Nov. 30, 1926. 1,608,836

J. W. BRYCE

CONVERTING PUNCH

Filed April 17, 1924 7 Sheets-Sheet 1

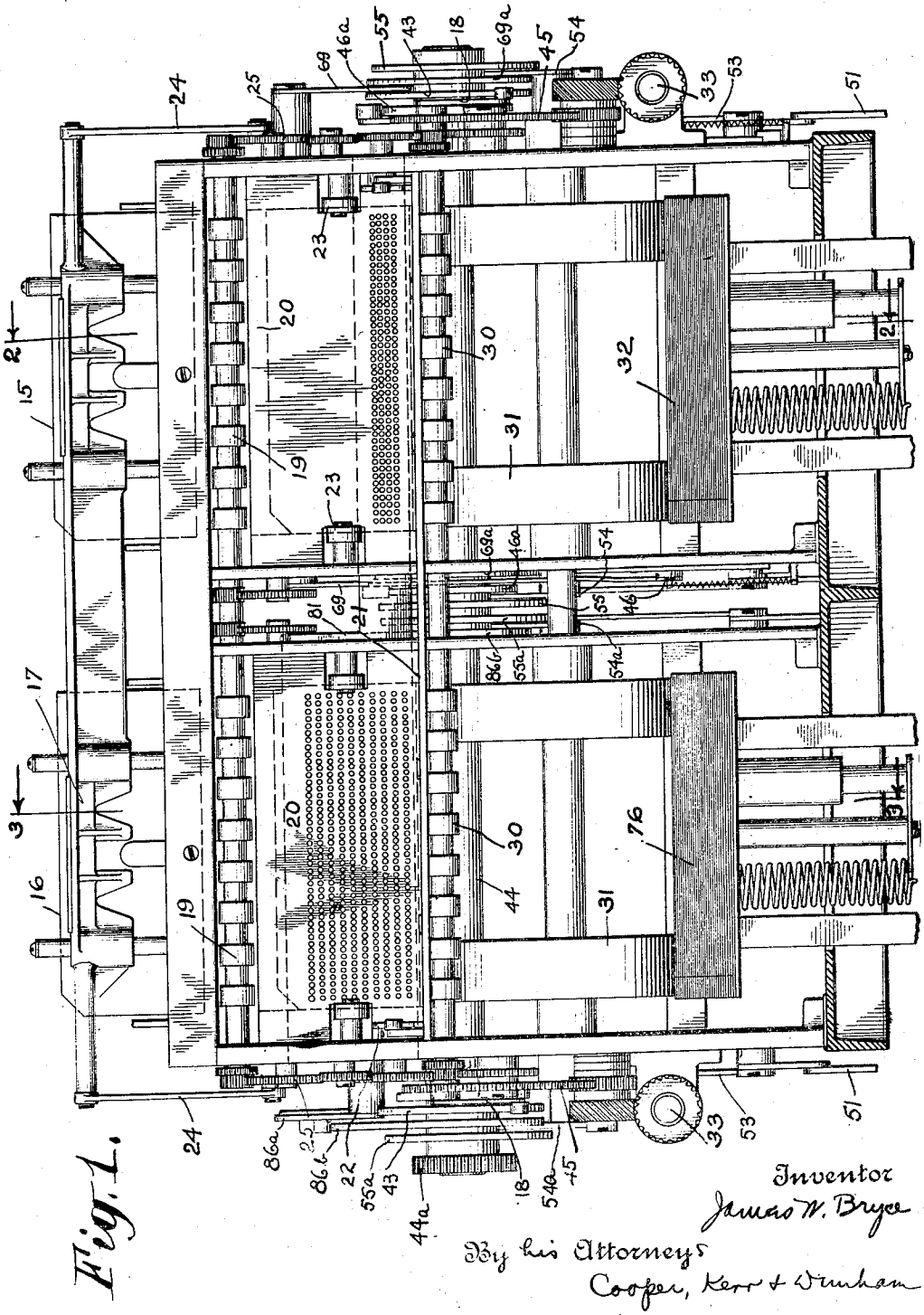


Fig. 1.

