April 10 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 1

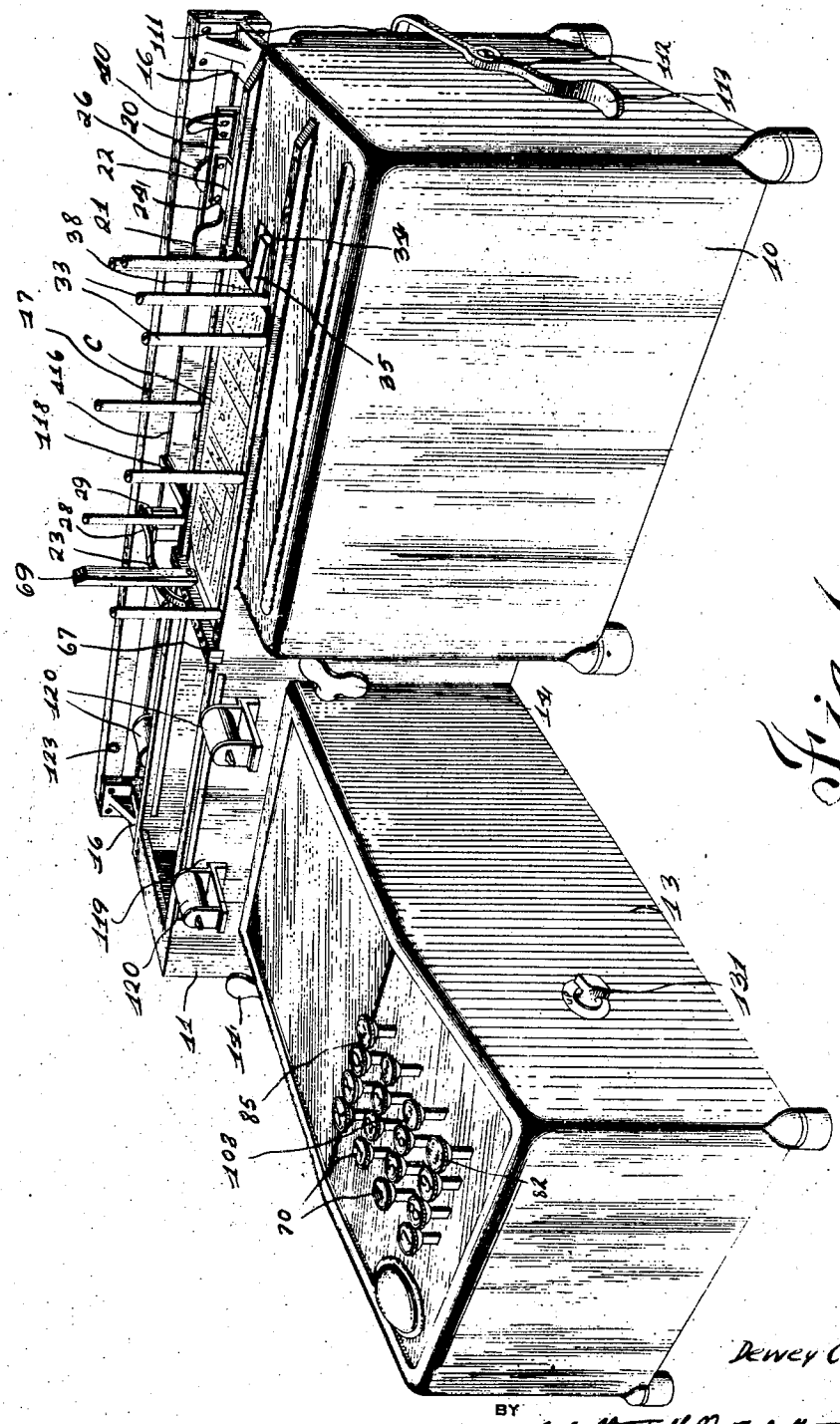


Fig. 1.

INVENTOR
Dewey C. Daubmeyer.

BY
Whittemore, Hulbert & Whittemore & Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 2

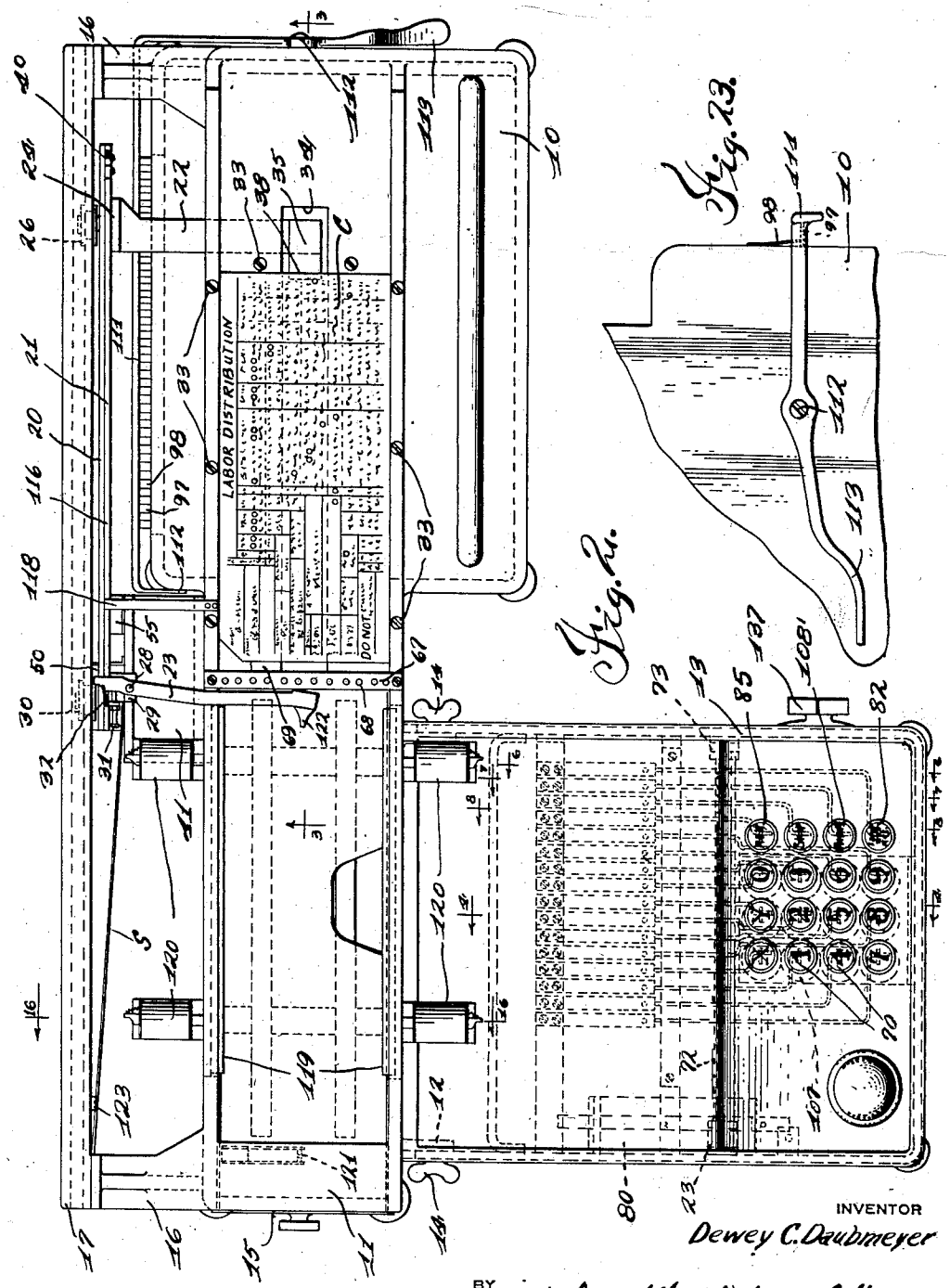


Fig. 2.

Fig. 23.

INVENTOR
Dewey C. Daubmeyer

BY Whittemore Hulbert & Whittemore Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 3

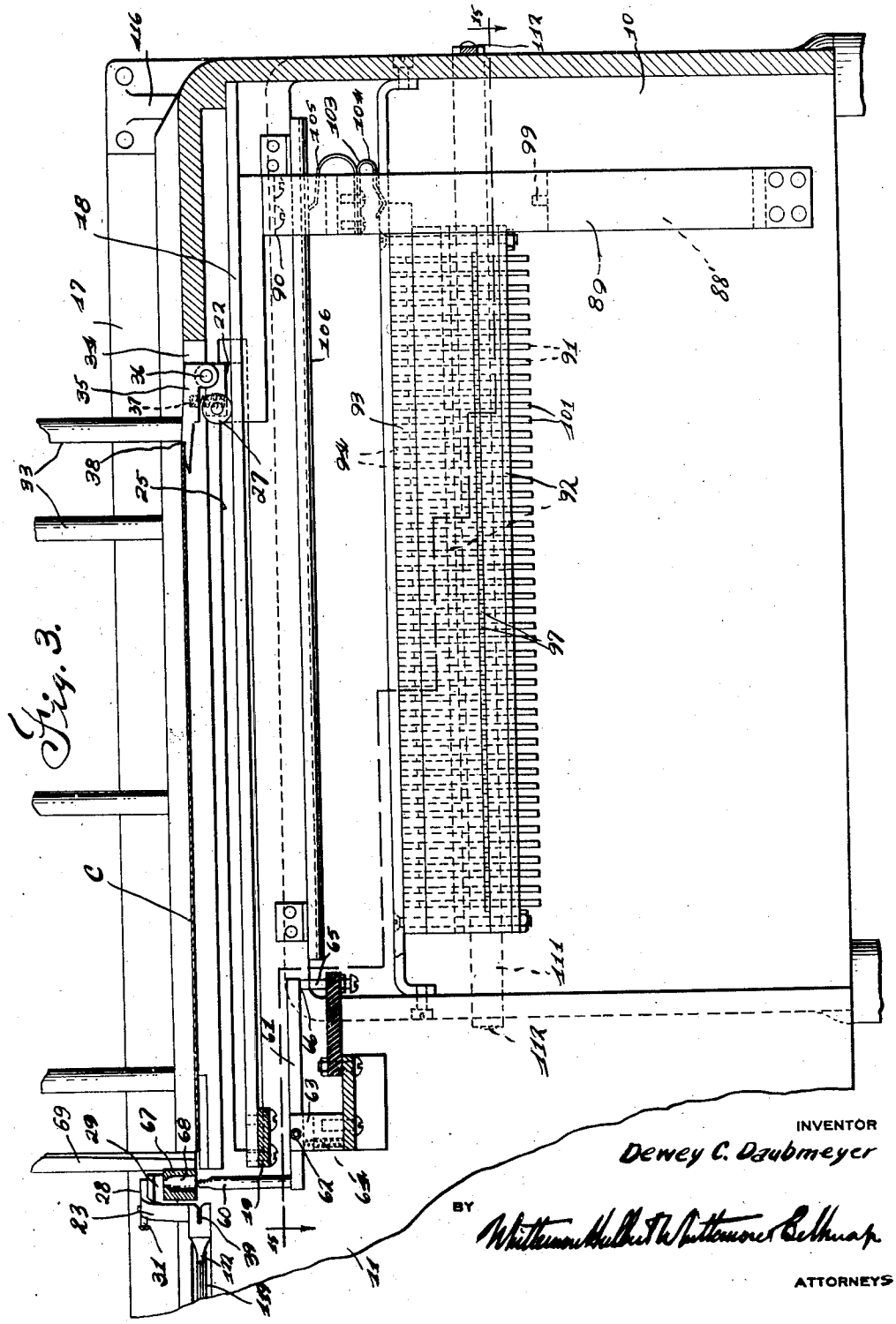


Fig. 3.

INVENTOR

Dewey C. Daubmeyer

BY Whittemore, Hulbert & Whittemore & Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 4

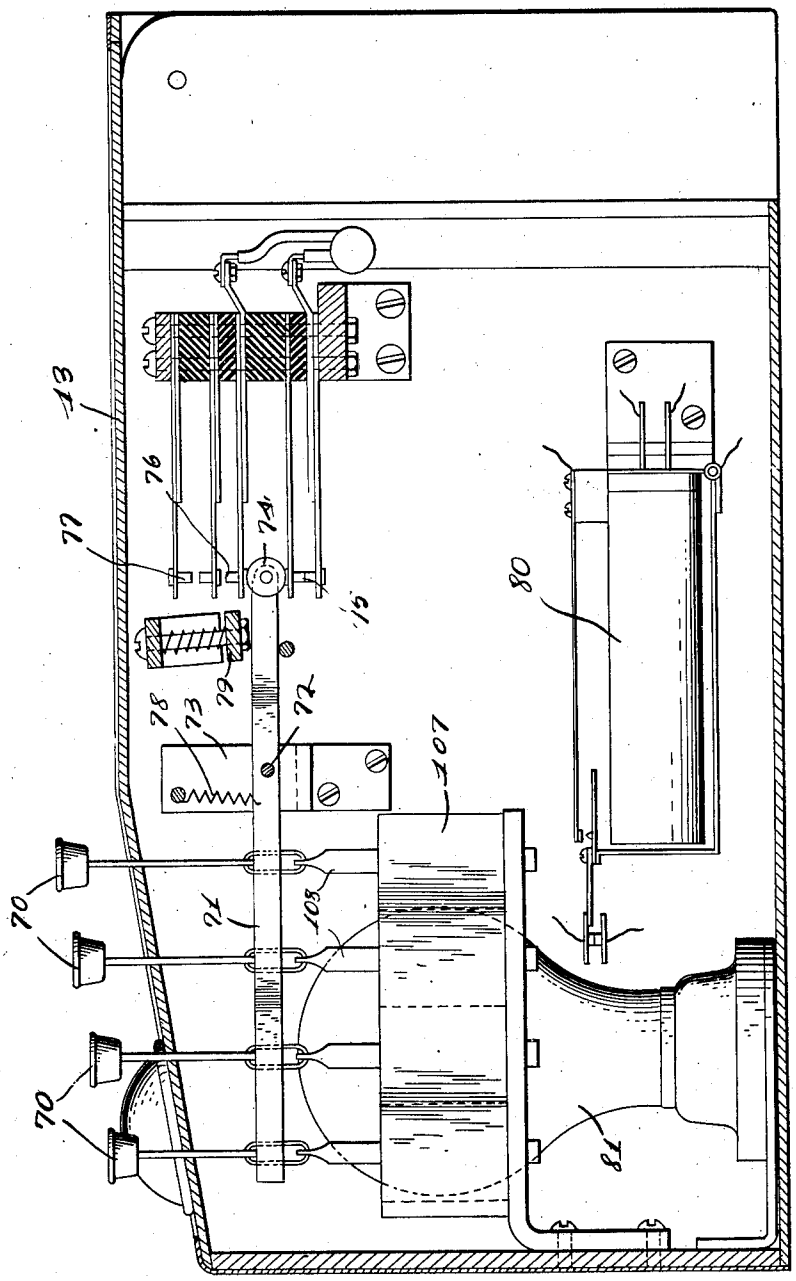


Fig. 4.

INVENTOR
Dewey C. Daubmeyer

BY Whittemore Hulbert & Whittemore Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 5

Fig. 19.

