In order that the pin box be lowered and pins properly project through the pattern card the interposer bars 41 must first be moved to the right out of the way of the descending pins. Subsequently the interposer bars are shifted to contact with the respective pins. Figs. 3 and 10 show the normally starting position of the interposer bars and Fig. 9 shows the bars shifted toward the left. In order to effect the setting of the

interposers a crank 45 is provided at the side of the machine, which crank is fast to a shaft 46. This shaft is slotted, as shown at 47 (Fig. 5), to receive friction washers 48, which washers are correspondingly splined to fit in the groove of the shaft. Disposed intermediate the various friction washers are pinions 49, which pinions mesh with the rack teeth 44 of the respective interposer bars. At one end of the shaft 46 there is provided a spring 50 which serves to crowd the friction washers 48 into contact with the adjacent pinions. In order to adjust the amount of friction suitable adjusting nuts 51 are threaded upon the end of the shaft 46. By rotating the crank in an anticlockwise direction the various interposer bars 41 will be shifted until their shoulders 42 engage the projecting pins 40 in their respective columns. Thereafter the pinion of the arrested interposer bar will slip relatively to its adjacent friction washer. In this manner it is possible to differentially set the various interposer bars by a simultaneous single crank movement.

In order to visually display the set-up of the machine after the interposer bars have been shifted the cover plates 52 over the interposer bars is slotted, as shown at 53. Along one side of this slotted opening there are graduations corresponding to the number of columns on the card and the corresponding interposer bars. This index is indicated at 54 in Fig. 2. In order to coordinate the numbers with the card form suitable clips 55 are provided on the cover plate 52 to receive a narrow section 56 cut from the top of one of the cards which contains the designating data. The top surfaces of the interposer bars are also provided with indicating numerals 57. After the interposer bars have been set their setting appears through the slot 53, as clearly shown in Fig. 2. This permits the taking of a direct reading of the interposer bar setting after the same has been shifted by the crank.

In the event that any interposer bar encounters no projecting pin it will move to its limit of movement being finally arrested by shoulder 42 coming in contact with cross bar 58 (Fig. 9). With this position of the interposer bar its block or lug 43 will be disposed out of alignment with all of the punches.

Provision is made for duplicating any desired number of cards up to 1500. In order to set the machine so that punching operations will be automatically stopped when the desired number of cards have been punched the operator adjusts units dial 70 with reference to the zero gauge 71 (see Fig. 1) and if hundreds of cards are to be perforated adjustment is also made of the hundreds setting handle 72. Handle 72 is adjusted until index 73 comes opposite the desired number on the graduated scale 74. The adjustment of the units dial 70 is effected by means of the set-

ting knob 75. The operation of the stopping devices will be hereinafter described. It will be assumed that they are set at the desired points and that the operator has placed a supply of blank cards in the supply magazine 77 placing on top of them a suitable weighted follower block 78 (Fig. 3).

The operator now depresses the start key 79 (Figs. 1 and 21) thereby closing contacts 80 and establishing a circuit from source 81 through the driving motor 82 and back to source. Latch 83 now holds contacts 80 closed and the motor is set in operation.

Motor drive

Referring to Figs. 2, 4 and 19, the drive for the machine extends from the motor 82 to a worm shaft 84. This latter shaft may also be driven by hand, when desired, by means of a hand crank 85 which is normally disconnected from the shaft by means of the springs 86 shown in Fig. 2. The shaft 84 through its worm drive a worm wheel 87 (Fig. 19) which has fast to it a pinion 88 which meshes in turn with pinion 89. A gear train marked 90 in Fig. 19 is adapted to drive delivery roll shafts 91. The pinion 88 is fixed to the main driving shaft 92 of the machine.