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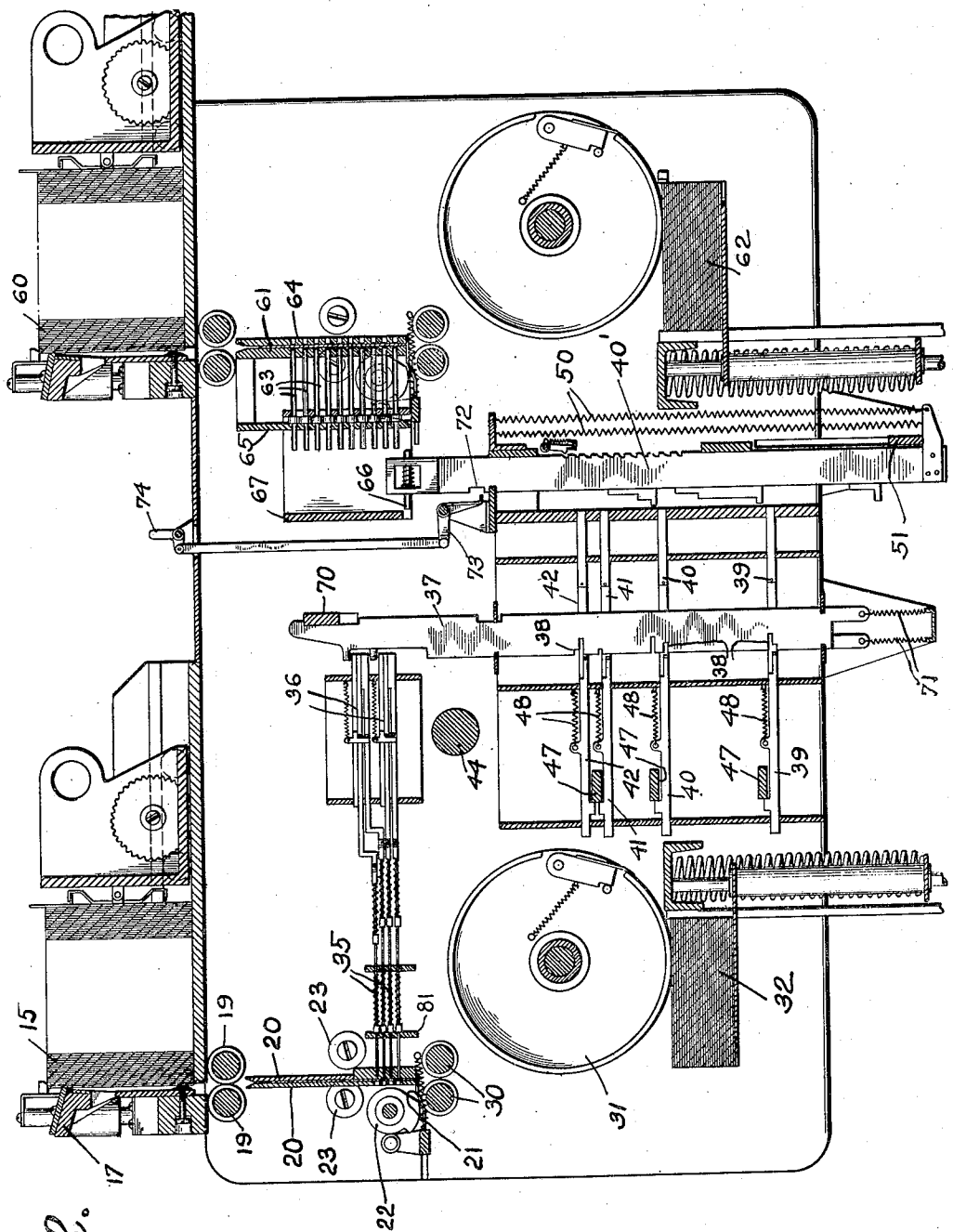


Fig. 2.