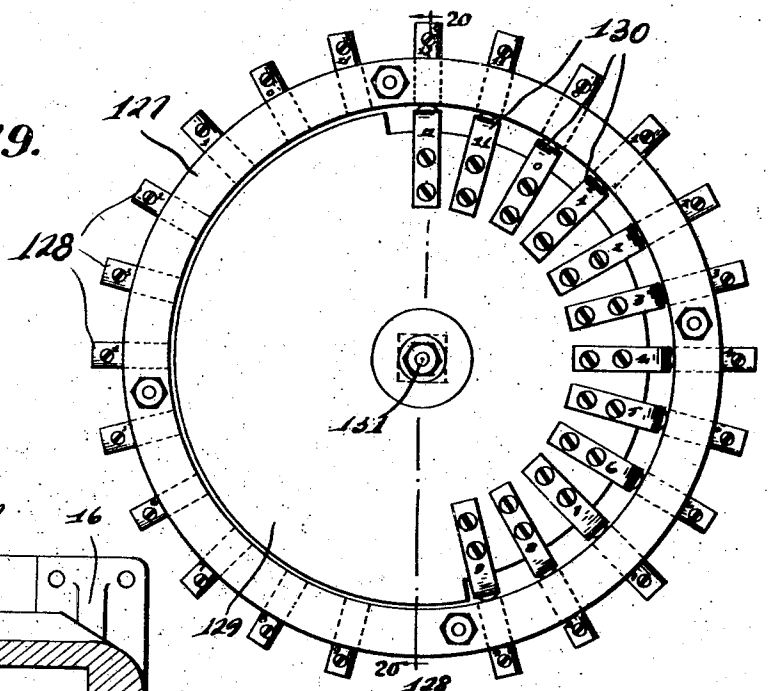


Fig. 5.

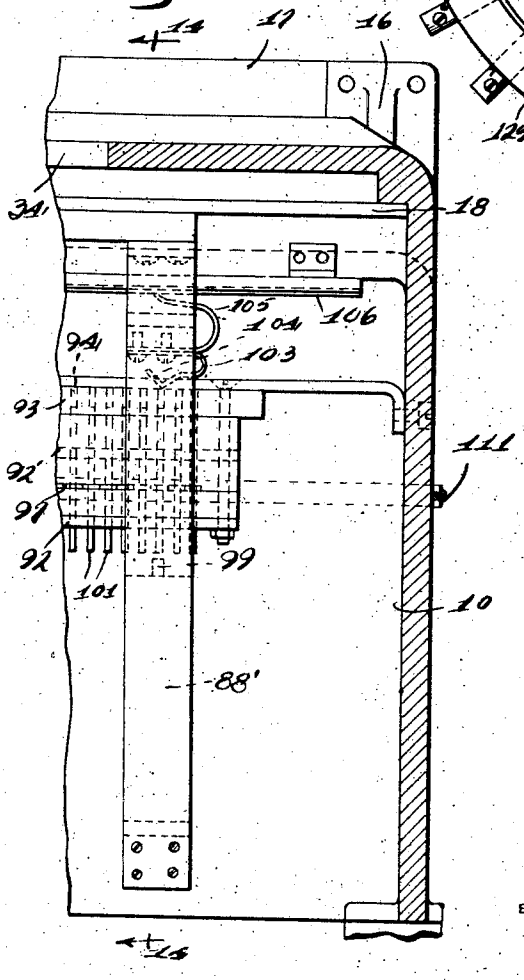
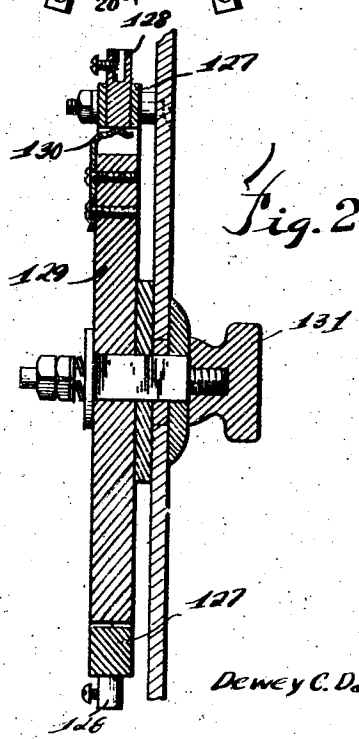


Fig. 20.



INVENTOR

Dewey C. Daubmeyer

BY Whittemore, Hulbert & Whittemore, Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 6

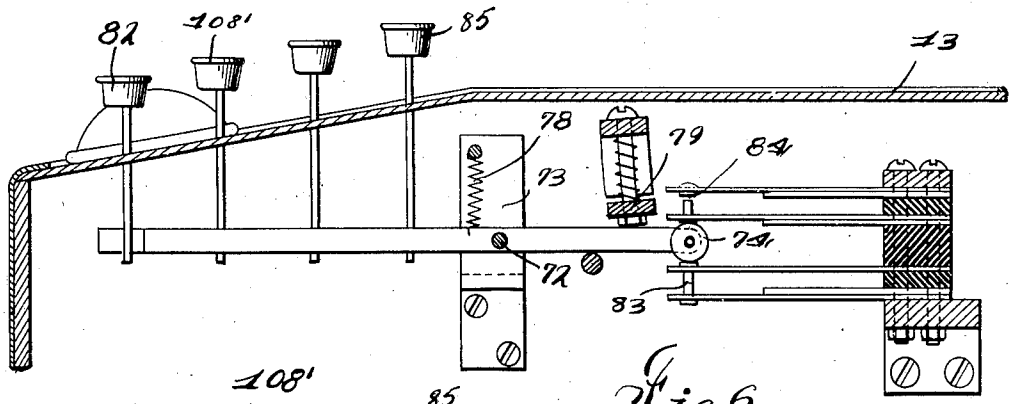


Fig. 6.

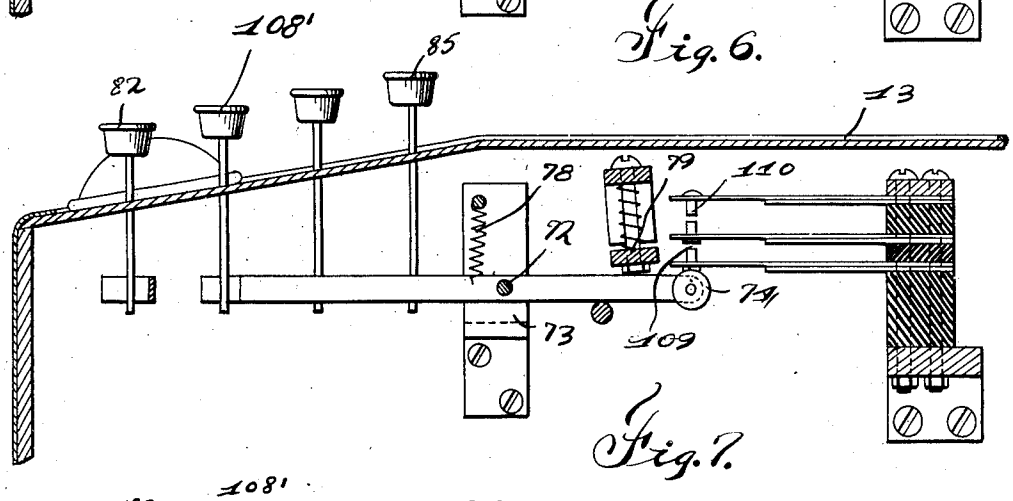


Fig. 7.

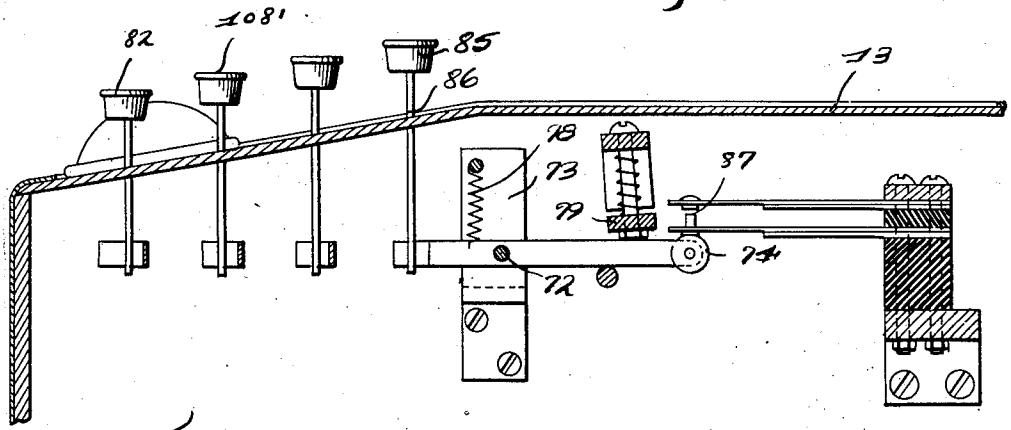


Fig. 8.

INVENTOR

Dewey C. Daubmeyer

BY

Whittemore, Hulbert & Whittemore, Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 7

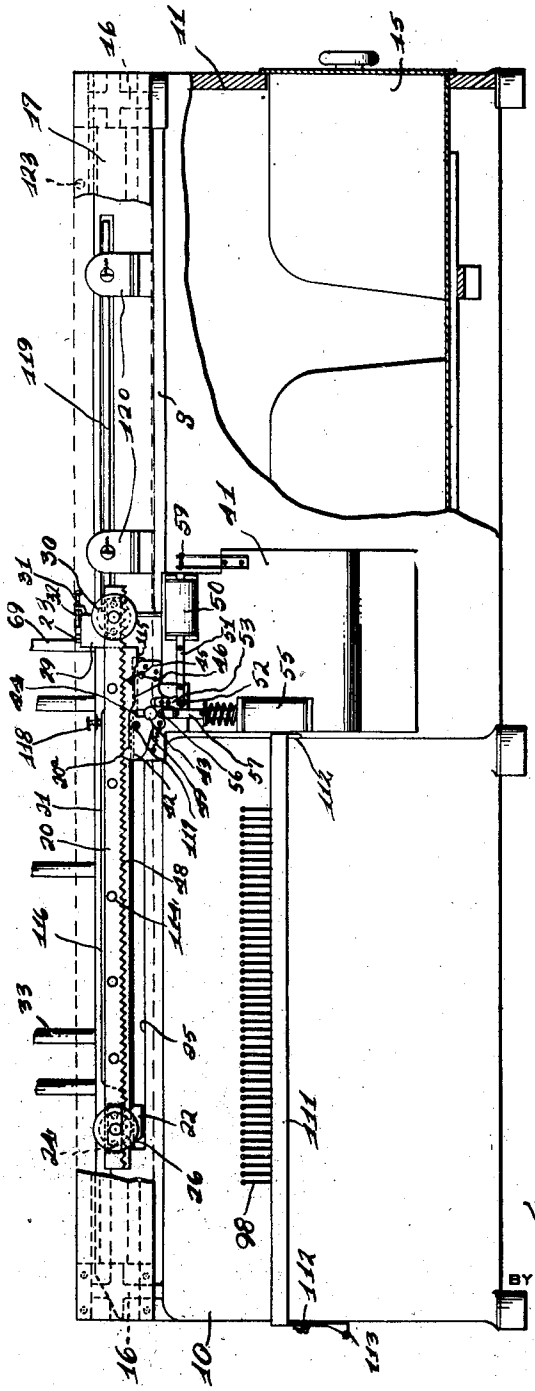


Fig. 9.

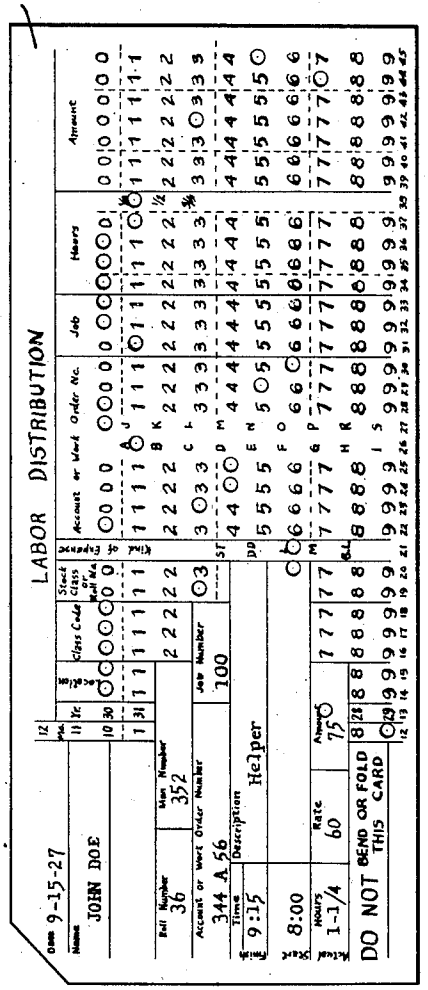


Fig. 21.

INVENTOR
Dewey C. Daubmeyer

BY

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 8

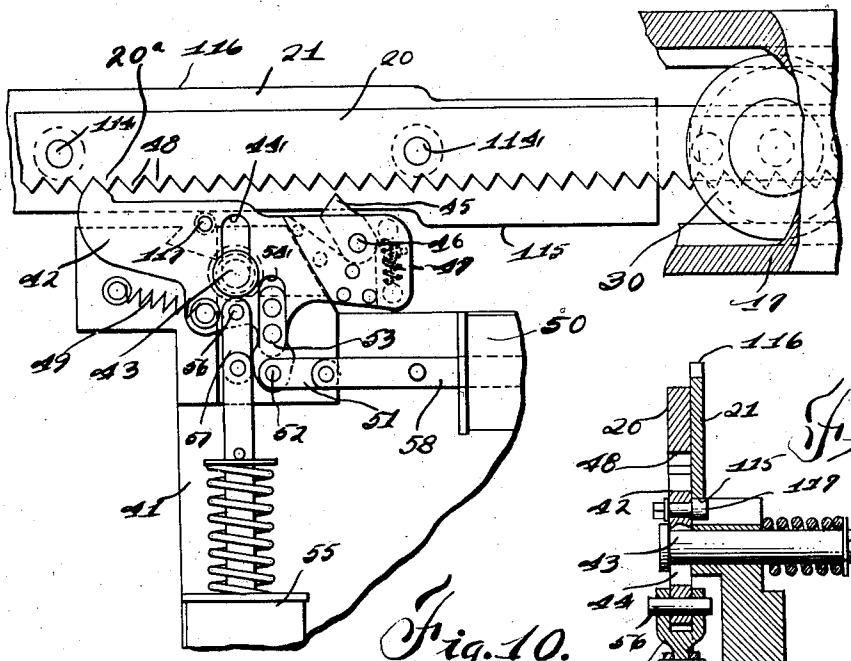


Fig. 10.

Fig. 13.

Fig. 12.