Referring now to Fig. 3, the main drive shaft 92 is provided with a crank 93 which has connected to it a pitman 94. The opposite end of the pitman 94 is pivotally connected to an arm 95 (Figs. 3 and 20) which is loosely mounted on a shaft 96. Arm 95 is at its upper end is provided with a V-shaped jaw 97 which is adapted to receive a cross shaft 98 which in turn is rigidly secured to a pair of picker actuating arms 99. These picker arms 99 are also fixedly mounted on shaft 96. Fig. 16 shows the picker arms 99 together with arm 95. Upon the forward movement of arm 95 to the right in Fig. 3, the picker arms 99 follow operating in a clockwise direction under the influence of coil operating springs 100 (Fig. 16). Pivotally connected to the upper end of the picker arms 99 are supplementary arms 101 (Figs. 3, 16 and 23), which at their opposite ends connect to slide blocks 102 suitably mounted for slidable movement in guide slots 103 in the frame parts of the machine. Pivotally secured to the blocks 102 are picker plates or arms 104 carrying a transverse adjusting plate 105. The adjustment plate is yieldingly pressed upwardly to carry the picker 104 towards the cards by means of a spring 106 and the adjustment of the pickers may be effected by means of an adjusting screw 107. Upon the forward movement of the pitman the lowermost card C in the supply magazine will be displaced by the pickers and carried forward to the position shown in Fig. 23. In this position the card C has been passed into the die plates of the punch mechanism. During transit from the supply magazine the cards

are prevented from buckling upwardly by fingers 110 which are pivoted on the supply magazine and yieldingly pressed downward by springs 111 (Fig. 23).

Die plate structure

The die structure includes die plates 61 and stripper plates 62 (see Figs. 9, 22 and 22^a). These plates are both fixed to side plates 60, which side plates are guided at their ends by the corner posts 31 and at their outer sides by the side plates 59 of the punch section of the machine (see Figs. 9^a, 22 and 22^a). The die plates and the stripper plates 61 and 62 are suitably spaced by spacing plates 61^a to provide a throat for the card to enter therebetween. Disposed across the side plates 59 and fixed thereto is a cross plate 64 which is suitably perforated to receive the punches 65 which fit at the lower ends in the perforations in the stripper plate. The punches 65 at their upper ends are provided with heads 65^a. Slidably fitting in the fixed plate 64 are plunger pins 67. These pins have around them compression springs 68 which bear upon the die and stripper plate assembly and tend at all times to force the same downwardly. Disposed across the top of the stripper plate 62 are a plurality of bars 63 which are fixed to the stripper plate in a manner not shown. These bars are arranged to fit cooperating notched recesses in the punches 65.

Punch operation

It may be stated that just before a blank card C reaches its forward position in the die plate assembly a card abutment 117 is positioned in front of the die plate to register the card accurately with the die. This card abutment 117 is pivoted at 118 (Figs. 3 and 4) and is spring thrust by spring 119 into arresting position. The timing of the card abutment operation is controlled by a cam 120 fixed on the main shaft 92 of the machine. This cam cooperates with a follower arm 121 integral with the card abutment 117. After the perforating operation the abutment 117 is withdrawn by means of cam 120.

It will be assumed that the interposer bars 41 have been selectively positioned to bring the lugs over the corresponding punch. The rotation of the main drive shaft 92 causes cams 115 (Figs. 9, 22 and 22^a) to come in contact with the transverse rod 116 fixed to the punch frame plates 60. The rotation of cam 115 causes the die and stripper assembly to be elevated against the tension of springs 68. Such of the punches 65 as are under the interposing abutments 43 are held downwardly punching holes at the proper positions on the card. This is the condition of parts shown in Fig. 22^a. All of the punches which do not have interposing abutments over them are lifted up relatively to fixed plate 64 in the manner shown in Fig. 22^a. Cams 115 now

continue in their rotation and at a later time in the cycle the springs 68 come into action to press the die and stripper plate assembly downwardly and during this operation the heads 65^a on the depressed punches act to withdraw the depressed punches from the card. At the same time such punches as have not been depressed are pulled down relatively to fixed plate 64 by means of the cross bars 63. Fig. 22 shows the parts after the punches have been restored. Here cam 115 is shown in the lower position. The card now in the punching die has received a duplicate of the punchings on the pattern card. Means are provided for removing the punched card from the die plate structure in order to permit the entrance of the succeeding unpunched card. This mechanism will now be described.