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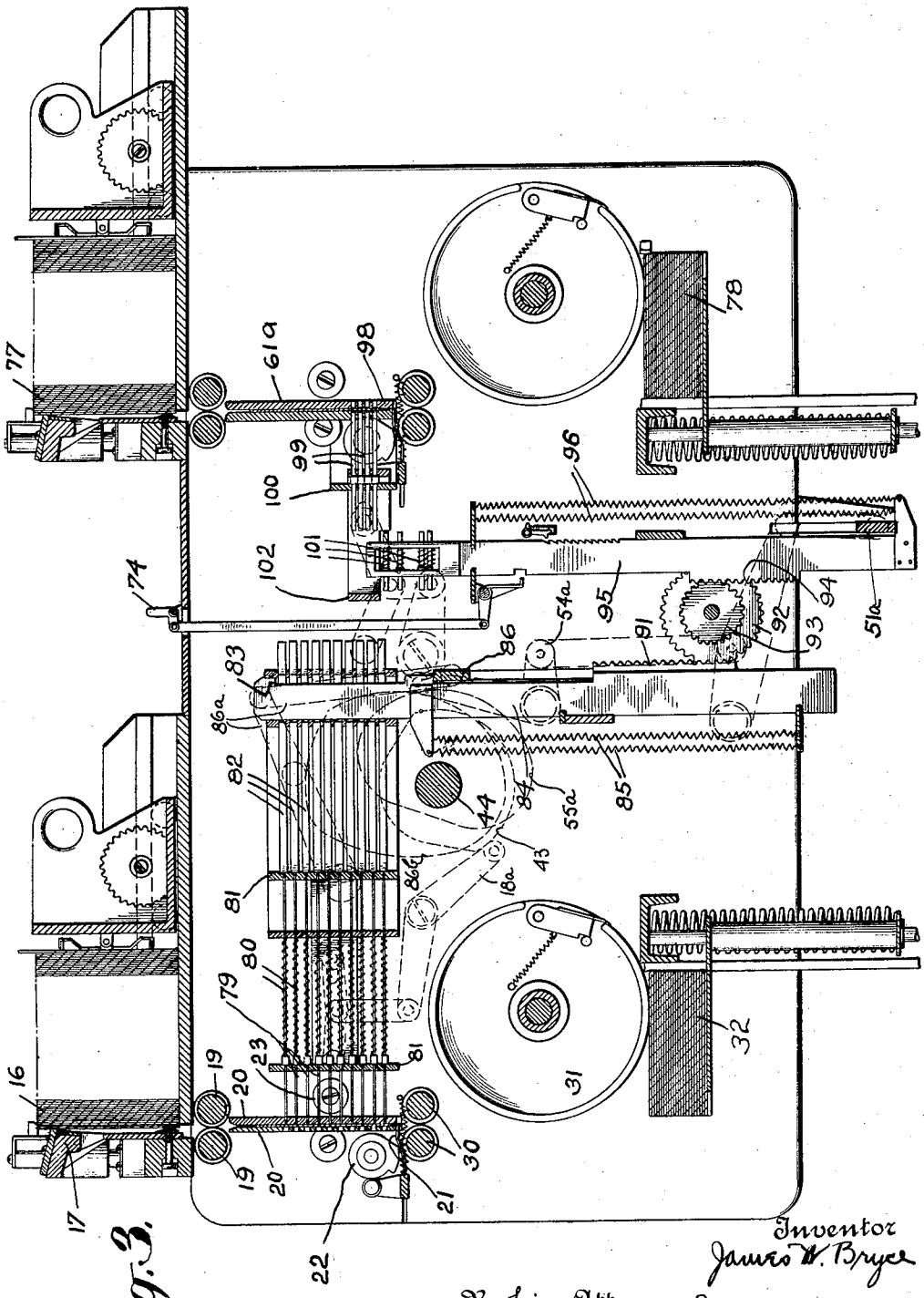


Fig. 3.

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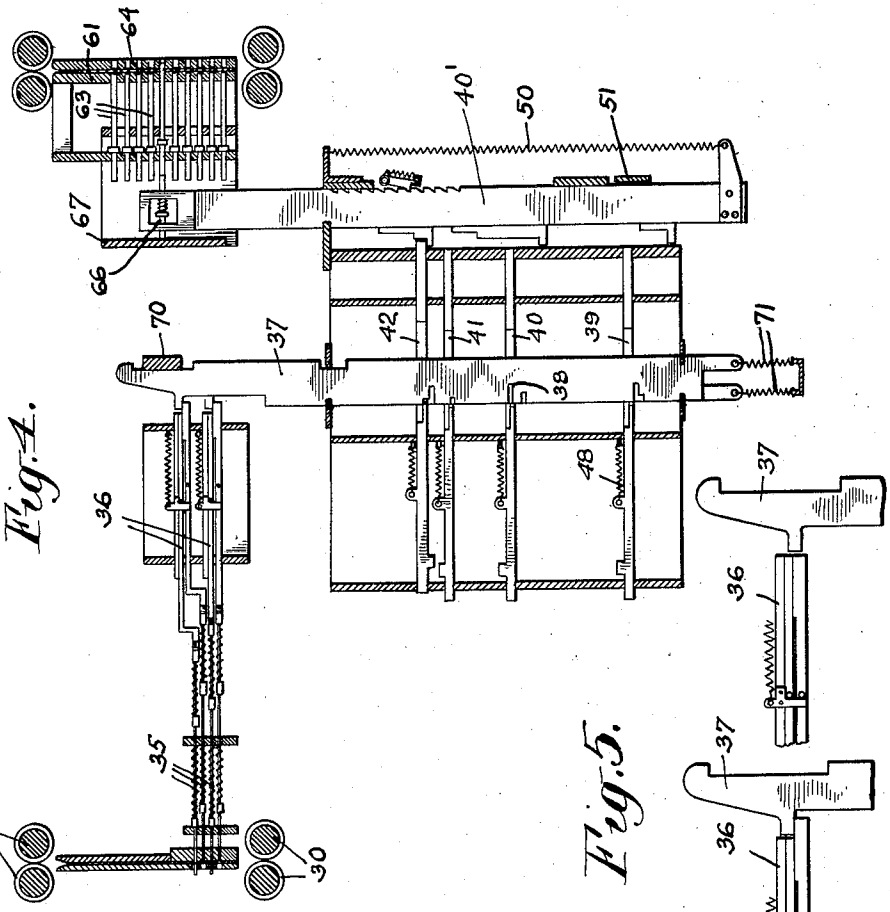


Fig. 4.