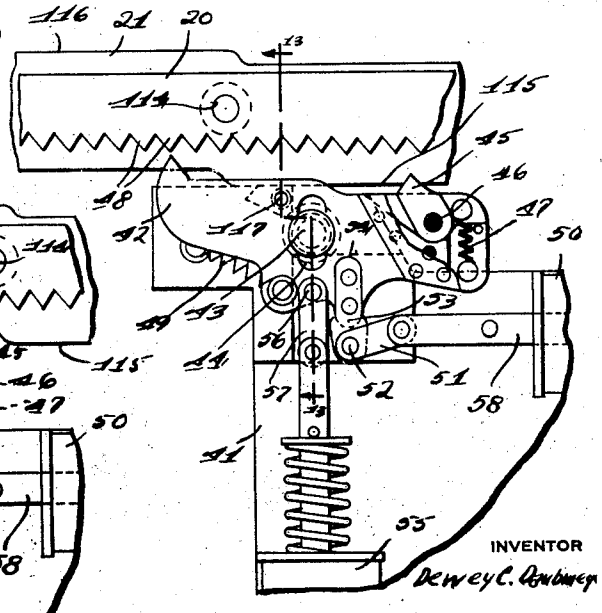
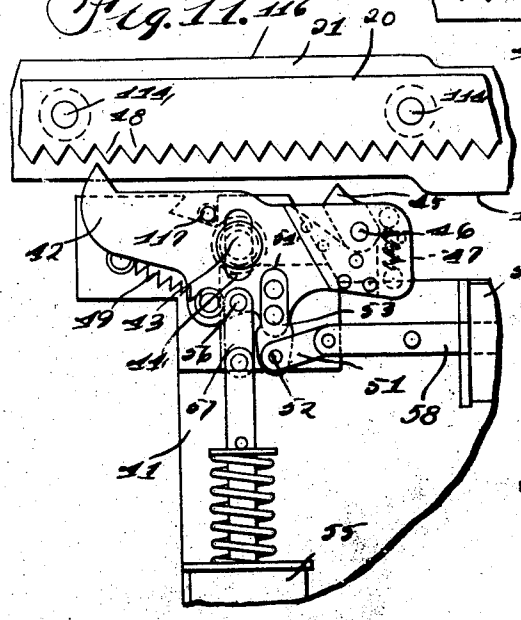


Fig. 11.



INVENTOR
Dewey C. Daubmeyer

BY
Whittemore, Hulbert & Whittemore & Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 9

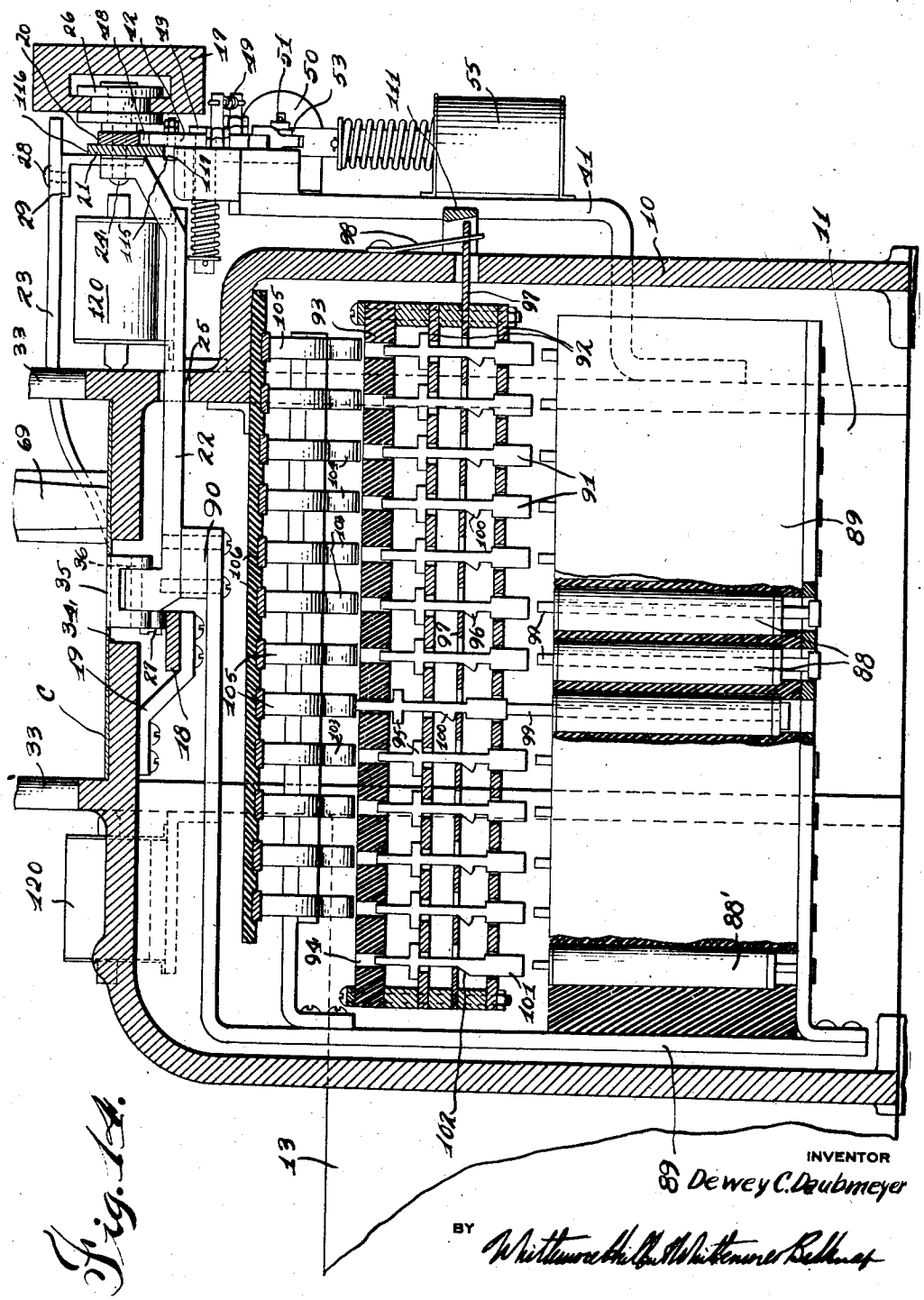


Fig. 1A.

INVENTOR

Dewey C. Daubmeyer

BY Whittemore Hulbert & Whittemore Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 10

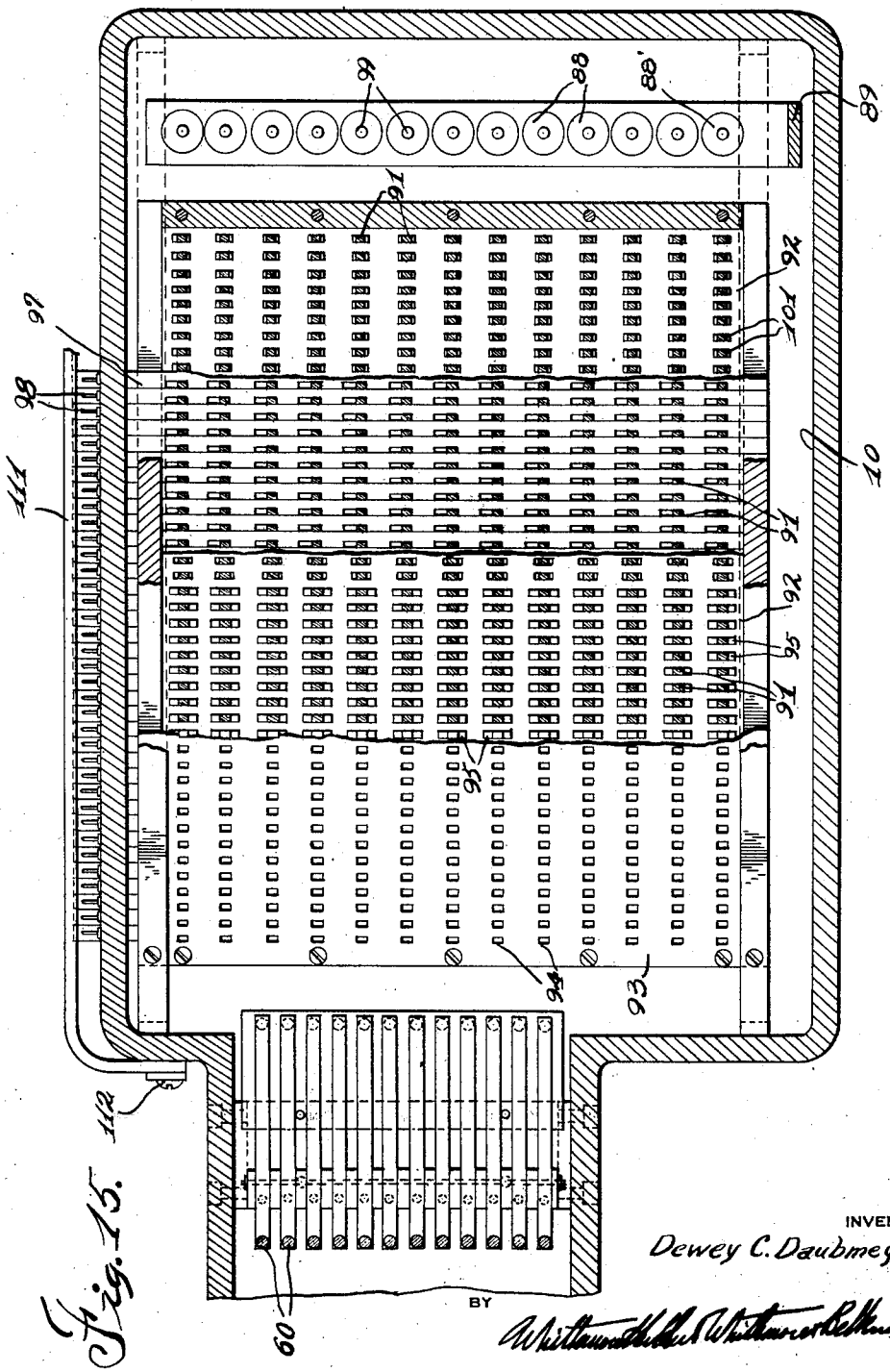


Fig. 15.

INVENTOR
Dewey C. Daubmeyer

BY

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 11

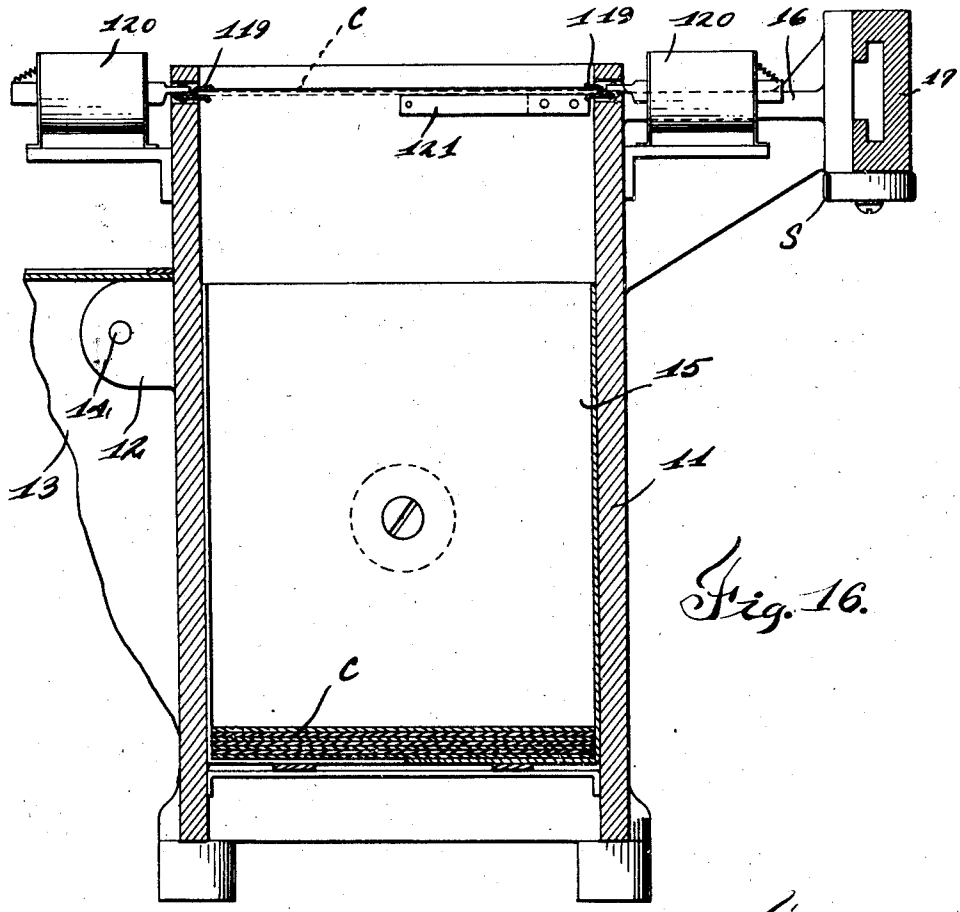


Fig. 16.

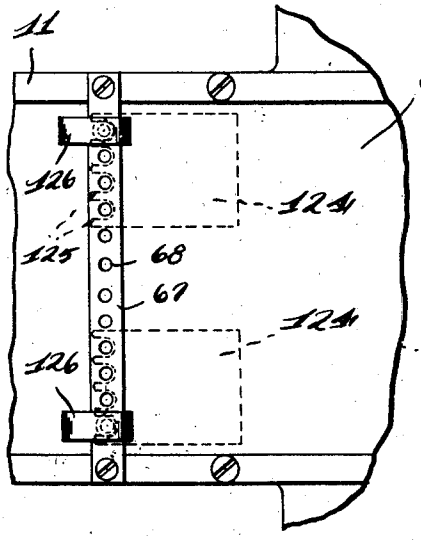


Fig. 25.

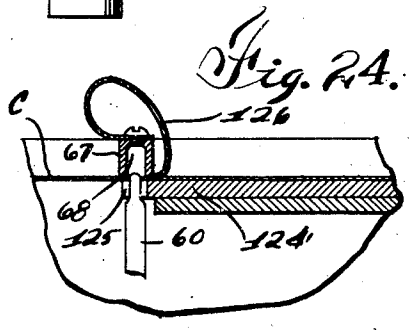


Fig. 24.

INVENTOR
Dewey C. Daubmeyer

BY Whittemore, Hulbert & Whittemore & Belknap

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 12

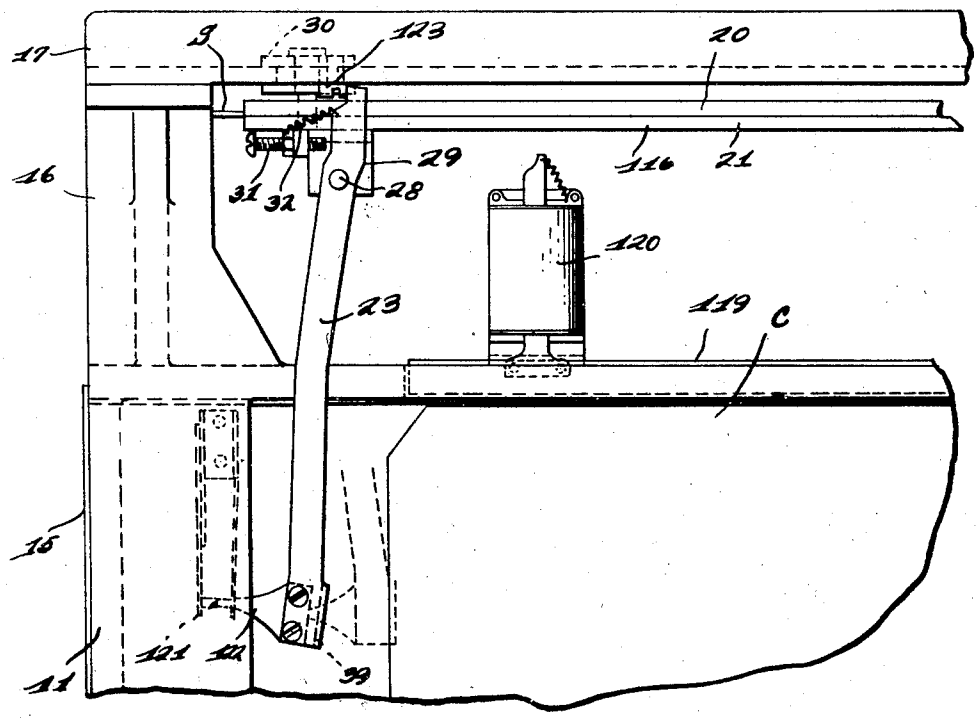


Fig. 18.