Briefly stated, the operation of discharging a card from the die plate assembly consists in pushing the same from the entrance end of the card throat by means of a supplementary device or pusher. This pusher advances the card so that its leading edge engages in the bight of the feed rolls 122, which latter rolls are driven by the feed roll shafts 91 previously described. The feed rolls 122 deliver the punched card to the discharge stack 123. The pusher structure for effecting this operation will now be described.

Disposed across the machine is a pusher plate 124. This pusher plate 124 is fixed to a cross bar 125 (see Figs. 3 and 2). The cross bar in turn is fixed at its ends to bars 126 which are slidably guided upon the card magazine as shown in Fig. 1. During the forward feed of the blank card by the picker structure the pusher plate 124 is slightly elevated out of the path of the card to permit the new blank card to pass freely thereunder. This position of parts is shown in Fig. 13. The elevation of the pusher plate 124 is effected by means of a camming projection 127 on bars 126. When the bars 126 are restored to the left the camming projection rides up on rollers 128 and thus elevates the pusher plate. In order to actuate the pusher plate a pair of links 129 are provided, each of which is pivotally connected to operating arms 130 (Figs. 24 and 25). The links 129 are also upwardly slotted at 131 (Figs. 1, 11 and 12) to receive studs 132 fixed to the bars 126. To maintain the engagement of these slotted portions of members 129 with studs 132 springs 133 are provided removably secured to brackets fast to the bars 126 and at the lower ends to links 129. The spring support and open top slot construction permits the disconnection of the pusher plates from the actuating mechanism at any time should it be desired to retract the pusher plate manually if it is desired to remove a mutilated card or for any other reason.

The arms 130 are operated at the proper

time in the machine cycle by means of coil operating springs 181 (Fig. 25). Referring to Figs. 11 and 12 there is suitably fixed upon the main driving shaft 92 of the machine the cam 182, which cam cooperates with a pair of arms 183, 184, provided with suitable follower rollers adapted to engage the cam. Arm 183 is fixed to the shaft 185, to which the pusher actuating arms 130 are also fixed. Arm 184, on the other hand, is loosely mounted on shaft 185. In the normal operation of the machine the follower roller on arm 183 follows cam 182 and permits the spring actuation of the pusher arms 130 at the proper time in the machine cycle. Should the pusher devices jam in their forward movement due to a mutilated card or for any other reason the arm 183 will not follow the cam but will assume the position shown in Fig. 12. Arm 184 is provided with a shoulder 186 extending under a spring contact blade 187 forming one of a pair of contacts 188 which are carried by a suitable insulating block 189 fast to the fixed arm 183. During the normal operation of the machine arms 183 and 184 are in parallelism and abutment 186 keeps contacts 188 open as shown in Fig. 11. In the event of a jam of the pusher mechanism these parts 188 are permitted to close in the manner shown in Fig. 12 to thus stop the operation of the machine in a manner to be hereinafter described.

Stacker construction

Referring now to Figs. 3 and 4, a stacker which receives the completed punched cards delivered by feed rolls 122 comprises a bottom plate 123 which is fixed to a bracket 134. This bracket is slotted as shown at 135 and substantially one-half of it is provided with threads 136 which normally engage the threaded vertical shaft 137. The bracket 134 is also provided with an upper extending portion 138 which is unthreaded and adapted to slidably bear against the threaded shaft 137. It will be understood that the overhanging weight of the stacker plate 123 and the cards thereon will keep threads 136 engaged with the shaft 137. By lifting upward upon the stacker plate 123 the threads may be disengaged and the entire stacker elevated or lowered to any desired position. As the cards are fed into the stacker provision is made for automatically lowering the stacker cards and the stacker plate 123. This operation is effected by periodically rotating threaded shaft 137 by means of a ratchet 139. To actuate this ratchet a sliding pawl 140 is provided (Fig. 3), which pawl at its end remote from the ratchet is connected to an upwardly extending link 141 pivoted at its upper end to the frame part of the machine. The pawl 140 is retracted to the left by means of a spring 142 and is periodically

thrust to the right by means of a pin 143 carried on one of the cams 115.