Fig. 5.

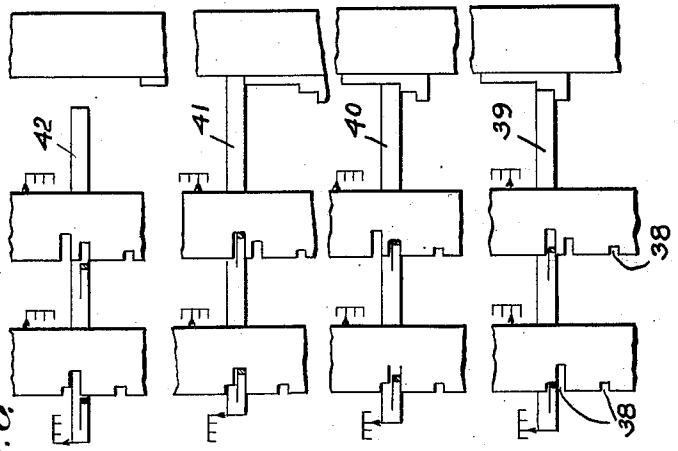


Fig. 6.

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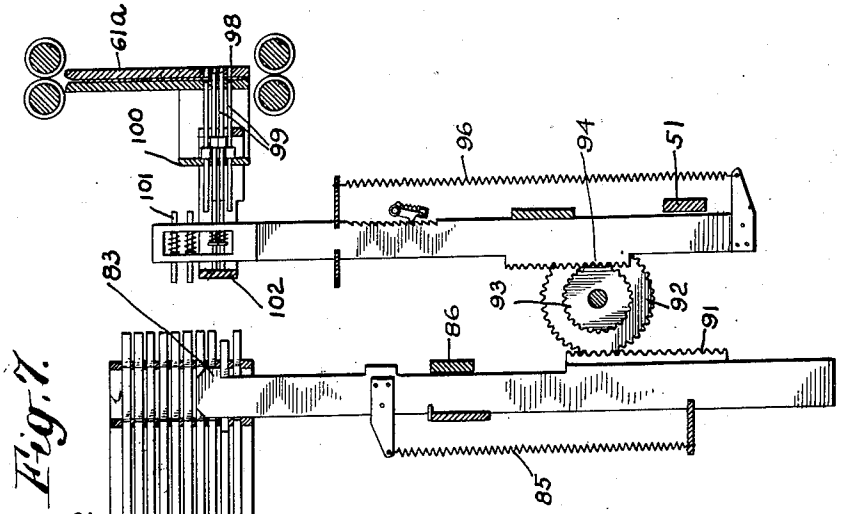


Fig. 7.

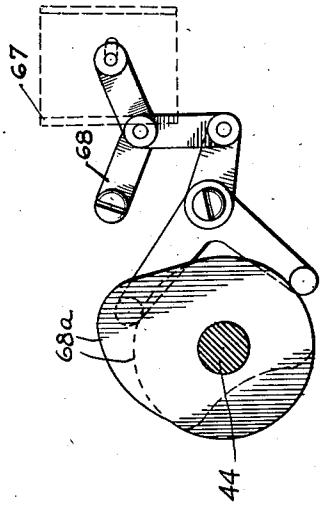


Fig. 8.