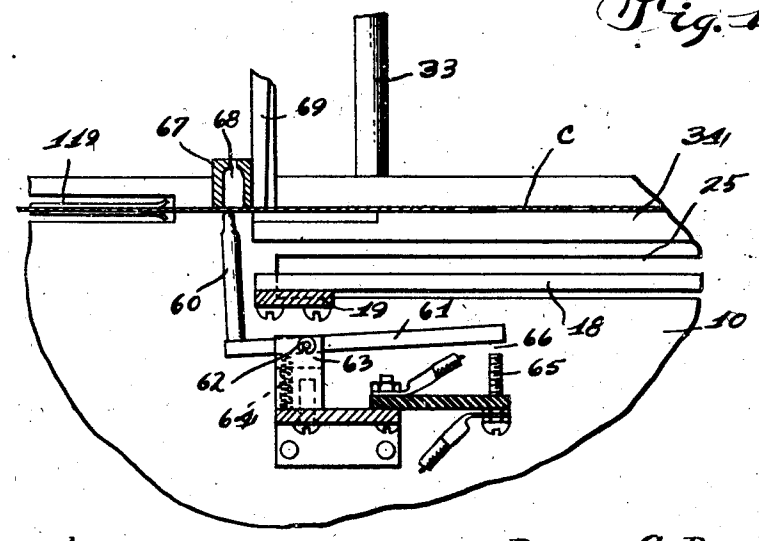


Fig. 17.

INVENTOR

Dewey C. Daubmeyer

BY

ATTORNEYS

April 10, 1934. D. C. DAUBMEYER 1,954,522

VERIFYING MACHINE

Filed Nov. 26, 1928 13 Sheets-Sheet 13

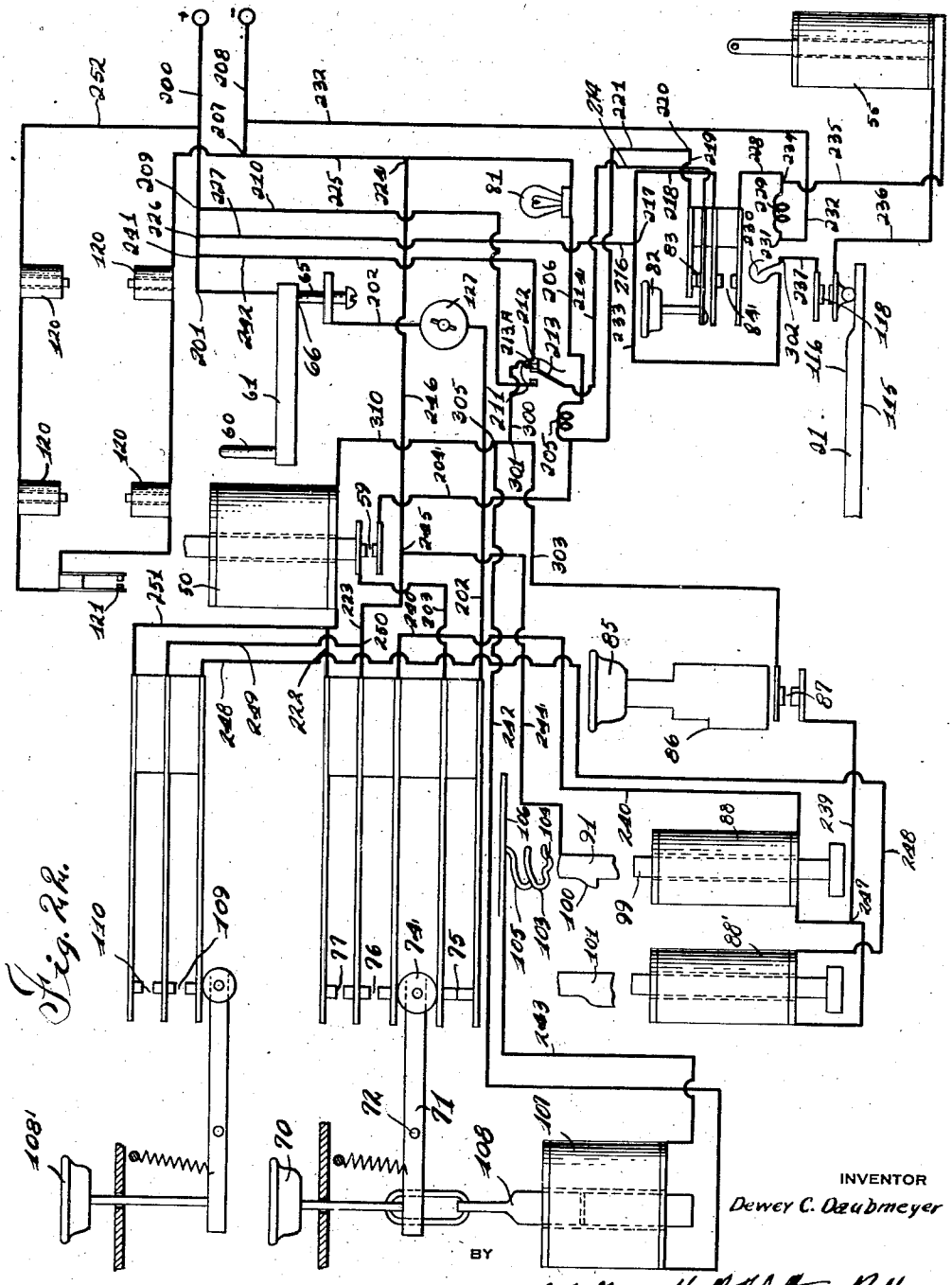


Fig. 24.

INVENTOR
Dewey C. Daubmeyer

BY

ATTORNEYS

Patented Apr. 10, 1934 1,954,522

UNITED STATES PATENT OFFICE

1,954,522

VERIFYING MACHINE

Dewey C. Daubmeyer, Detroit, Mich.

Application November 26, 1928, Serial No. 321,971

70 Claims. (Cl. 73—51)

This invention relates to verifying machines employed in the verification of perforated tabulating cards and more particularly to improvements in devices of this class which are automatic in operation and electrically controlled.

Verifying machines of this character find particular utility in connection with accounting systems and the like in which the data to be recorded is indicated by a perforation or a series of perforations in a tabulating card or sheet. Inasmuch as the tabulating cards are manually perforated by an operator the accuracy of the data sheets or cards thus produced is conditional upon the skill and care exercised by the operator. In order to check the accuracy of the perforations in these data cards before they are sorted and tabulated it is customary to pass the cards through a verifying device by means of which any errors therein may be detected.

Heretofore verifiers of this character have been principally manually controlled and the construction has been such that it has been difficult, if not impossible, to detect many of the various types of errors which occur with more or less frequency in record cards of this nature. In the form of verifier shown and claimed in my Patent No. 1,608,493 dated November 30, 1926 means is provided for accurately and positively detecting all classes of errors which might be made during the original perforation of the cards and for indicating the presence of an error by a signal. However, while the structure claimed in my aforesaid patent overcomes all of the objections of previous verifying devices the verifier therein disclosed is in nowise automatic in that there is no automatic card feeding mechanism; no automatic card ejecting mechanism; no automatic field skip mechanism; and no means for automatically verifying data common to two or more cards.

Therefore, the present invention has as its object to make more efficient, to render automatic and improve generally heretofore known verifiers or error indicators of the character to which this invention pertains. In accordance with the present invention means is provided for automatically feeding the cards to the error detecting mechanism and for ejecting the card at the completion of the verifying operation. Automatic means is provided for verifying data common on two or more cards without a depression of the keys of the device by the operator. An automatic field skip is also provided whereby a certain field or plurality of fields of the card may be automatically skipped without any positive action on the part of the operator.

The present invention also contemplates the provision of means for reversing the sequence of the electrical circuits of the verifying mechanism whereby cards which come from the perforating machine face downwards may be verified face downwards without necessitating the rearrangement of the same and by operating the keys of the verifying mechanism in the customary or usual manner.

The herein described construction involves numerous advantages of automatic control and operation not hereinbefore specifically referred to which contribute materially to produce a substantially completely automatic device which may be operated with consummate ease, rapidity and efficiency.

The several objects, advantages and novel details of construction of this invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings wherein a physical embodiment of a structure by means of which these advantages may be carried into execution is illustrated. In these drawings:

Figure 1 is a perspective view of the device.

Figure 2 is a top plan view.

Figure 3 is a longitudinal sectional view through the device taken substantially on the plane indicated by line 3—3 in Figure 2.

Figure 4 is a sectional view taken substantially on the plane indicated by line 4—4 in Figure 2.

Figure 5 is a fragmentary vertical longitudinal sectional view through the machine with the contact lifter mechanism in a different position.

Figure 6 is a fragmentary sectional view taken substantially on the plane indicated by line 6—6 of Figure 2 showing the key controlling the carriage release mechanism.

Figure 7 is a similar view taken substantially on the plane indicated by line 7—7 of Figure 2 showing the key controlling the reset mechanism.

Figure 8 is a similar view taken substantially on the plane indicated by line 8—8 of Figure 2 showing the key for controlling the repeating mechanism.

Figure 9 is a rear elevation of the machine with certain parts broken away for sake of clearness.

Figure 10 is an enlarged fragmentary elevation of the escapement mechanism.

Figure 11 is a similar view with the parts in a different position.

Figure 12 is a similar view with the parts in still another position.

Figure 13 is a vertical sectional view taken substantially on the plane indicated by line 13—13 of Figure 12.

Figure 14 is a vertical sectional view taken substantially on the plane indicated by line 14—14 in Figure 5.

Figure 15 is a fragmentary horizontal sectional view taken substantially on the plane indicated by line 15—15 in Figure 3.

Figure 16 is a fragmentary transverse sectional view taken substantially on the plane indicated by line 16—16 of Figure 2.

Figure 17 is a fragmentary sectional elevational view showing one of the initial circuit contacts in open position.

Figure 18 is an enlarged fragmentary plan view of the carriage in one of its extreme positions.

Figure 19 is a fragmentary elevational view of the circuit reversing mechanism.

Figure 20 is a sectional view taken substantially on the plane indicated by line 20—20 of Figure 19.

Figure 21 is a plan view of one of the tabulating cards.

Figure 22 is a diagrammatic view illustrative of the circuits involved.

Figure 23 is a fragmentary elevational view showing the manual latch plate operating means.

Figure 24 is a fragmentary sectional view through a modified form of card guiding mechanism, and

Figure 25 is a fragmentary plan view of the structure illustrated in Figure 24.

The problem herein involved is that of verifying the accuracy of the perforations in for instance a tabulating card or sheet such as shown at C in Figure 21. The tabulating card therein illustrated is known in the art as a dual card for the reason that the card has data to be verified written across the face thereof. Dual cards are verified face upwards. Cards known as transcript cards are also used. These cards have no data written upon them, the data being read from a separate record when the cards are verified. It is preferable and much more efficient to verify transcript cards face downwards because as these cards are perforated the operator places them in the pile face downwards. With heretofore known verifying machines it has been necessary to verify all cards either face upwards or face downwards but in accordance with the present invention and by means yet to be referred to this present machine may be readily altered so that tabulating cards may be verified either face upwards or face downwards.

It will be noted that with the so-called dual cards the data represented by the perforations in the several fields is also written in the spaces provided for that purpose at the left hand end of the card. In the sample card illustrated in Figure 21 an error appears in the "Amount" field. This error consists in the perforation of a "3" in the 42nd column which column should have been spaced. Errors which commonly occur are errors of double punching; perforations punched in fields which should have been spaced; last column errors and insufficiently perforated fields. The herein described machine is adapted and particularly designed to detect all of the aforementioned and any other errors which may occur during the original perforating of the cards.

Referring now more particularly to the drawings it will be noted that the base of the machine consists essentially of a main base portion 10 of hollow construction and of substantially rectangular shape having a laterally extending hollow rectangular portion 11 of a width less than that of the main portion 10. The base portion 11 is provided with spaced projections or lugs 12 to which the key board housing or casing 13 is adjustably pivotally connected as for instance by set screws 14. The hollow interior of the main base portion 10 is employed principally for containing and housing the repeat mechanism while the hollow interior of base portion 11 constitutes a receptacle for the verified cards. To this end the base portion 11 is provided with a removable tray or drawer 15 in which the verified cards are deposited and from which they may be removed by withdrawing this tray or drawer. Projecting upwardly from the upper side of housing 13 are the manually operated keys of the device and the contacts controlled thereby are arranged interiorly of this housing 13 as is also the electric signal lamp and also preferably the circuit reversing mechanism, all of which will hereafter be more fully referred to.

Preferably cast integrally with the base of the machine and extending rearwardly therefrom are bracket arms 16 which constitute supports for one of the rails 17 of the track or guide way of the card carriage. The other rail of this track or guide way is indicated by the reference character 18 and extends longitudinally of the housing 10 interiorly thereof and may be conveniently supported by means of brackets 19.

The card carriage consists of a rack bar 20 and a skip bar 21 to which arms 22 and 23 are connected. Arm 22 is rigidly connected to the bars 20—21 as indicated at 24 and extends in a horizontal plane into the interior of base 10 through a slot 25 formed in the rear vertical wall thereof. A roller 26 mounted at the outer end of arm 22 works in track or guide way 17 while the inner end of arm 22 is provided with a roller 27 which runs on track 18. Arm 23 at the other end of the card carriage is pivotally mounted as at 28 to a bracket 29 secured to the end of the bars 20—21. A roller 30 is also provided which runs in track or guide 17. The short end of arm 23 beyond pivot 28 is adapted to engage an adjustable stop 31 and to be normally urged into engagement with this stop by means of a spring 32, for a purpose to be more fully hereinafter referred to.

The stack of cards to be verified is deposited in a hopper or rack defined by a plurality of upstanding bars or guide members 33 which project upwardly from the base 10. The top wall of the base portion 10 is provided longitudinally and centrally thereof with a slot 34 in which a card knife 35 carried by arm 22 is adapted to travel. This card knife is pivotally mounted as at 36 on the end of arm 22 and is normally urged upwardly by means of a spring 37. This knife member 35 is provided with a knife edge and a shoulder 38 adapted to engage behind the edge of the lowermost card of the stack of cards deposited between the guides 33. The other or opposed edge of the card C is engaged by the end of arm 23. For this purpose the end of this arm is slotted as indicated at 39. By adjusting adjustable abutment 31, the distance between the card engaging portions of arms 22 and 23 may be regulated so as to prevent buckling of the card.