Counting and stopping mechanism

As previously explained provision is made for setting the machine to punch a predetermined number of cards and then stop. Detailed operation of this counting and stopping mechanism will now be given referring particularly to Figs. 1, 6, 7 and 8.

It will be assumed for explanation that it is desired to punch two cards and then stop the machine. The operator grabs unit setting knob 75 and shifts the knob counterclockwise until the second graduation on the ratcheted dial 70 is in alignment with index 71. It may be explained that unit setting knob 75 is fixed to the ratcheted dial 70. The operator now starts the machine in the usual way by depressing start key 79. The machine then operates. At each complete rotation of the main operating shaft 92 a cam 144 fixed to shaft 92 rocks a spring restored bell crank assembly 145 in a clockwise direction. Pivotal and spring connected to the bell crank 145 is a drag pawl link 146 carrying a pawl 147 (Figs. 6 and 7), which pawl cooperates with the ratchet teeth 148 on ratchet disk 70. Thus at each operation of the machine ratchet disk 70 is advanced one step in a clockwise direction. Units ratchet wheel 70 in addition to being provided with the units ratchet teeth 148 is provided at one point on its periphery with a deep ratchet notch 149. As shown in Fig. 6, this notch is disposed two steps away from the notch engaged by pawl 147. Upon the machine making two complete operations pawl 147 will drop into the deep notch 149 and thereupon engage one of the ratchet teeth 150, which teeth are disposed upon a sector ratchet disk 151 which has the hundreds setting handle 72 connected to it. Sector 151 is loosely pivoted upon a supporting stud 152 and is frictionally held in position by means of suitable friction washers 153 disposed in cooperation with plate 70 and the hundreds graduating dial 74. Sector 151 carries a block 154 which is adapted to engage a flexible contact 155. Cooperating with this contact is a fixed contact 156 suitably fixed and insulated from the frame of the machine. The normal position of these contacts is open for the machine to continue to operate. This position is shown in Fig. 6. When the pawl 147 engages the deep notch 149 it also engages the ratchet teeth 150 on sector plate 151 rocking said sector plate one step in a clockwise direction and thus closing the contacts as indicated in Fig. 7. The closure of these contacts controls the stoppage of the machine in a manner which will be hereinafter described.

If it is desired that the machine shall run for, say, 202 units before stopping in addi-

tion to adjusting the units ratchet plate 70 by setting knob 75, the operator also adjusts the hundreds sector plate 151. This is done by grasping the handle 72 and swinging the plate counterclockwise until the desired number of hundreds on index plate 74 align with index 73. The stopping operation will then be the same as before except that the units ratchet disk 70 will make several complete revolutions before the stopping segment is finally brought up into contact with the flexible contact 155.

Referring now to the circuit diagram of the machine (Fig. 21), contact 155 is connected to a line 157 which extends to and connects with the upper of a pair of contacts 158. These contacts 158 are closed simultaneously with the closure of start contacts 80 by the depression of the start key 79.

In the construction of the machine as shown in Fig. 8, the start key is located directly over the two pairs of contacts 80 and 158 and, when depressed, closes both of them. Both of them are likewise held closed by the latch 83. In Fig. 21 for clearness in the diagrammatic showing these contacts are shown one below the other. The contact 156 is connected to a line 159 which extends to one side of source 81. The other contact of contact pair 158 is connected to a line 160 which extends to a magnet 161 in which a return line 162 including a resistance 163 extends back to the other side of the source. The energization of magnet 161 either by the closure of contacts 155, 156, or by the closure of other contacts as will be hereafter described, serves to attract an armature 164 and thereby release latch 83 permitting the contacts 80 to automatically open and thereby interrupt the circuit to the motor 82. Simultaneously the contacts 158 are opened so that the parts are set up for a subsequent operation. If it is desired to stop the machine operation at any time the operator can depress a stop key 165 thereby release latch 83 and stop the motor operation in a similar manner. In addition to stopping the operation of the machine after a predetermined number of cards have been punched provision is made for automatically stopping the operation of the machine should the cards become exhausted from the supply magazine or in case the pusher fails to operate properly or in case the picker fails to operate properly. These stopping devices will now be described.