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CONVERTING PUNCH

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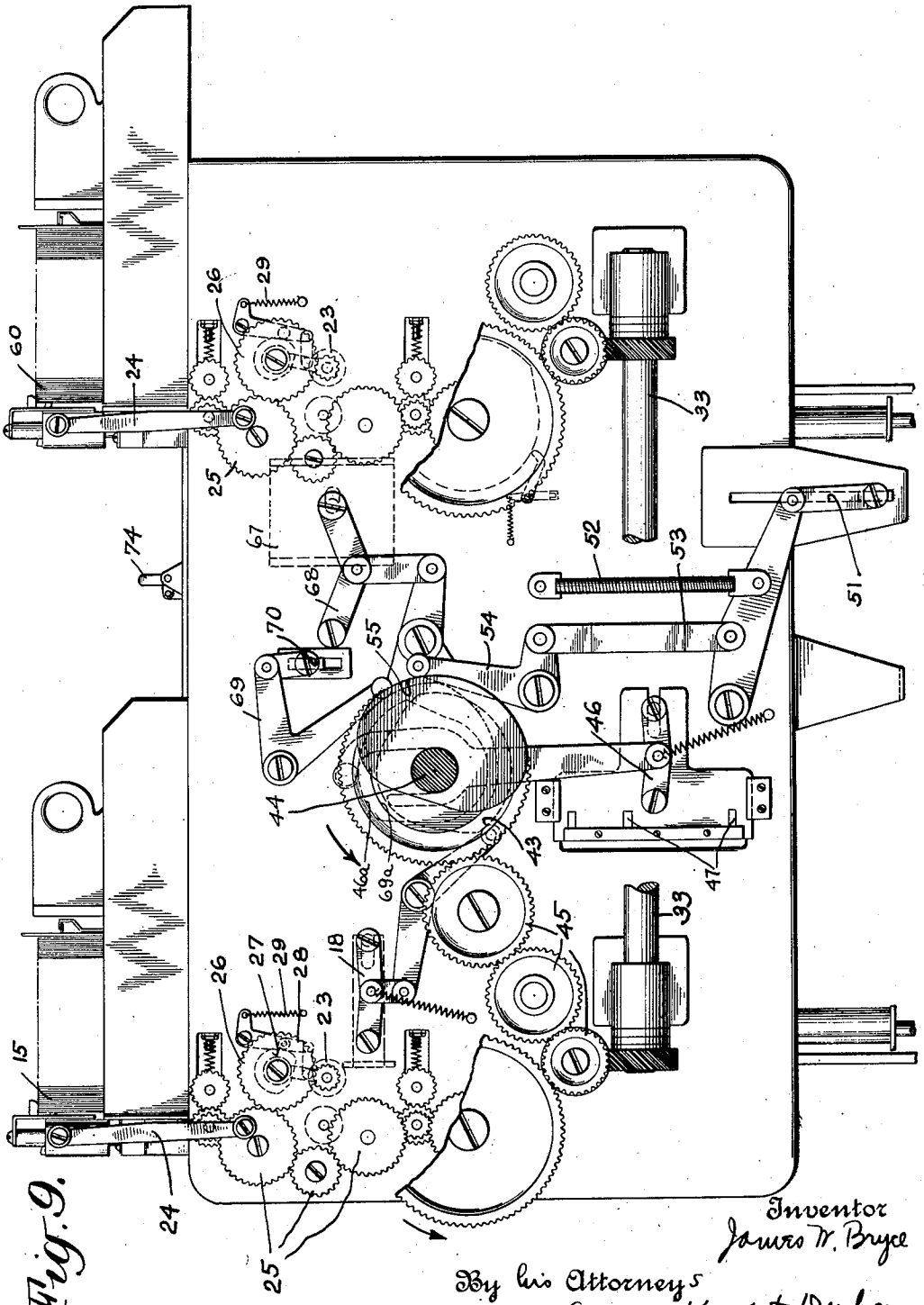


Fig. 9.

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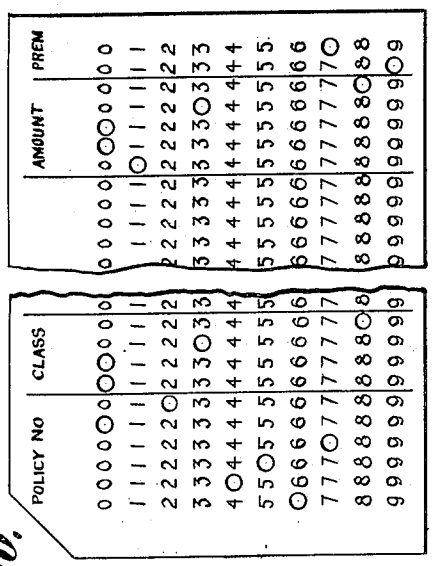


Fig. 10.

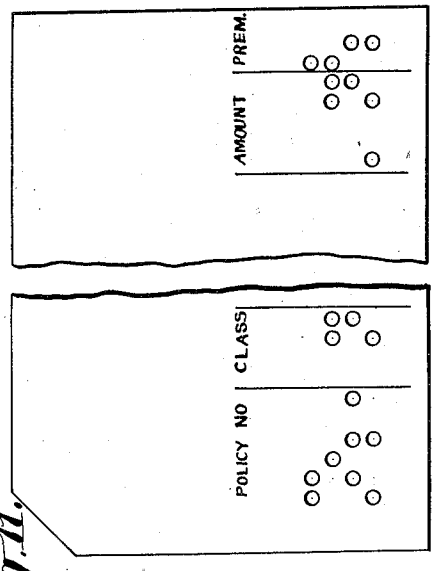


Fig. 11.