The card carriage is normally urged toward the left in Figures 2 and 3 by any suitable means such as a spring operated draw band S, and this movement of the carriage is controlled by escapement and skip mechanism yet to be more fully referred to. While any desired means may be provided for moving the carriage to the right against

the action of the spring I have herein illustrated a thumb piece 40 for this purpose.

The escapement mechanism is shown in detail most clearly in Figures 10, 11 and 12. This escapement mechanism is preferably mounted on a bracket plate 41 and consists of a main pawl 42 pivotally mounted as at 43 upon a stud projecting from the bracket plate 41. The pivot stud 43 passes through a slot 44 in the main pawl for a purpose to be later referred to. Main pawl 42 is provided with a second pawl 45 pivotally connected thereto as at 46 and normally projected in an upward direction by means of a spring 47. These pawls 42 and 45 are adapted to alternately engage the teeth 48 of rack 20 in the customary manner. The main pawl 42 is normally rocked about its pivot to cause it to engage the teeth of the rack by means of a spring 49.

I propose operating the escapement mechanism electrically by means of an escapement solenoid 50. The armature of this solenoid is connected to the escapement mechanism by means of a link 51 pivotally connected as at 52 to a block 53 capable of vertical sliding movement in a slot 54 formed in the main pawl 42.

The reference character 55 indicates an escapement release solenoid the armature of which is pivotally connected as at 56 to the escapement mechanism by means of a link 57. Thus in a manner and for a purpose to be later more fully referred to the entire escapement mechanism may be moved downwardly out of engagement with the teeth 48 of rack bar 20. The slots 44 and 54 hereinbefore referred to permit this escapement mechanism to move downwardly upon an energization of escapement release solenoid 55.

Arranged adjacent the escapement solenoid 50 and adapted to be operated by the armature 58 thereof is a delayed error circuit switch 59. Thus upon each energization of escapement solenoid 50 the resulting movement of the armature causes a closing of this delayed error circuit switch 59, for a purpose to be later referred to.

As will be understood each card C is ordinarily moved with a step by step movement toward the left as viewed in Figures 2 and 3 and as a consequence each vertical row of numerals or other indicia or each vertical field of the card is successively presented above perforation detecting means herein shown as consisting of a row of plungers or perforation detecting pins 60. There are usually twelve of these plungers, each of which controls an individual circuit corresponding to the twelve positions in each vertical field of the card C. Each plunger 60 is mounted upon the end of a rockable lever 61 pivotally supported intermediate its length as at 62 upon a supporting block 63. A spring 64 normally urges the plunger end of each lever 61 upwardly. The rear end of each lever 61 is adapted when in engagement with adjustable contact 65, to close one of the twelve circuits hereinbefore referred to. The contacting members 61—65 constitute what will hereinafter be referred to as an initial error circuit contact or switch 66. The arrangement of these initial error circuit contacts is such that during the passage of the card past the plungers 60 the imperforate portions of the card will rock the plunger ends of the levers downwardly thus opening the corresponding contacts 66. However, whenever a perforation or a plurality of perforations register with the corresponding plungers 60 the corresponding levers 61 are permitted to rock to the position illustrated in Figure 3 whereupon the corresponding contacts 66 are closed. Extending transversely of the machine and above the upper ends of the series of plungers 60 is a block 67 provided with depressions or recesses 68 providing clearance for the protruding ends of those plungers which are engaging apertures in the card. An adjustable throat block 69 arranged at the forward end of the card hopper accurately guides the cards between the block 67 and the plunger 60. The closing of any of the initial error circuit contacts 66 effects an energization of the error circuit relay in a manner yet to be referred to.

There are twelve keys 70 corresponding to the twelve circuits hereinbefore referred to and corresponding to the twelve positions in each vertical field of the card to be verified. Each of these keys operate a corresponding lever 71 which is pivotally mounted intermediate its ends as at 72 on a bracket 73. The rear end of each lever 71 is provided with a roller 74 and the movement of each lever operates a plurality of contacts or switches now to be referred to in detail. Adjacent the rear end of each lever 71 and operated thereby by the corresponding key is a normally closed error circuit contact or switch 75, a normally open lift coil circuit contact 76 and a normally open escapement circuit contact or switch 77. There are twelve individual contacts or switches 75, one for each of the twelve hereinbefore referred to circuits and a corresponding number of lift coil circuit contacts or switches 76. The escapement circuit contacts or switches 77 are common to all of the twelve keys 70. It will thus be readily seen, particularly from an examination of Figure 4, for instance, that a depression of any of the keys 70 causes the corresponding levers 71 to rock whereupon contact or switch 75 will first be opened and contacts 76 and 77 subsequently closed. If the key 70, which has been depressed, corresponds to the plunger 60 which has entered a perforation in the card C the error relay circuit will not be energized. However, if the key 70 does not correspond to the detected perforation in the card or if there are two perforations in that particular column and only one key 70 has been depressed then the error circuit relay will be energized, the circuit being completed thereto through initial error circuit contact 66, normally closed error circuit contact 75 and delayed error circuit contact 59. It will be understood that delayed error circuit contact 59 is closed upon energization of escapement solenoid 50 which solenoid was energized upon the closing of contact or switch 77. The closing of contact or switch 76 in this operation of the machine is an idle operation, the circuit of which this contact or switch forms a part coming into operation only when it is desired to set up contacts in the automatic repeat mechanism yet to be referred to.

The key board is arranged for touch system operation and the keys are arranged in stepped banks, each key having preferably smooth celluloid tips all of which is conducive of speed in operation. The construction of the levers is such that a short stroke of the keys effects an operation of the machine. Each lever is preferably provided with a lift spring 78 which maintains the corresponding key in its normal position while a resilient buffer abutment 79 is provided to limit the movement of the key in the other direction.

When an error is detected as above pointed out the circuit thus completed energizes error circuit relay 80 which controls an error lamp cir-

cuit for illuminating signal lamp 81. This signal lamp will remain illuminated until the relay 80 which controls the same is de-energized. The relay circuit is de-energized by depression of key 82 shown particularly in Figure 6. A depression of this key opens normally closed contact or switch 83 thus breaking the relay circuit and closes contact or switch 84 which closes the circuit energizing escapement release solenoid 55. This permits the carriage to return to the left whereby the card may be released for correction.

The present invention contemplates the provision of means whereby the added feature of automatically verifying data, common to two or more cards, is made possible. This automatic verification may be frequently employed to advantage especially on "transcript" cards where it is not unusual to encounter a number of cards which have been perforated from one record having the same date, sheet number, work order number, etc. Frequently the only data differing on a number of these cards is, for instance, the identification number of the commodity and its value. When this condition presents itself the operator may, with the present machine, operate a repeat key, prior to entering the field to be repeated automatically and thereafter upon verification of the first of the series of cards having common data, set up a series of contacts corresponding to this common data whereupon the cards of this group or series subsequently verified cause the machine to be operated in such a manner that this verification is accomplished automatically without any attention from the operator.

In order to accomplish this, repeat key 85, see particularly Figure 8, is depressed. This key is provided with a shoulder 86, as is customary, which engages the edge of the slot through which it passes so that this key may be depressed and held down. A depression of repeat key 85 closes contact or switch 87 which initially completes a contact lifter solenoid circuit common to all of the lifter solenoids. The individual circuits controlling respectively the several lifter solenoids are completed by the closing of switches 76 operated by keys 70. The contact lifter solenoids are indicated by the reference character 88 and are twelve in number thus corresponding to the twelve positions in each vertical field of the card. These solenoids are mounted in a frame 89, an arm of which is connected as at 90 to the card carriage so that this bank of contact lifter solenoids 88 travel longitudinally of the machine with a step by step movement in the same manner as the card carriage. This bank of solenoids 88 travels under a plurality or field of contact pins 91, the number of these pins corresponding to the number of positions in the entire field of the card to be verified. Thus there are forty-five rows of twelve each of these contact pins. This field of contact pins is mounted in a frame consisting essentially of spaced guide plates 92 and a guide plate 93 of fibre or other insulating material. Each contact pin registers with an aperture 94 in the fibre guide plate 93 through which the pin may be projected for the purpose of making a contact with a contact member yet to be referred to. Each pin is further provided with a shouldered portion 95 adapted to rest upon the uppermost guide plate 92 for the purpose of limiting its downward movement and also with a shoulder 96 adapted for engagement with a latch or keeper strip or plate 97. There is a latch strip 97 for each vertical row of contact pins 91 and each latch plate is normally urged to the right as seen for instance in Figure 14, by a spring 98. An energization of any one of the solenoids 88 causes the armature 99 thereof to be projected upwardly to thus project the corresponding contact pin beyond the upper surface of fibre plate 93. During this movement of the contact pin the inclined face 100 of the shoulder 96 thereof moves the latch plate 97 to the left and after the contact pin has been fully projected the spring 98 returns the latch plate to its normal position and the pin is held in its projected position.

If one contact pin in a vertical field has already been set up and the pin in that field is to be changed the setting up of another pin will release the previously set up contact pin because each time a contact pin is set up the latch plate is moved to the left out of engagement with the shoulder 96 whereupon the previously set up pin may drop back to its original position. Thus a contact pin which has once been set up will remain in that position until another pin is set up or until the set up pin has been positively released by a releasing mechanism yet to be referred to. If it is desired to set up for instance two contact pins in the same vertical field two of the lifter solenoids 88 can be energized simultaneously whereupon the two contact pins will be set up as will be obvious.

Associated with each vertical column of contact pins is a latch release pin 101. This is operated by a solenoid 88' similar to the lifter solenoids 88. This pin is provided with a cam surface 102 which will move the latch plate to the left as viewed in Figure 14, to release the previously set up pins in that column.

It will be understood that the field of contact pins 91 is permanently fixed within the base 10 of the machine and as mentioned hereinbefore the bank of lifter solenoids 88 is moved successively under each vertical column of these contact pins. Carried in the frame 89 above the field of contact pins are a plurality of wiper contacts 103. There are twelve of these contacts corresponding to the twelve positions of each vertical column or field and to the twelve lifter solenoids 88. Each wiper contact consists of a resilient portion 104 which is adapted to engage with one of the projected contact pins 91 and with a resilient arm 105 adapted to have a sliding contact or engagement with a longitudinally extending contact rail 106.

Each one of the twelve circuits controlled by these contact members includes a key operating solenoid 107 which has the armature 108 thereof connected to the stem of the corresponding key 70. Thus upon the completion of any one of these twelve circuits the corresponding key operating solenoid 107 is energized and the corresponding key 70 is drawn downwardly in the same manner as if depressed from above. This will operate the contacts or switches 75, 76 and 77 in the same manner as when these keys are depressed manually. If, therefore, contact pins are set up in several of the vertical columns or fields, corresponding to data common to several cards, the card carriage will be moved and the keys 70 operated and the perforations in the card verified automatically in the same manner as though the keys 70 were operated manually by the operator.

The circuits controlling the escapement mechanism, the contact lifter solenoid, and the automatic repeat mechanism, are all controlled by switch 212—213A which is automatically operated

by the error circuit relay. Thus upon the detection of an error either in the manual or automatic operation of this device, the error circuit relay is energized and this switch is opened so that neither the escapement mechanism, contact lifter mechanism, nor repeat mechanism can be further actuated. Thus the column in which the error appears can be readily located.

As was described previously a depression of any of the bank of keys 70 causes lift coil contact or switch 76 to be closed. As was also previously mentioned this is an idle movement of this switch except when repeat key 85 has been previously depressed. After the repeat key is depressed and contact 87 closed then the subsequent depression of any of the keys 70 causes the circuit to the corresponding lifter solenoid 88 to be completed through contact 76. Thus as the first of a series of cards having common data is verified the contact pins which must be set up to subsequently verify the remaining cards containing common data, will be automatically set up. Thereafter as previously mentioned the remainder of this group of cards may have the field containing common data automatically verified without further attention on the part of the operator, the machine operating automatically to verify each column step by step and the carriage moving to the left with a step by step movement as though the keys 70 were manually operated.

As was previously pointed out the contact pins 91 which were set up during the verification of the first of a group of cards having common data may be returned to normal inoperative position upon the operation of release pins 101. The circuit energizing solenoid 88' which operates the release pins 101 is controlled by reset key 108' which key is arranged adjacent the other special keys 82 and 85. This key is shown more particularly in Figure 7 and it will be noted that a depression of reset key 108 closes normally open contact or switch 109 and also closes contact 110 which operates the escapement. In this manner the vertical fields may be successively cleared of set-up contact pins 91 by repeatedly depressing reset key 108.

By reference to Figures 3 and 23 the manner in which all of the vertical fields may be simultaneously cleared manually will be made apparent. From these figures it will be noted that a clearing bar 111 is employed which extends longitudinally of the base adjacent the ends of the latch bars which protrude exteriorly of the base. This latch bar is pivotally mounted as at 112 and may be operated by means of a handle 113. A depression of handle 113 rocks the clearing bar so as to simultaneously move all of the latch strips 97 in a direction to release any set-up of contact pins 91.

In verifying the various types of cards employed in perforated card tabulating systems it is frequently advantageous to provide means whereby certain fields of the card may be automatically skipped. The necessity for skipping fields may be that with cards upon which certain classes of data is indicated it is unnecessary to utilize or verify certain fields. It might also happen that only a certain portion of the card is used. In any event in verifying machines of this character great efficiency and many advantages are obtained if means is provided whereby the fields which it is unnecessary to verify can be automatically skipped. To this end the present invention contemplates the provision of means whereby those portions of the card which need not be verified are passed over by an automatic release of the carriage when these fields are approached. To this end the carriage is provided with a skip bar hereinbefore indicated by the reference character 21. This skip bar is connected to the rack bar 20 and to the carriage by means of, for instance bolts or screws 114 whereby the same may be readily removable. By making the skip bar readily removable, bars having cam surfaces designed in accordance with the fields to be skipped may be employed. In the physical embodiment of the invention herein illustrated, and more particularly shown in Figure 9 the skip bar 21 is of relatively simple construction. This skip bar is provided with a cam surface 115 on the lower edge thereof and a cam surface 116 on the upper edge thereof. These raised or cam portions of the skip bar overlap one another slightly as shown in Figure 9. The lower cam surface 115 acts on a projection or pin 117 carried by the main pawl 43 of the escapement mechanism. The purpose of this lower cam surface 115 is to move the escapement mechanism out of engagement with the rack bar 20 upon the movement of the carriage to its extreme right hand position. The upper cam surface 116 acts to close contact or switch member 118 which initially completes a relay circuit for maintaining escapement release solenoid 55 energized. The utility of this construction is as follows: During the operation of the machine the carriage may be released by depressing release key 82. This energizes the circuit in which escapement release solenoid 55 is included which solenoid in turn withdraws the escapement mechanism from engagement with the rack bar thus permitting the carriage under the influence of its spring to move to its extreme left hand position, see Figures 2 and 3, or to the right in Figure 9. Except at the extreme right hand position of the carriage the contacts 118 are closed by upper cam surface 116 and upon a depression of release key 82 a relay circuit is completed through contacts 118 which relay circuit acts to maintain escapement release solenoid energized irrespective of whether or not release key 82 is maintained depressed. Thus a momentary depression of the release key 82 will permit the carriage to move to its extreme left hand position. When however, the carriage is moved to its extreme right hand position upper cam surface 116 is moved beyond contacts 118 and these contacts are separated thus de-energizing the relay circuit.