Referring to Figs. 15 and 20, pivoted to a fixed frame part of the machine are a pair of arms 166. These arms have pivoted to them at 167 supplementary arms 168 having upwardly extending ear portions 169 adapted to project through openings 170 in the bottom of the card magazine. The arms 168 are normally urged forward relative to arms 166 by means of blade springs 171 and are

limited in their relative upward movement by means of shoulders 172 which extend under the arms 166. The weight of the parts of the arms 166 and the arms 168 pivotally connected thereto is such that the assembly normally tends to rock anticlockwise. This anticlockwise rocking movement is normally prevented by means of a card in the card magazine engaging ears 169 in the manner shown in Fig. 15. After the last card has passed from the card magazine the rocking movement of the parts is no longer prevented and they rock to the position shown in Fig. 20, in which position notches 173 in the arms 166 engage a cross bar 174 carried by the picker arms 99. After such engagement has taken place the forward rocking of the picker arms is prevented.

Referring now to Fig. 16, the arm 95 which, as previously explained, carries the V-shape jaw 97 and is connected to the pitman 94, carries on a bracket 175 a pair of contacts 176. So long as the cross shaft 96 is engaged within the V notch 97 these contacts will be held open by the cross shaft 98 engaging one of them in the manner shown in Fig. 15. In the event that the picker arm 99 is restrained against forward movement the contacts 176 under their spring action will move to closed position as shown in Fig. 20 inasmuch as they are no longer maintained open by engagement with shaft 98.

Referring now to the circuit diagram of the machine, the contacts 176 are disposed intermediate line 157 and line 159. The closure of these contacts will operate in a similar manner to interrupt the operation of the machine as the closure of the contacts 155 and 156 previously referred to.

The reason for providing the pivoted and spring connection intermediate the arms 168 and 166 is to prevent the picker arms from being suddenly released in the event that the supply of cards is replenished in the supply magazine 77. Should the cards be replenished the arms 168 will be pressed downwardly yieldingly relative to their supporting arms 166 and arms 166 will not disengage from bar 174 until the pitman has again returned to home position. Under these conditions the V notch will push the arms 79 slightly anticlockwise allowing the arms 166 to spring up to unlatching position.

Provision is made for stopping the following movement of the picker arms relative to pitman 94 in the event that a card becomes jammed after it has been partially removed from the card magazine 77. Referring to Figs. 3 and 16, the arm 95 carries a pin 177, which pin in case of the normal engagement of shaft 98 with the V jaw 97 is adapted to press rearwardly upon a wire 178, which wire extends to and connects with a pawl 179 pivotally mounted on shaft 98. With normal engagement pawl 179 will be maintained ele-

vated and out of engagement with a locking ratchet segment 180. In the event of the pitman advancing away from the shaft 98 the pawl 179 will be permitted to drop under the influence of gravity into engagement with the ratchet sector 180 and thus prevent any further advance with the picker arm. The reason for this interlock is to lock up the picker in the event of a jam in the card and to maintain the picker against a violent forward swinging movement after the mutilated card has been removed.

Provision is also made for interrupting the machine operation in case the card pusher structure fails to function properly and advance sufficiently to eject a card from the die assembly. This means comprises contacts 188 which are arranged to be normally opened when the pusher structure functions properly and which close upon the failure of the pusher devices to advance. Contacts 188 are likewise disposed between lines 157 and 159 and the closure of these contacts at any time in the machine operation will open the motor circuit and stop the operation of the machine in the manner previously described.