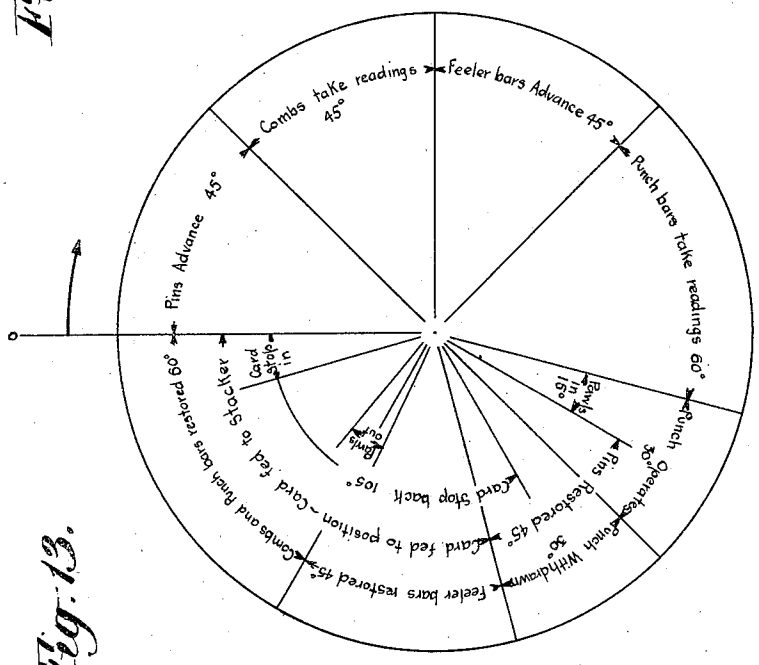


Fig. 13.

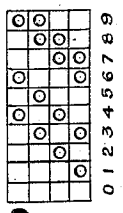


Fig. 12

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Patented Nov. 30, 1926. 1,608,836

UNITED STATES PATENT OFFICE.

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CONVERTING PUNCH.

Application filed April 17, 1924. Serial No. 707,062.

In the use of perforated card systems the record has usually consisted of a perforated card having index points or designations perforated therein. Heretofore there have been two general systems employed in perforating cards. One is the so-called Hollerith system in which a single perforation is utilized disposed in different positions or locations in a column on the card and thereby indicating by such difference of location a different value.

Another system also used is the so-called Peirce combinational hole system. In this system certain spaces on the cards are allocated for perforating purposes and in place of using a single hole variously disposed, in a column, use is made of combinations of one or more holes which designate the record. In the Peirce system the value of the designated perforated record is determined not only by the location of a hole in its field but by the number of holes taken in connection with the relative location of such holes on the field. Each system presents certain advantages in use. Stated generally, the Peirce system may be said to permit the application of a great amount of data to a card of given size than with the Hollerith system.

At the present time there are considerable numbers of tabulators and other perforated card handling machinery now in use and these machines are solely adapted to handle a particular form of card or perforated record. Accordingly if a user has cards and machines of one system he cannot change to another system without reperforating all of the cards already in existence. With machines now in use such a reperforation of a mass of cards would necessitate the manual perforating of each card one at a time and it is obvious that the labor of such a reperforating operation where an extensive number of cards were involved would be enormous.

The present invention has for its object the provision of a simple machine which will permit the automatic duplication of cards in one system from other cards which are perforated in another system.

A further object of the present invention resides in the provision of a machine which has automatically and without manual aid successively perforated cards according to the Hollerith system from other cards already perforated in accordance with the Peirce system.

A further object of the present invention is to provide a machine for automatically perforating cards in accordance with the Peirce system from other cards which have previously been perforated in accordance with the Hollerith system.

In the drawings,

Fig. 1 represents substantially a side view of the machine.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is another sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged detail view of certain of the parts shown in Fig. 2 and adapted for reading perforations of a Peirce card and punching corresponding perforations in a Hollerith card.

Fig. 5 illustrates certain comb selector mechanisms utilized in reading the combination hole perforations of a Peirce card.

Fig. 6 is a diagrammatic view of the combination combs showing the methods in which these combs select for operation a feeler bar.

Fig. 7 is an enlarged detail view of certain of the parts shown in Fig. 3, which mechanism is utilized for reading the perforations of a Hollerith card and for converting the same into punched readings upon a Peirce card.

Fig. 8 is a detail of the cams which operate the punching mechanism.

Fig. 9 is a side view of the machine showing details of the cam and driving mechanism.

Fig. 10 is a detail view of the Hollerith card.

Fig. 11 is a detail view of the Peirce card.

Fig. 12 is a detail diagrammatic view showing the Peirce combinational hole system.

Fig. 13 is a timing diagram of the machine.

Stated generally the machine comprises two main sections. In one section means are provided for converting record cards from the Peirce combinational hole system to the Hollerith system. Disposed directly alongside of this mechanism there is another section of the machine where cards may be converted and vice versa, i. e., the already punched cards are punched in accordance

with the Hollerith system and the to be punched cards are based upon the Peirce system.