When the carriage is in position to bring the first column or field over the detecting plungers 60 the main pawl 42 of the escapement mechanism is in engagement with tooth 20a of rack 20 (see Figures 9 and 10). However it is desirable to move the carriage beyond this position so as to insure the engagement of the card knife behind the edge of the lowermost card. It is for this purpose that the lower cam surface 115 is employed. It will be seen that as the carriage is moved to its extreme right hand position lower cam surface 115 engages pin 117 of the escapement mechanism and thus moves this escapement mechanism from engagement with the rack bar. When the handle 40 by which the carriage has been moved to its right hand position is released, the carriage will then move several tooth spaces to the left until pin 117 rides off of lower cam surface 115 whereupon the main pawl 42 of the escapement mechanism will come into engagement with tooth 20a and the card will then

be positioned with the first field in registration with the detecting plungers 60.

It will be obvious that by providing as many lower cam surfaces 115 as are necessary in accordance with the character or type of the card being verified those fields or groups of fields which it is unnecessary to verify may be automatically skipped. By making the skip or cam bar readily removable bars having the cam surfaces thereof constructed in accordance with the various stacks of cards being verified may be quickly and easily substituted.

Means is provided for automatically guiding the card after it passes the verifying or detecting plungers 60 and for subsequently releasing the card, after the completion of the verifying operations and for depositing it in the receptacle or drawer 15. For this purpose I provide a pair of grooved guide ways 119 which are so mounted as to be capable of movement toward and away from one another. Each card guide 119 is controlled by a pair of solenoids 120. These solenoids are connected in series and controlled by a contact or switch member 121 arranged adjacent the left hand end of the machine. The left hand arm 23 of the card carriage hereinbefore referred to is provided with a lug or projection 122 preferably of insulating material, which, when the carriage reaches its extreme left hand position, engages contacts 121 to close the same.

This simultaneously energizes solenoids 120 which act to move the guideways 119 away from one another. This permits the card carried thereby to be deposited in the drawer 15. Just prior to the engagement of lug 122 with contact member 121 the short end of arm 23 beyond pivot point 28 engages a stop or abutment 123 which swings the arm 123 about its pivot to disengage the slotted portion 39 from the left hand end of the card. Consequently when the solenoids 120 are energized a card may drop freely into the drawer 15 therebelow.

In Figures 24 and 25 a modified form of card holding mechanism is illustrated. In this form of construction the left hand card arm 23, the card guides 119, the solenoids 120 and consequently the switch 121 are dispensed with. In this modified form of construction a lower support 124 for the card is provided which support extends under the block 67 hereinbefore referred to. The edge of this support 124 is scalloped or cut away to form a plurality of fingers 125 which extend between the series of detecting plungers 60. Cooperating with the lower support 124 is a resilient spring member 126 which may be conveniently secured to the upper surface of bar 67 and will extend downwardly and exert a slight pressure upon the upper face of the card C. This pressure will be sufficient to maintain the card in engagement with the lower support 124 until after the last column to be verified has been moved past the verifying plungers 60. After this the card will drop by gravity into the drawer 15.

As was previously mentioned dual cards must be verified face up as the data is written across the face thereof while transcript cards are preferably verified face down because it is customary for the operator to turn these cards face down as they come from the perforating machine, so as to keep them in the order of the written data. As was also heretofore mentioned it has been impossible prior to this invention, to verify cards both face upwards and face downwards in the same machine. The reason for this is obvious. When the cards are verified face upwards each vertical field starts at the top of the card and extends downwardly toward the lower edge thereof whereas when the card is turned face downward the sequence of the vertical field is reversed and what was the top of the vertical field is now the bottom of the vertical field and vice versa. As a consequence the circuits corresponding to the several numerals or positions of each vertical field must be reversed if the keys 70 are to be operated in the customary manner. In accordance with the present invention means is provided for quickly reversing the sequence of the twelve main circuits and by reference to Figures 19 and 20 the manner in which this is accomplished will be made more apparent. This reversing device consists of an outer circular shaped member or drum 127 provided with a plurality, in the present instance twenty-three, contacts 128. Rotatively arranged interiorly of this drum 127 is a contact disc 129 provided with a plurality, in the present instance, twelve contacts 130. A handle 131 is provided for rotating contact disc 129. Ordinarily when verifying dual cards face upwards contact disc 129 is in the position wherein contact number "12" thereof is in engagement with contact number "12" of the outer drum 127. Under these conditions the twelve main circuits controlled by the main keys are normal so that a depression of for instance "No. 1" key operates "No. 1" circuit of the twelve main circuits. When however transcript cards or other cards which must be verified face downwards are being passed through the machine handle 131 is operated to rotate contact disc through approximately 180 degrees thereby positioning contact number "12" of disc 129 opposite contact number "9" of the outer drum member; contact number "11" of the disc opposite contact number "8" of the outer drum member, etc. This reverses the sequence of the twelve main circuits so that the main key board 70 may be operated in the customary manner and the perforations in the various positions of each field correctly verified.

In general the operation of the herein described device is as follows:

A stack of cards to be verified is placed in the card hopper defined by the uprights 33 and throat block 69. These cards may be placed in the hopper either face upwards or face downwards and the sequence of the twelve main circuits of the device adjusted in accordance therewith by a proper manipulation of the circuit reversing device 127. The card carriage which is normally in its extreme left hand position is moved to its extreme right hand position whereupon the card knife 35 is moved beyond the edge of the lowermost card of the stack. As the card carriage approaches its extreme right hand position pin 117 carried by the escapement mechanism engages lower cam 115 of skip bar 21 to maintain the escapement disengaged from the rack 20. It will be remembered that during the greater part of the travel of the card carriage toward the right the escapement has been maintained disengaged by the escapement release solenoid 55 which is kept energized by the relay circuit closed in part through skip bar controlled contacts 118. When the carriage is released it shuttles back towards the left until the pin 117 of the escapement mechanism rides off lower cam 115 whereupon the escapement mechanism engages for instance tooth 20a of rack bar 20. In the meantime the card knife 35 has engaged the right hand edge of the lowermost card of the stack and has moved this card to a position where the first column to

be verified registers with the detecting or verifying plungers 60. In the meantime upper cam 116 of the skipper bar has again closed contacts 118 initially controlling the relay circuit designed to maintain escapement release solenoid 55 energized should this escapement release solenoid be energized by the normal depression of release key 82.

As the first column to be verified comes into registration with the verifying plunger 60 the imperforate portions of the card depress the plungers 60 thus opening the corresponding initial error circuit contacts 66. However, if a perforation is present, one of the plungers 60 will have entered this perforation in this column and the corresponding initial error circuit contact 66 will be closed. The operator then depresses one of the keys 70. This opens the corresponding normally closed error circuit 75 and successively closes lift coil circuit contact 76 and escapement contact 77. The closing of contact 77 energizes escapement solenoid 50 to operate the escapement and permit the carriage to move one tooth space to the left thus presenting the next vertical column to the verifying plunger 60. Upon energization of escapement solenoid 50 the armature 58 thereof moves outwardly to close delay error circuit contact 59. If it be assumed that the proper key 70 was depressed the error circuit is not successfully closed because of the previous opening of normally closed error circuit contact 75. The error circuit is completed only when an initial error circuit contact 66, the corresponding normally closed error circuit contact 75 and the common delayed error circuit contact 59 are closed. If, however, the perforation detected by plungers 60 is incorrect or an incorrect key 70 has been depressed or there are two perforations in that particular vertical column when there should have been but one, the error circuit will be completed through one of the twelve main circuits. This energizes error circuit relay 80 which controls the signal lamp circuit which is then energized thus illuminating signal 81. As previously pointed out, the energization of the error circuit relay 80 separates a pair of contacts included in the escapement circuit, and also the repeat circuit so that in case an error is detected the further operation of the machine is interrupted. This circuit remains closed and the signal lamp 81 remains illuminated until a depression of release key 82. A depression of this key opens normally closed contact 83 in the relay circuit thus de-energizing the relay and closes contact 84 which energizes escapement release solenoid 55 whereupon the carriage returns to the left to release the card for correction.

If in verifying the stack of cards it is found, from the record from which verification is made that there is a group of cards having common data the repeat mechanism is brought into operation so that this data common to the several cards need not be individually manually verified thereon. To this end repeat key 85 is depressed prior to the verification of the common data on the first card. Repeat key 85 is provided with a shoulder whereby the same may be held depressed. A depression of this key closes contact 87 which initially completes the lifter solenoid circuit controlling the energization of lifter solenoids 88. It will be understood that this bank of solenoids travels under the field of contact pins 91, there being thirteen of these lifter solenoids one for each of the positions of the vertical field and one for the reset pin. Thereafter when the data common to the group of cards is being verified on the first of this group, the depression of any of the keys 70 causes, by the closing of the lift coil circuit contact 76, an energization of the solenoid 88 corresponding to that particular key. Upon energization of any of the solenoids 88 the armature 99 thereof moves upwardly and projects the corresponding contact pin 91 above the upper surface of fibre 93 or in other words sets the corresponding contact pin. These pins are maintained in projected or set position by means of the latch plates 97. When the field or fields on the first card have been verified, which are common to the group of cards and it is no longer desired to set up any of the contact pins 91, repeat key 85 is disengaged and permitted to resume its normal position. Thereafter a depression of any of the keys 70 in the normal verification of the cards does not set up any of the contact pins 91 because the initial contact 87 is open and the closing of contacts 76 is an idle operation.

If, for instance, the data set up in the field entitled "Account or Work—Order No." as shown on the card illustrated in Figure 21 is common to a number of cards, contact pins corresponding to this data will be set up in the corresponding vertical columns in the bank of contact pins 91. Thereafter as the first column of this field of each card approaches the verifying plungers the circuits to the corresponding key operating solenoids 107 will be energized by engagement of the contact wipers 103 which will cause the corresponding keys 70 to be drawn downwardly by solenoids 107 in accordance with the contact pins 91 which were previously set up. This movement of the keys 70 rocks the corresponding levers 71 and operates the contacts 75, 76 and 77 in the same manner as though the keys were manually depressed by the operator. Simultaneously the verifying plungers 60 are functioning to detect any perforations in each column and should an error occur in any of the perforations the error signal circuit will be completed in the same manner as previously described. The automatic verification of each card will continue to the extent to which the contact pins 91 have been set up whereupon the automatic verification will cease and the remainder of the card, if such there be, may be verified by a manual depression of the proper keys.

A contact pin set up in any vertical column will be released by the setting up of another contact pin in the same column or may be released by the energization of solenoid 88' which will operate the release pin 101 of the vertical column with which it registers. This solenoid is energized by a depression of reset key 108' which closes contact 109 completing the circuit to solenoid 88' and also closes contact 110 completing the circuit to the escapement solenoid 50. Thus the contact pins set up in successive vertical columns may be released by the repeated depression of reset key 108 or all of the latch plates may be simultaneously released by operating reset bar 111 through handle 113.

The operation of the escapement mechanism will probably be best understood by an examination and comparison of Figures 10, 11 and 12. In Figure 10 the escapement mechanism is in its normal position while in Figure 11 escapement release solenoid 55 has been energized to withdraw the escapement mechanism from engagement with rack 20 whereupon the carriage will move to its extreme left hand position permit-

ting a release of the card for correction or removal. As was previously mentioned escapement release solenoid 55 is energized by a depression of release key 82 and inasmuch as contacts 118 are normally maintained closed by the upper cam 116 of skip bar 21 a relay circuit which is initially closed by these contacts is completely energized by depression of release key 82 and maintains solenoid 55 energized until the carriage has been returned to its extreme right hand position wherein upper cam portion 116 permits an opening of contacts 118 thus breaking the relay circuit. In Figure 12 the carriage is shown in its extreme right hand position wherein the escapement mechanism is maintained out of contact with the rack by reason of the engagement of pin 117 with lower cam 115 of the skip bar.

After the complete verification of a card the carriage approaches its extreme left hand position wherein projection 122 causes contacts 121 to close thus energizing solenoids 120 which spread the track guides 119 to permit the card to drop into the receptacle 15.

In the foregoing description, the terms "initially control" and "initially completes" are used in designating the action of contacts and switches in the several circuits which, when closed, partially complete the circuits in which they are located and thus start the completion of these circuits.

By reference to Figure 22 the several circuits involved in this device will be explained. For example, let it be assumed that one of the contacts 66 is closed by reason of the corresponding plunger 60 entering a perforation and that the perforation is incorrect so that a depression of keys 70 does not open normally closed error circuit contact 75. Under these conditions the error circuit will be closed as follows: From the positive side of the source of power through wire 200 to point 201, through contact 66, wire 202, to circuit reversing device and on through wire 202, through normally closed contact 75, which it will be remembered was not opened by key 70, thence through wire 203, through contact 59 which has been closed by the energization of escapement solenoid 50, thence through wire 204 and through coil 205 of relay 80, thence through wire 206 and signal light 81 to point 207 and then out through wire 208 to the negative side of the source of power. This energizes relay 80 to maintain signal lamp 81, illuminated. The energization of relay 80 closes the relay circuit which maintains signal lamp bulb illuminated until the relay circuit is broken. The circuit closed by the energization of the relay is as follows: From the positive side of the source of current through wire 200 to point 209, thence through wire 210 to contact 211, thence through the armature 213 of the relay and through wire 214 and across normally closed switch 83, then through wire 219 to point 220, through wire 221, back through the coil 205 of the relay, thence through wire 206 and signal lamp 81, and on through wire 225 to point 207, and through wire 208 to the negative side of the source of current. The signal lamp remains illuminated until key 82 is depressed which breaks the relay circuit by opening normally closed contacts 83.

Upon depression of key 70 the escapement solenoid 50 is energized by the closing of contact 77, the following circuit being thus energized. From the positive side of the source of current from wire 200, to point 241, thence through wire 242 to contact 212 associated with relay 80, thence through contact 213A carried by the armature 213 of the relay and through wire 300 to point 301, thence through wire 310 and through the coil of escapement solenoid 50, through wire 222 and across closed escapement contact 77, then through wire 223 to point 224, through wire 225 to point 207, and out through wire 208 to the negative side of the source of current. It will be noted that in the event the relay 80 has been energized and armature 213 thus moved, the escapement solenoid circuit will be broken as the contacts 212—213A will be separated. Thus if an error has been detected which is the occasion when the relay 80 is energized, the escapement mechanism cannot be further operated until cognizance of the error has been taken by the energization of the relay error circuit and as a consequence the further operation of the card carriage will be interrupted and the column in which the error is present may be readily detected.