As previously mentioned there are certain instances when it is desired to punch dual holes in a given column in the card. These holes are ordinarily located in particular columns on the card and in such columns I contemplate the providing of special interposer bars 41^a of the type shown in Figs. 17 and 18. These interposer bars are provided with the usual abutment 43 and shoulder 42 and, in addition, the rear end of the interposer is slotted at 190 to receive a supplementary bar 191. In practice a number of these bars 191 will be made up provided that supplementary abutment shoulders 43^a are at different positions relatively to the end 192 thereof. The selected supplemental interposer bar 191 will be placed in position in the slotted groove 190 and the supplemental abut 43^a will then cooperate to depress an extra punch in that column. To properly align the supplemental interposer bar and to prevent its dropping through the slot 190 the bar 191 is provided with an eliminating pin 193 and the main interposer bar 41^a is provided with an abutment or a cross pin 194. The interposer bar 41^a may be made of spring metal so as to grip the supplemental bar 191.

It may be explained that in the event that the machine accidentally stops due to the closing of the safety control contacts it is necessary to bring the machine back to home position before it can be restarted. This can be conveniently effected by means of the manual crank handle 85.

What I claim is—

1. A gang punch comprising punching mechanism including a plurality of punches and a die structure, a perforated pattern card, a plurality of stop pins, and means for

displacing the same to permit the pins in alignment with the perforations of the pattern card to pass therethrough, punch selecting members, means for moving said members into engagement with extended stop pins, to thereby select the punches which are to be operated, and blank card feeding means for successively advancing blank cards to the punching mechanism.

2. In a punching machine having punching mechanism including a plurality of punches, means for selecting a plurality of said punches for punching operations, said means including a perforated pattern element, a plurality of pins adapted to pass through the perforations of the pattern element, punch selecting members controlled by direct contact with the pins which pass through the pattern element, and means for operating the punching mechanism and simultaneously forcing a plurality of the selected punches through the card to be punched.

3. A machine for punching cards comprising a main operating mechanism, punching devices operated thereby, a card magazine, a picker operated upon the actuation of the main operating mechanism for successively feeding cards from said card magazine to said punching devices, a pusher device independent of said picker for ejecting cards from the punching devices after the same have been punched, and means for operating the said pusher in timed relation to the operation of said picker and in accordance with the movement of said main operating mechanism.

4. A machine for punching cards comprising a card magazine, punching devices and a stacker for punched cards, a picker for withdrawing cards from the card magazine and directly placing the same in cooperation with said punching devices, a pusher independent of said picker for ejecting cards from said punching devices and for initiating delivery of the same to the stacker, and means for sequentially operating said picker and said pusher.

5. In a card punching device including in combination with punching devices, means for delivering blank cards thereto, means including a pusher independent of said means for delivering blank cards for ejecting the punched cards from said punching attachment, and means for displacing said pusher out of the path of incoming blank cards at the times when the latter are being fed into the punching devices.

6. In a card handling machine, in combination with a card magazine, a picker device for feeding cards therefrom, mechanism for performing an operation upon the cards fed by said picker device, means for operating the mechanism and for controlling the operation of said picker, and means operative upon said picker meeting undue resistance for

automatically suspending the operation of said mechanism.

7. In a card handling machine, in combination, a card magazine, means for cyclically feeding cards therefrom, a mechanism which is adapted to operate upon said fed cards, means for rendering said feeding means inoperative to perform any feeding movement following feeding of the last card in the magazine, and means controlled by the feeding means for thereupon stopping the operation of said mechanism.

8. In a card handling machine, in combination, a card magazine, means for feeding cards therefrom, a mechanism which is adapted to operate upon said fed cards, operating means for said mechanism, means rendered operative upon the absence of cards in the card magazine for preventing the operation of the card feeding means, and means other than the card feeding preventing means operative upon the failure of said card feeding means to operate for automatically suspending the operation of the operating means for said mechanism.