Disposed at the top of the machine are two supply pockets for the already punched cards. One pocket 15 (Fig. 2) receives cards which are already punched according to the Peirce system. The other supply pocket 16 (Fig. 3) receives cards which are already punched in accordance with the Hollerith system. Both of these pockets are of conventional form arranged to automatically feed the cards up to a suitable picker mechanism generally designated 17 for both pockets. It will be understood that in practice either one or both pockets can be operated at a time. The picker 17 is actuated through the usual linkage 24 (Fig. 9) to feed either or both cards downwardly from the supply stacks into suitable feed rolls 19. Inasmuch as the feed mechanism for either of the Peirce or Hollerith cards is identical only one mechanism will be described and corresponding reference characters will be applied to the other mechanism. From feed rollers 19 cards pass into throat plates 20 and are arrested by the card abutment 21. This card abutment is similar in purpose and function to like parts in the Hollerith Patent No. 685,608. Each card is momentarily arrested by the card abutment during the time the reading is taken therefrom. Subsequently, the card abutment 21 is withdrawn by a cam device 22 and after this withdrawal a supplementary feed roll 23 which is disposed at the edge of the card is brought into engagement with the card by being rocked bodily towards it. The means for rocking this roller is best shown in Fig. 9. This figure shows the links 24 for actuating the picker, the picker and feed roll gearing generally designated 25 and a supplementary gear 26 carrying a cam 27. The follower of this cam is fixed on a bell crank linkage 28 which connects to the trunnions supporting the feed roller 23. Upon the rotation of gear 26 the cam 27 turns and allows a spring 29 to rock the feed roller 23 into engagement with the card concurrently maintaining its rotation. Thus the card which was previously stationary and disposed between the plates 20 is advanced into the bight of the lower feed rolls 30, which rolls in turn deliver the card to a stacker device 31. which in turn stacks the cards upon discharge stacks 32. All of the instrumentalities heretofore described are driven from the main drive shaft 44 of the machine by the gearing indicated in Fig. 9. To drive the shaft 44 I provide a gear 44^n.

Referring now to Fig. 2, means for sensing the reading on the Peirce type of record cards will now be described. Generally this sensing mechanism is of the type commonly used in Peirce tabulating machines now in general use. It comprises groups of sensing pins 35 which, through selecting mechanism 36 (Fig. 5), control the relative position of selector combs 37. Two of these selector combs 37 are provided for each record card field or column and the selecting mechanism causes the combs 37 to assume various relative positions to each other. Each selecting comb has upon its edge notches indicated at 38 (Fig. 6). Disposed adjacent the combs are suitable feeler bars 39, 40, 41 and 42. In accordance with the relative positions of the combs 39 some particular one of these feeler bars 39 to 42 inclusive will be permitted to advance to the right to a differential extent and the projecting end of the advanced feeler bar will act as a stop for the punch selector bar 40′. It will be understood that there are groups of combs and punch selector bars for each record card column or field. The actuation of the pins 35 is effected by means of a toggle mechanism 18 (Fig. 9), which is in turn actuated from suitable cams 43 disposed on the main shaft 44. Cam shaft 44 is in turn driven in unison with the other drive shaft of the machine by the gear train generally designated as 45. The advance of the feeler bars at the proper time in the cycle is also controlled by means of a similar toggle linkage 46 actuated from cams 46^a on the cam shaft 44. The toggle linkage 46, when actuated, permits the advance of restoring bars 47 (Fig. 2) and thereafter the feeler bars 39, 40, etc., may advance under the action of springs 48.

It will be understood that the punch selector bars 40′ are arrested in differential elevated position by the stop pieces 39, 40, 41 and 42. Raising of the punch selector bars 40′ is effected by tension springs 50 (Fig. 2), this action being permitted at the proper time in the cycle by the raising of restoring frame 51. The restoring frame is slidably guided in the frame parts of the machine and in turn is raised by a tension spring 52 connected to a linkage 53, which extends to a bell crank 54 (Fig. 9), which in turn is controlled by suitable cams 55 on the cam shaft of the machine. The foregoing parts are more fully described in the copending application of John Royden Peirce, Serial No. 566,449, filed June 7, 1922.

Hollerith punch section.