Upon depression of release key 82 the relay circuit controlling the signal lamp 81 is not only de-energized by opening contacts 83 but the carriage release solenoid 55 is energized by the closing of contacts 84. The circuit energized by the closing of contacts 84 is as follows: From the positive side of the source of current through wire 200 to point 226, thence through wire 227 to point 217, thence through wire 218 across closed contacts 84, thence through wire 228 through the coil 229 of relay 230 to point 231, thence through wire 232 and through wire 208 to the negative side of the source of current. This energizes the relay circuit by means of which the escapement release solenoid is maintained energized. The circuit maintained by the relay 230 is as follows: From the positive side of the source of current through wire 200 to point 226, thence through wire 227 to point 217, then through wire 233 and through relay 230, to point 302, then through wire 237 and through closed contact 118, through wire 236 through the coil of escapement release solenoid 55, then through wire 235 and through coil 229 of the relay 230, and thence through wire 232 and wire 208 to the negative side of the source of current. It will be understood that the contacts 118 are maintained closed by the upper cam surface 116 of skip bar 21 during the greater portion of the movement of the carriage so that except when the carriage is in its extreme right-hand position the contacts 118 are maintained closed. Consequently the normal closing of contacts 84 by depression of carriage release key 82 energizes relay circuit which maintains the escapement release solenoid 55 energized until the carriage is returned to its extreme right-hand position, and the contacts 118 thus permitted to open because the lower contact slides off the upper cam surface 116. However, when this occurs the relay circuit just described is de-energized.

When it is desired to set up contact pins 91 prior to the commencement of the automatic verification, repeat key 85 is depressed and held depressed by the engagement of shoulder 86 with the edge of the housing, the depression of this key closing contact 87. When thereafter any of the keys 70 are depressed the corresponding lift coil circuit contact 76 is closed and the following circuit is energized. From the positive side of the source of current through wire 200 to 241, then through wire 242 and across closed contacts 212—213A, then through wire 300 to point 301, and through wire 303 across closed contacts 87, and thence through wire 239 through the coil of contact lifter solenoid 88 then through wire 240 and

across closed contacts 76, thence through wire 223 to point 224, and through wire 225 and wire 208 back to the negative side of the source of current. As previously mentioned, the energization of any of the lifter solenoids 88 causes the armatures thereof to move so as to set up corresponding contact pins 91. Inasmuch as this circuit includes the normally closed contacts 212—213A which are opened by the energization of the error relay circuit, the energization of this circuit upon the detection of an error will render the circuit through the contact lifter solenoids inoperative.

With the contact pins 91 set up for the automatic verifying operation, circuits to the corresponding key operating solenoids 107 are energized as the wiper contacts 103 come in contact with the set up pins 91. The circuit to each key operating solenoid is as follows: From the positive side of the source of current through wire 200 to point 241, thence through wire 242 across closed contacts 212—213A, thence through wire 300 to point 301, then to point 305, and through wire 242 to the coil of key operating solenoid 107, thence through wire 243 and rail 106, then through wiper contact 103 and the set up contact pin 91, then through wire 244 to point 245, and then through wire 246 to point 224, and through wire 225 to point 207, and through wire 208 to the negative side of the source of current. The energization of key operating solenoid 107 pulls the corresponding key downwardly as though depressed from above and operates contacts 75, 76 and 77 in the same manner as when the keys 70 are manually depressed. Thus the escapement mechanism is operated and the fields to be verified are successively presented to the detecting plungers 60. It will also be seen that this circuit includes contacts 212—213A which are operated when the error relay is energized so that in the event this has occurred by reason of the detection of an error, the automatic operation of the machine is interrupted so as to enable the vertical column in which the error exists to be readily located.

When it is desired to release the contact pins 91, the resetting pin 101 controlling the latch strip 97 is operated by energizing reset solenoid 88'. This is accomplished by depressing reset key 108' which closes contacts 109 controlling the circuit to solenoid 88' and contact 110 controlling the escapement mechanism. The first circuit energized, that is to the reset solenoid 88', is from the positive side of the source of current through wire 200 to point 241, through wire 242 and across closed contacts 212—213A, then through wire 300 and 303 and across closed contacts 87. It should be understood that the repeat key controlling these contacts, is kept depressed during the resetting of the contact pins 91. From closed contact 87 the circuit continues through wire 239 to point 247, thence through the coil of reset solenoid 88', through wire 248, across closed contact 109, thence through wire 249 to point 250, thence through wire 223 and 246 to point 224, thence through wire 225 and through wire 208 to the negative side of the source of current. The escapement solenoid circuit closed by contacts 110 is from the positive side of the source of current through wire 200 to point 241, thence through wire 242 across closed contacts 212—213A, through wire 300 to point 301, thence through wire 310 and through the coil of escapement solenoid 50, then through wire 251, across closed contacts 110, then through wire 249 to point 250, and through wires 223, 246, 225 and 208, to the negative side of the source of current.

When the carriage reaches its extreme left-hand position and closes contact 121 the four solenoids 120 controlling the card guide tracks are energized, the circuit being as follows: From the positive side of the source of current through wire 200, wire 252, through the solenoids 120 connected in series, through closed contact 121 and through the other two solenoids and thence to point 207 and through wire 208 to the negative side of the source of current.

From the foregoing it is believed that the construction and operation of the herein described device will be readily apparent to those skilled in this art. The construction and relation of parts of the physical embodiment of the invention herein described in detail and the arrangement of the several electrical circuits employed are considered as satisfactory and proper expedients for carrying into execution the objects of the present invention. It is obvious, however, that many of the essential and all of the non-essential details of this invention may be altered without departing from the spirit and scope thereof and to this end reservation is made to make such changes as may come within the purview of the accompanying claims.

What I claim as my invention is:

1. In a verifier, means for advancing a perforated sheet, a signal circuit, perforation detecting means for initially closing said circuit, key operated means for further controlling said circuit and means operated in delayed sequence by said sheet advancing means for completing the control of said circuit.

2. In a verifier, means for advancing a perforated sheet, a signal, perforation detecting means for initially controlling said signal, key operated means for further controlling said signal and means actuated in delayed sequence by said sheet advancing means for completing the control of said signal.

3. In an error indicator, means for advancing a perforated sheet, an error signal circuit, means engageable in the perforations of said sheet for use in verifying the accuracy of the same, said error signal circuit including a switch operated by said means for partially controlling said signal circuit, a switch actuated by said sheet advancing means for further controlling said signal circuit and a key actuated switch for nullifying the action of said two first mentioned switches, as and for the purpose set forth.

4. In an error indicator, means for advancing a perforated sheet, a signal, means normally restrained by the imperforate portion of the sheet and operable by the presence of a perforation for initiating the operation of said signal, means controlled by said sheet advancing means for jointly controlling the operation of said signal and other means for completing the control of said signal.

5. In an error indicator, means for advancing a perforated sheet, a signal, means normally restrained by the imperforate portion of the sheet and operable by the presence of a perforation for initiating the operation of said signal, means controlled by said sheet advancing means and actuated in delayed sequence for jointly controlling the operation of said signal and other means operable in accordance with the correct position of the perforations for completing the control of said signal.

6. In an error indicator, means for advancing a perforated sheet, a signal, means normally re-

strained by the imperforate portion of the sheet and operable by the presence of a perforation for initiating the operation of said signal, means controlled by said sheet advancing means and actuated in delayed sequence for jointly controlling the operation of said signal and key actuated means for completing the control of said signal.

7. In a device for verifying the accuracy of perforations in a perforated sheet, perforation detecting means, means for presenting the sheet to said detecting means, a signal, means operable in delayed sequence and controlled jointly by said detecting means and said sheet advancing means for partially controlling said signal and means operable intermediate the action of said jointly acting means for completing the control of said signal.

8. In a device for verifying the accuracy of perforations in a perforated sheet, perforation detecting means, means for presenting the sheet to said detecting means, a signal circuit, means acting in delayed sequence and controlled initially by said detecting means and subsequently by said sheet advancing means for initially energizing said signal circuit and means acting intermediate said initially and subsequently acting means for further controlling said signal circuit.

9. In a verifying machine, the combination with means for advancing a perforated sheet, of means for verifying the accuracy of the perforations including verifier keys, a field of contact members, means for setting up selected contact members in said field for initially establishing electric circuits, key operating solenoids controlled by said circuits and means for successively completing said circuits to selectively energize said solenoids whereby said keys are actuated in predetermined sequence.

10. In a verifying machine, the combination with means for advancing a perforated sheet, of a perforation detector means, an error signal circuit, including a switch actuated by said perforation detector and adapted to be closed when said detector engages a perforation, an escapement mechanism controlling said sheet advancing means, a switch also included in said signal circuit and actuated by said escapement mechanism, a verifying key and a normally closed switch in said signal circuit adapted to be opened upon the operation of said key, as and for the purpose described.

11. In a verifying machine, the combination with means for advancing a perforated sheet, of a plurality of perforation detectors, an error signal circuit, a plurality of switches each in a respective parallel branch of said signal circuit controlled by said perforation detectors and adapted to be closed when the corresponding detectors engage perforations, each of said parallel branches also including a normally closed switch, a corresponding number of verifying keys, said last named switches and verifying keys being remote from said perforation detectors, and means actuated by a depression of any of said verifying keys for opening the corresponding normally closed switch whereby the closing of a detector actuated switch is nullified if the perforation detected corresponds to the verifying key depressed.

12. In a verifying machine, the combination with means for advancing a perforated sheet including an escapement mechanism, of perforation detectors, an error signal circuit, a plurality of switches each in a respective parallel branch of said signal circuit corresponding to the number of perforation detectors, said switches being controlled by said perforation detectors and adapted to be closed as the perforation detectors engage perforations, a normally open escapement actuated switch also in said circuit and acting in delayed sequence with respect to the said first mentioned switches, each of said parallel branches also including a normally closed switch, a corresponding number of verifier keys and means actuated upon a depression of each key for opening the corresponding normally closed switch whereby the closing of said detector operated and escapement actuated switches will be nullified if the key depressed corresponds to the perforation engaged by the perforation detector.

13. A verifying machine substantially comprising in combination, means for advancing a perforated sheet, means for verifying the accuracy of the perforations including key operated means and means for automatically actuating said keys in predetermined sequence including a plurality of contact members, electrically actuated means for automatically rendering operative selected contact members, electrically operated means associated with each of said keys for actuating the same and means actuated in dependence upon the movement of said sheet advancing means for successively engaging said operative contact members to selectively energize said key actuating means, as and for the purpose set forth.

14. A verifying machine substantially comprising in combination, means for advancing a perforated sheet, means for verifying the accuracy of the perforations including verifying keys and means for automatically actuating said keys in predetermined sequence including a field of contact members movable to operative and inoperative positions and corresponding in number to the positions on the sheet to be verified, means for moving said contact members including a bank of solenoids, and means for energizing said solenoids to render operative selected contact members, a key actuating solenoid associated with each verifier key, and circuit closing means adapted to be moved across said field of contact members in dependence upon the movement of said sheet advancing means and adapted to successively engage said operative contact members to selectively energize said key operating solenoids.

15. A verifying machine substantially comprising in combination, means for advancing a perforated sheet, means for verifying the accuracy of the perforations therein including normally manually operated verifier keys and means for automatically actuating said keys including a group of contact members movable to operative and inoperative positions and corresponding in number to the number of positions on the sheet to be verified, means for moving said contact members including a bank of solenoids corresponding in number to the number of positions in one vertical field of the sheet, means for moving said bank of solenoids successively in alignment with each vertical field of the group of contact members, means for selectively energizing said solenoids to render operative selected contact members, a key actuating solenoid associated with each verifier key and a bank of circuit closers corresponding in number to the number of positions in each vertical field and adapted to be successively brought into engagement with the operative contact members for successively completing circuits to said key actuating sole-

noids, whereby said keys may be automatically actuated in accordance with said operative contact members.

16. A verifying machine substantially comprising in combination, means for advancing a perforated sheet, means for verifying the accuracy of the perforations therein including normally manually operated verifier keys and means for automatically actuating said keys including a group of contact members movable to operative and inoperative positions and corresponding in number to the number of positions on the sheet to be verified, means for moving said contact members including a bank of solenoids corresponding in number to the number of positions in one vertical field of the sheet, means for moving said bank of solenoids successively in alignment with each vertical field of the group of contact members, means for selectively energizing said solenoids to render operative selected contact members including a repeat key initially closing a circuit including said solenoids and other switches in said circuit controlling respectively said solenoids, said switches being operable by said verifier keys, a key actuated solenoid associated with each verifier key and a bank of circuit closers corresponding in number to the number of positions in each vertical field and adapted to be successively brought into engagement with the operative contact members for successively completing circuits to said key actuating solenoids, whereby said verifier keys may be automatically actuated in predetermined sequence in accordance with the circuits controlled by said operative contact members.

17. In a verifying machine, the combination with means for advancing a perforated sheet, of means for verifying the accuracy of the perforations including key operated means, means for setting up a plurality of contact members to initially establish a plurality of electric circuits, key operating means included in said circuits, means for successively completing said circuits to automatically actuate said keys in predetermined sequence and means for rendering inoperative the set-up contact members.

18. In a verifying machine, the combination with means for advancing a perforated sheet, of means for verifying the accuracy of the perforations including key operated means, means for setting up a plurality of contact members to initially establish a plurality of electric circuits, key operating means included in said circuits, means for successively completing said circuits to automatically actuate said keys in predetermined sequence, a reset key and electric circuits controlled thereby whereby the set-up contacts may be successively rendered inoperative.

19. In a verifying machine, the combination with means for advancing a perforated sheet, of means for verifying the accuracy of the perforations including key operated means, means for setting up a plurality of contact members to initially establish a plurality of electric circuits, key operating means included in said circuits, means for successively completing said circuits to automatically actuate said keys in predetermined sequence, a reset key, said advancing means including an escapement circuit, a reset circuit controlled by said key and including switches for closing said circuits.

20. In an error indicator, means for advancing a perforated sheet including an escapement mechanism, means for verifying the accuracy of the perforations including an error signal circuit, a relay circuit for maintaining said error signal circuit energized, an escapement release mechanism, a switch controlling said escapement release mechanism, a switch controlling said relay circuit and a carriage release key for actuating said switches whereby said escapement may be released and said error signal circuit de-energized.

21. In a verifying machine of the character described, means for advancing a perforated sheet including a carriage, means for verifying the accuracy of the perforations, and means actuated by said carriage for automatically releasing said sheet at the completion of its advancing movement.

22. In a verifying machine of the class described, a carriage for advancing a perforated sheet, means for verifying the accuracy of the perforations in said sheet, means for receiving and guiding the sheet after it passes said verifying means and means actuated by said carriage in one of its extreme positions for causing said sheet guiding and receiving means to release the sheet.

23. In a verifying machine, means for advancing a perforated sheet including a carriage, means for verifying the accuracy of the perforations in said sheet, card receiving guides, electrical devices for moving said guides, a switch controlling a circuit including said electrical devices and means actuated by said carriage for closing said switch whereby said card receiving guides will be actuated to release said card.

24. In a verifying machine, the combination with means including a carriage for advancing a perforated sheet and means for verifying the accuracy of the perforations in said sheet, of resilient means for frictionally engaging said sheet to guide and present the same to said verifying means until the completion of the advancing movement.

25. In a device for verifying the accuracy of perforations in a perforated sheet, the combination with verifying means, of means for advancing the sheet including a pair of spaced arms engageable with the edges of the sheet and means for automatically separating said arms to release the sheet at the completion of the advancing movement.