9. A punching device adapted to duplicate the punchings of a previously punched card which serves as a pattern comprising in combination, means for simultaneously sensing all of the perforations of a pattern card, a plurality of punches, means controlled by said sensing means for selecting the punches which are to be operated, means for feeding unpunched cards to punching position, said feeding means being yieldingly actuated whereby upon failure of a card to feed properly the resistance of the latter card will resist movement of said feeding means and thereby prevent piling up of spoiled cards in the punching position thereby avoiding injury to said punches, and means for thereafter operating the selected punches.

10. A punching device adapted to duplicate punchings of a previously punched card which serves as a pattern comprising in combination, a manually adjustable pin box adapted to sense the perforations of a pattern card, a plurality of punches, a plurality of punch selectors, manually operable means for setting said selectors in accordance with the setting of the pins of said pin box, said selectors when set selecting certain of the punches for operation, means for feeding cards into cooperation with said punches, and means for thereafter operating said punches.

11. A duplicating punching device including in combination with a plurality of punches means including pins for simultaneously sensing all of the perforations of a pattern card, a plurality of punch selectors, means for differentially displacing the same in accordance with the setting of the aforesaid pins and means for constantly indicating by numerical or like readings the setting of said selectors.

12. In a punching attachment including a plurality of differentially displaceable punch selectors, means including directly numbered scales for visually showing the set-up of said selectors and of the punches controlled thereby.

13. In a punching attachment including means for simultaneously sensing all of the perforations of a pattern card, a plurality of punches, a plurality of punch selectors differentially displaceable in accordance with the setting of said sensing devices, for selecting the punches which are to be operated, and means for visually indicating numerically the set-up of said punches before the same are operated to permit checking before punching is effected.

14. In a machine for duplicating the punchings of a previously punched card which serves as a pattern, punching devices; means for feeding unpunched cards to said devices and for removing the cards therefrom after they have been punched, means for selecting the punches to be operated, said means comprising a plurality of perforation sensing pins adapted to project through the perforations of a pattern card and serve as stop elements, interposer punch selector bars, means for differentially displacing the same into cooperation with said pins and means for simultaneously operating all of the selected punches in said punching devices to thereby duplicate the data on the pattern card.

15. In a punching device including a die assembly and a plurality of punches cooperating therewith, means for selecting said punches for operation, said means comprising a punched pattern card, controlled pin stop elements, and punch selector devices adapted to be differentially displaced different distances into cooperation with said stops and into a selecting position with respect to corresponding punches.

16. The invention set forth in claim 15 in which manually actuated means is provided for simultaneously displacing a plurality of said punch selectors into cooperation with their respective stops.

17. The invention set forth in claim 15 in which a manually actuated means is provided for displacing the pin stops into or out of stopping position.

18. The invention set forth in claim 15 in which means is provided for displacing the stop pin devices to a position out of cooperation with the pattern card to permit the said pattern card to be replaced.

19. The invention set forth in claim 15 in which means is provided for visually indicating the numerical set-up of the punch selector devices to thereby permit the checking of the punching of the pattern card and of the to be punched card before punching is effected thereon.

20. In a card punching machine in combination with means for feeding blank cards to punching position, means for punching the cards, said means including devices for operating a plurality of punches simultaneously, means for simultaneously selecting a plurality of punches for operation, said means comprising a pattern card sensing means provided with pins adapted to project through the perforations of a pattern card, and means controlled by said projected pins for controlling and selecting the punches for operation, means for operating the selected punches and means for subsequently feeding out the punched card from the punching means.

21. In a punching machine having a plurality of punches arranged in columns, differential punch selector members manually settable to render operative a plurality of punches in a single column of punches.

22. A gang punch including in combination, a plurality of punches, a plurality of corresponding stop pins, said punches and said pins being arranged in columns, and punch selecting members cooperating with said stop pins to render operative a plurality of punches in a single column of punches.

23. In a card handling machine, mechanism for performing an operation upon cards, a card magazine, means for feeding cards therefrom to said mechanism, means for driving both the aforesaid mechanism and the feeding means, and means adapted to be operated by the resistance of the card against the feeding means for automatically preventing operation of said driving means upon the card failing to feed properly.