26. In a record card working machine, means for verifying the accuracy of the perforations in a perforated sheet including perforation detecting means, an error signal circuit controlled thereby, means for automatically operating said verifying means including a repeat circuit, and means actuated upon the energization of said error signal circuit for rendering inoperative said repeat circuit.

27. In a record card machine, means for advancing a card including a carriage, card receiving guides, electrical devices for moving said guides, a switch controlling a circuit including said electrical devices and means actuated by said carriage for closing said switch whereby said card receiving guides will be actuated to release said card.

28. A record sheet working machine substantially comprising in combination, means for advancing a record sheet, work keys, and means for automatically actuating said keys in predetermined sequence including a plurality of contact members movable to operative and inoperative positions, electrically actuated means for automatically moving selected contact members

to operative position, electrically operated means associated with each of said keys for actuating the same, and means actuated in dependence upon the movement of said sheet advancing means for successively engaging said operative contact members to selectively energize said key actuating means.

29. In a record sheet working machine, the combination with means for advancing a record sheet, of work performing means including key-operated means, a plurality of contacting members movable to operative and inoperative positions, means for setting up said contact members to initially establish a plurality of electric circuits, key operating means included in said circuits, means for completing said circuits to automatically actuate said keys, and electrically actuated means for selectively rendering inoperative said set-up contact members.

30. In a record card machine, a card carriage, an escapement mechanism therefor, means including a skip bar movable with said carriage for initiating the release of said escapement mechanism, and release key actuated means for completing the release of said escapement mechanism.

31. A record card machine having in combination a movable card carriage, an escapement mechanism therefor, a skip bar movable with said carriage, and mechanical and electrical means actuated by said skip bar, said mechanical and electrical means being adapted to supplant each other in controlling said escapement mechanism during the travel of said card carriage.

32. In a record card machine, a card carriage including spaced card engaging means, and means operative by movement of said carriage to a predetermined position for separating said card engaging means to release said card.

33. In a record card machine, a carriage for moving a multi-field record card, an escapement mechanism for controlling the movement of said carriage, a skip bar movable with said carriage and provided with cam surfaces on two faces thereof and electrical and mechanical means controlled respectively by said cam surfaces and operative upon movement of said carriage to control said escapement mechanism, for the purpose set forth.

34. In a record card working machine, a card carriage, a card receptacle, means for horizontally receiving said card from said carriage, means for depositing said card in said receptacle, and means controlled by said carriage for actuating said last-named means.

35. In a record card working machine for cards having fields in which the positions are arranged in predetermined sequence, a plurality of corresponding circuits, and means for altering the sequence of said circuits to correspond to the positions with the card in inverted position.

36. In a record card working machine for record cards having a plurality of columnar fields with a plurality of positions arranged in sequence from top to bottom, a plurality of circuits corresponding in number and sequence to the positions of a field, and means for reversing the sequence of said circuits to correspond to the sequence of the positions in a field when the card is worked in an inverted position.

37. In a record sheet working machine, an escapement mechanism including a circuit, means for setting up a plurality of contacts including a circuit, key operating means including a circuit, a signal circuit, and means operated upon an energization of said signal circuit for rendering said first three circuits inoperative.

38. In a machine of the class described, a signal circuit including a relay energized upon the occurrence of an error in the sheet being worked upon, an escapement circuit controlling a sheet carriage, a contact lifter circuit controlling means for setting up contacts to form a pattern, a key-operating circuit controlling work key operating means, and a switch means common to said escapement circuit, contact lifter circuit and key-operating circuit, said switch means being operated upon an energization of said signal circuit relay to break said three circuits.

39. In a verifying machine of the class described, an error signal circuit, a key operating circuit, and means operated upon an energization of said signal circuit for rendering said key operating circuit inoperative.

40. In a record sheet working machine, a plurality of normally manually operated keys, a contact lifter circuit common to all of said keys, a repeat key operable to initially partially establish said circuit, a plurality of individual contact lifter sub-circuits including contact lifters electrically connected to said first circuit, a plurality of contact members movable to operative position by said contact lifters, and means operated by said first-mentioned keys for respectively completing said sub-circuits to actuate said contact lifters.

41. In a record sheet working machine, an escapement mechanism including an operating circuit, a plurality of contact members, means for selectively setting-up said contact members, a reset key and means controlled thereby for actuating said escapement mechanism and rendering inoperative said set-up contact members.

42. In a record sheet working machine, a sheet carriage having means normally urging the same in one direction, an escapement mechanism for said carriage, electrical means for controlling said escapement mechanism, said means including a switch for initially establishing a relay circuit, a skip-bar movable with said carriage, means on said skip-bar for maintaining said switch closed during a portion of the movement of said carriage, means on said skip-bar for mechanically controlling said escapement mechanism during a portion of the movement of said carriage, and a carriage release key for completing said initially established circuit for electrically controlling said escapement mechanism.

43. In a record card machine, perforation detecting means, an escapement mechanism, error indicating means including means operated in delayed sequence to said detecting means by said escapement mechanism and means for rendering inoperative said escapement mechanism upon actuation of said error indicating means.

44. A perforated record verifying machine comprising settable mechanism with means for setting the same to represent a pattern conforming to the location of perforations on records, means for automatically actuating said mechanism to compare the perforations on records to be verified with the pattern formed by said settable mechanism and means for indicating a disagreement between the perforations of a record being verified and the pattern formed by the setting of said mechanism.

45. A perforated record verifying machine, comprising record analyzing mechanism, means for feeding a series of records one by one to the analyzing mechanism, settable means controlled

by the analyzing mechanism for effecting a set up corresponding to the first record in the series, means for maintaining the said set up during the feeding of records which agree or disagree with the set up, and means controlled conjointly by the analyzing means and the settable mechanism for comparing the perforations of each record after the first with the set up effected by the first record.

46. A perforated record verifying machine comprising settable mechanism with means for setting the same to represent a pattern with which the perforations on inserted records should conform, means for automatically comparing the perforations on portions of inserted records with corresponding portions of the pattern, manipulatable means for manually verifying other portions of the records, selective means for determining which portions of the records shall be automatically compared and means for indicating a disagreement between the perforated record and the pattern.

47. A perforated record verifying machine comprising settable mechanism comprising members settable selectively partly under control of a master record to form a pattern to which perforations in certain portions of an inserted record should conform, means for automatically comparing the corresponding portions of an inserted record with said pattern, manipulative means for manually verifying other portions of said record selectable according to the will of the operator, and means for indicating a disagreement between the perforated record and the pattern.

48. A perforated record verifying machine comprising record analyzing mechanism, means for feeding a series of records one by one to the analyzing mechanism, key means, means controlled by the analyzing mechanism and said key means for effecting a set up corresponding to certain portions of the first record of the series, means for maintaining the set up during feeding of the following records, means controlled conjointly by the analyzing mechanism and the settable mechanism for comparing the perforations in corresponding portions of each record after the first with the set up effected by the first record and manipulative means for manually verifying other portions of said records.

49. In a verifying machine, the combination with means for advancing a perforated sheet, of a signal circuit, perforation detecting means, switch means controlled by said perforation detecting means for initially completing said signal circuit, a keyboard, and switch means adjacent to and controlled by said keyboard for opening said signal circuit if initially completed by reason of an accurate perforation.

50. In a verifying machine, means for advancing a perforated sheet, a signal circuit, perforation detecting means, switch means controlled by said perforation detecting means for initially completing said signal circuit, manually operated keys remote from said perforation detecting means, and switch means adjacent to and controlled by said manually operated keys for nullifying the action of said first mentioned switch means when said perforation detecting means engages a correct perforation.

51. In a device for verifying the accuracy of perforations in a perforated sheet arranged in a plurality of fields, sheet advancing means including a carriage, a rack associated with said carriage, an escapement mechanism including a pair of pallets alternately engaging said rack for controlling the movement of said carriage, and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism and provided with cam surfaces acting to bodily move said escapement mechanism to automatically disengage the same from said rack during the travel of said carriage.

52. In a record card machine, a card carriage, a rack associated with said carriage, an escapement mechanism engaging said rack for controlling the movement of said carriage, means for mounting a part of said escapement mechanism for movement toward and away from said rack in the vertical longitudinal plane of the rack, and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism and provided with cam surfaces engageable with the movable part of said escapement mechanism during the travel of said carriage to bodily move said escapement mechanism from said rack.

53. In a record card machine, a card carriage, a rack associated with said carriage, an escapement mechanism having portions alternately engaging said rack for controlling the movement of said carriage, said escapement mechanism being mounted for movement toward and away from said rack in the vertical longitudinal plane of said rack and having a cam follower, and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism, said skip bar being provided with cam surfaces arranged in the same longitudinal plane and acting upon said cam follower during the travel of said carriage to engage said escapement mechanism to move the same away from said rack and out of engagement therewith.

54. In a record card machine, a card carriage, a rack fixed to said carriage, an escapement mechanism engaging said rack for controlling the movement of said carriage, said escapement mechanism being mounted for movement toward and away from said rack, means for actuating said escapement mechanism to cause said carriage to advance with a step-by-step movement, means for moving said escapement mechanism away from said rack and for holding the same out of engagement therewith, said means including a skip bar movable with said carriage and provided with cam surfaces arranged in the same longitudinal plane and engageable with said escapement mechanism during the travel of said carriage to disengage said escapement mechanism from said rack.

55. In a record card machine, a card carriage, a rack fixed to said carriage, an escapement mechanism engaging said rack for controlling the movement of said carriage step by step, means for mounting a portion of said escapement mechanism for movement toward and away from said rack in the vertical longitudinal plane of said rack, and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism and provided with cam surfaces arranged in the same longitudinal plane and acting upon said movable part during the travel of said carriage to automatically disengage said escapement mechanism from said rack and hold it disengaged for predetermined intervals.

56. In a record card machine, a card carriage, a rack associated with said carriage, an escapement mechanism having portions alternately engaging said rack for controlling the movement

of said carriage, said escapement mechanism being mounted for movement toward and away from said rack in the vertical longitudinal plane of said rack, a cam follower associated with said escapement mechanism and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism and provided with cam surfaces arranged in the same longitudinal plane and acting upon said cam follower during the travel of said carriage to move said escapement mechanism away from said rack and out of engagement therewith.

57. In a record card machine, a card carriage, a rack fixed to said carriage, an escapement mechanism engaging said rack and normally controlling step-by-step movement of said carriage, means for mounting a portion of said escapement mechanism for movement toward and away from said rack in the vertical plane of said rack, and having a cam follower associated therewith, and a skip bar associated with said rack and arranged in constant operative relation with said escapement mechanism, said skip bar being provided with cam surfaces arranged in the same longitudinal plane acting on said cam follower during the travel of said carriage to automatically disengage said escapement mechanism from said rack and hold it disengaged for predetermined intervals.

58. In a machine of the class described, means for feeding a perforated card across the machine, perforation sensing members adapted to enter perforations as the card is fed across the machine, means operated by said sensing members when the latter enter perforations in a card for affecting the control of said feeding means, a key operatively associated with each of said perforation sensing members, means operated by said keys when depressed to also affect the control of said feeding means, and means also operated by said keys for causing said feeding means to operate.

59. In a perforated record card machine, a carriage for moving a record card, an escapement mechanism normally operating to advance said carriage step-by-step, a cam bar in constant operative relation with said escapement mechanism and provided with means for automatically disengaging said escapement mechanism during the advancing movement of the carriage, and means actuated by the carriage upon the further movement thereof for automatically releasing said card at the completion of its advancing movement.

60. In a perforated record card working machine, a card carriage for moving a record card, an escapement mechanism normally operating to advance said carriage step-by-step, a card receptacle, and means for automatically depositing said card in said card receptacle including a skip bar acting on said escapement mechanism to release said carriage, and means actuated by said carriage for depositing said card in said card receptacle at the completion of the advancing movement of the carriage.

61. In a perforated record card machine, a carriage for moving a record card including a pair of spaced arms engageable with the edges of the card, an escapement mechanism normally operating to advance said carriage step-by-step, a skip bar in constant operative relation with said escapement mechanism provided with means for automatically disengaging said escapement mechanism at a predetermined point during its advancing movement, and means for automatically separating said arms to release said card at the completion of the advancing movement of the carriage.

62. In a perforated record card working machine, a carriage for moving a record card including a pair of spaced arms engageable with the edges of the card, an escapement mechanism normally operating to advance said carriage step-by-step, a card receptacle, and means for automatically depositing said card in said card receptacle including a skip bar acting on said escapement mechanism to release said carriage at a predetermined point during its advancing movement, and means for automatically separating said arms to release said card into said receptacle at the completion of the advancing movement of the carriage.

63. A record sheet verifying machine substantially comprising in combination, means for advancing a record sheet with a step-by-step movement, verifying means including keys and analyzing elements, means for automatically actuating said keys in predetermined sequence including a plurality of contact members, cam means supplanting said sheet advancing means to automatically present desired portions of said sheet to said analyzing elements, and means actuated in dependence upon the movement of said sheet advancing means for successively engaging said contact members to selectively energize said key actuating means.

64. A record sheet working machine substantially comprising in combination, means for advancing a record sheet with a step-by-step movement, sheet working means including keys and work performing elements, means for automatically actuating said keys in predetermined sequence including a plurality of contacts members, cam means arranged in a single plane for supplanting said sheet advancing means to automatically present desired portions of said sheet to said work performing elements, and means actuated in dependence upon the movement of said sheet advancing means for successively engaging said contact members to selectively energize said key actuating means.

65. In a card verifying machine, means for advancing a card step-by-step, an escapement means for controlling said advancing means, operable keys, means for sensing data on said card, and error detecting means operatively connected with said keys and said sensing means for rendering said escapement means inoperative upon a disagreement between the keys operated and the data sensed by said sensing means.

66. In a card verifying machine, means for advancing a card, means for controlling said advancing means, means settable in accordance with desired data, means for sensing the data on said card, and means associated with said settable means and said sensing means for operating said controlling means to arrest the card advancing means upon a disagreement between the data on said card and the settable means.

67. In a card verifying machine, means for advancing a card step-by-step, escapement means for said advancing means, keys operable in accordance with desired data, means for sensing the data on said card, and means associated with said keys and said sensing means for actuating said escapement means to arrest the card advancing means upon a disagreement between the data on said card and the keys operated.

68. In a card verifying machine, means for

advancing a card step-by-step, an escapement means for controlling said advancing means, operable keys, means for sensing data on said card, electrical means operatively connected with said keys and said sensing means, and means controlled by said electrical means for rendering said escapement means inoperative upon a disagreement between the key operated and the data sensed by said sensing means.

69. In a perforated card verifying machine, a card carriage operable with a step-by-step movement, an escapement for controlling said movement, operable keys, sensing means engageable in the perforations of a card, an error circuit means operatively connected to said keys and said sensing means, and means operated by said error circuit means for rendering said escapement inoperative upon a disagreement between the key operated and the perforation engaged by said sensing means.

70. In a card verifying machine, means for advancing a card, operable keys, means for sensing data on said card, electrical means operatively connected with said keys and said sensing means, and means controlled by said electrical means for rendering said advancing means inoperative upon a disagreement between the key operated and the data sensed by said sensing means.

DEWEY C. DAUBMEYER.