24. In a card handling machine, means for operating upon a card, means for feeding cards out of the operating means, an operating mechanism for both of the aforesaid means, and means adapted to be operated by the resistance of the card against the feeding means for automatically suspending operation of said operating mechanism upon the failure of the card to feed properly.

25. In a card handling machine, a device for operating upon cards, means for feeding cards to said device, mechanism for driving both said device and said means, means for controlling the card feeding means including a releasable connection between said mechanism and said feeding means, means for releasing said connection to suspend the feeding operation upon failure of a card to feed properly, and means controlled by said releasable connection for stopping said mechanism upon the release of said connection.

26. In a machine for handling cards, means for acting upon the face of said cards, card feeding mechanism for advancing cards to said means, a detent member associated with said mechanism, and means for controlling said mechanism including a releasable con-

nection released to operate the detent member upon failure of a card to feed properly, and means controlled by said mechanism controlling means for thereupon stopping the first-mentioned means.

27. In a machine for handling cards, a card magazine, means for feeding cards therefrom, a mechanism adapted to operate upon said cards, and means positioned in advance of said mechanism for suspending the operation of the mechanism upon failure of the feeding means to properly feed cards from the magazine.

28. In a card handling machine, means for operating upon a card, means for ejecting cards after the latter have been operated upon, an electrical operating means for both the aforesaid means, an electric circuit controlling the operation of said electrical means, and controlling means in said circuit automatically effective to stop the operation of said electrical operating means immediately upon and coincidentally with failure of said ejecting means to properly eject a card.

29. In a card handling machine, means for operating upon cards, means for feeding said cards, an electrical operating means for both the aforesaid means, an electric circuit controlling the operation of said electrical means, and a switch controlling said circuit and automatically effective to open said circuit for stopping the operation of said electrical means immediately upon the failure of said feeding means to properly feed a card.

30. In a machine as set forth in claim 29, said switch being automatically controlled by the feeding means for effecting the opening of said circuit.

31. In the machine as set forth in claim 29, said switch comprising cooperating contact members normally moving concurrently with and controlled by the feeding means.

32. In the machine as set forth in claim 29, said switch normally tending to open said circuit, and means for preventing the switch from opening said circuit while the feeding means is operating properly.

33. In the machine as set forth in claim 29, said switch comprising a pair of cooperating contact members normally movable together as a unit, said feeding means including an element normally movable concurrently with said contact members, failure of said element to move concurrently with said contact members causing movement of said contact members relative to each other to effect aforesaid opening of the circuit.

34. In a machine for handling cards, devices for operating upon cards, means for feeding said cards, an operating means for both said devices and said feeding means, and means automatically effective to stop said operating means immediately upon failure of the feeding means to properly feed a card.

35. In a card handling machine, a card

magazine, mechanism for operating upon cards, operating means for said mechanism, feeding means for feeding cards from said magazine to said mechanism, means for stopping the operation of said card feeding means, said stopping means being normally under control of and prevented by cards present in the magazine from stopping operation of said card feeding means, and means controlled by said feeding means for controlling the operation of the operating means for said mechanism.

36. In a machine as set forth in claim 35, said stopping means having a feeler portion engaged by cards in the magazine whereby the said cards control said stopping means.

37. In a card handling machine, means for perforating cards, means for feeding cards to said perforating means, mechanism for operating both aforesaid means, a device intermittently operated by said mechanism, and means controlled by said device for stopping said mechanism after a predetermined number of cards have been fed and perforated.

38. In a punching machine in combination, card feeding devices, punching devices adapted to receive the cards and to punch the same, devices for ejecting the punched cards from said punching devices after the latter have been punched, a common means for operating each of said devices, and means effective for stopping operation of said operating means immediately upon failure of either the feeding or ejecting devices to operate properly.

In testimony whereof I hereto affix my signature.

JOHN T. SCHAAFF.

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