Referring to Fig. 2, the unpunched cards are disposed in a supply pocket 60 and by a similar feed mechanism to that heretofore described are adapted to be advanced into a card pocket 61 where they are retained during the punching cycle and afterwards discharged to lower feed rolls and to a stacker and thence to discharge stack 62. Adjacent the card pocket 61 is a punch carrying frame 65 slidably supporting a plurality of

punches 63 which are suitably aligned with the die plate 64. The rear ends of the punches project to the left of the punch frame 65 and one of them is adapted to be brought into alignment with an actuating plunger 66 carried on the punch selector bar 40'. After the punch selector 66 is in alignment with a particular punch a rear frame member 67 is moved to the right thus forcing the punch through the unpunched card in the card pocket. Restoration of frame 67 to the left restores the punches to normal position. The method of actuating the punch frame includes a toggle linkage 68 (Fig. 9) which is suitably operated from complementary cams 68[a] on shaft 44 of the machine (see Fig. 8). After a particular card has been punched it is withdrawn from the card pocket and discharged to the stacker mechanism. The various parts are then restored preparatory to the reading of a new card and the punching of the new unpunched card. The mechanism marked 69 actuated by cam 69[a] in Fig. 9, is intended to restore the bail 70 to upper position and thus elevate the combination combs 37. During the cycle this bail is lowered to permit the combs to drop under the influence of springs 71 (Fig. 2).

In duplicating cards it is sometimes desirable to suppress the punching in certain columns irrespective of whether the original cards had punchings in these columns or not. For this purpose the punch selector bars 40' (Fig. 2) are notched, as shown at 72, and locking fingers 73 are adapted to be thrown into these notches thus preventing the punch selector bars rising and the consequent punching of the cards. Suitable selector fingers 74 are provided disposed on the top of the machine and by manipulating these selector fingers any one or more of the lock pawls 73 may be engaged in the notches 72.

Fig. 4 shows the condition of parts just after punching has been effected. In this figure the sensing pins 35 have read the second and third holes from the bottom and the punch has punched the fifth hole from the top designating the numeral 4. The top punch of the series is provided for the numeral 0.

Referring now to Fig. 3, this figure shows the section of the machine which punches cards in accordance with the Peirce combinational hole system in accordance with data derived from cards punched according to the Hollerith digit system. In Fig. 3, 16 designates the supply pocket of already punched record cards and the same picker 17 feeds these cards into feed rolls 19 and thence they pass into card pocket 20 being arrested by the abutment 21. Eventually the stacker 31 delivers the cards to the discharge stack 76. In place of using groups of four pins as in the previously described section of the machine ten card sensing pins 79 are provided. These pins are advanced by springs 80 into contact with the card upon the forward advance of the pin box frame 81, which frame is operated by a toggle mechanism 18[a] similar to that marked 18 described in connection with Fig. 9. The pins at their rearward ends are provided with extended stop pieces 82 provided with lugs on their ends which, when the pins advance, extend into the path of a shoulder 83 on vertical bars 84. The bars 84 are adapted to be drawn downwardly by tension springs 85 upon the lowering frame 86. This frame is actuated by a linkage and follower 86[a] which cooperate with cams 86[b] on shaft 44. Each bar 84 carries a rack 91 meshing with a spur gear 92 which has fast to it a spur gear 93 meshing with a rack 94 on the punch selector bar 95. These punch selector bars are adapted to be elevated by tension springs 96 upon the raising of the frame 51[a] which is effected by a linkage and follower 54[a] cooperating with cams 55[a] on shaft 44. The means for feeding unpunched blank cards from the supply stack 77 to the discharge stack 78 is substantially identical with the mechanism previously described. It is sufficient to state that the unpunched cards are advanced into a card pocket 61[a], one side 98 of which forms a die plate. The group of punches 99 are suitably mounted in the pocket and punch frame 100. Disposed in spaced arrangement in the punch selector bars 95 are spring restored plungers 101. There are four of these plungers as shown and their spacing is such that if the selector is raised one step it will align the uppermost plunger with the lowermost punch. Then upon the actuation of the punching frame 102 a single hole will be perforated in the card corresponding to the numeral 1. If the selector bars are elevated two steps a single hole will be punched in the second hole space corresponding to the numeral 2 (see Fig. 12). If elevated three steps, the first and second plungers from the top will align with the first and third punches from the bottom of the card punching holes in the first and third spaces from bottom of the card and so on. The punching frame 102 is actuated by a toggle mechanism which is similar to the mechanism marked 68 in Fig. 9 and described in connection therewith.

Hereinafter in the claims when I refer to a different system of perforations it will be understood that I refer to converting from one fundamental system and scheme of perforations to a completely different scheme and system of perforations. For example, converting can be from the Hollerith digital system to the Peirce combinational system or vice versa. Such conversion it will be understood is distinct and different from a reading and punching according to a so-

called complementary arrangement based on the same system. In these complementary punching systems provision is made for copying the reading utilizing punchings where blank spaces are provided on the card from which the copying is made. In all such systems there is no conversion from one system to a different system but merely to a complementary punching based upon the same system.

What I claim is:—

1. A duplicating punching apparatus comprising in combination with means for reading the perforation designations of record which are perforated according to one system of perforations, means for translating the readings thus obtained and punching corresponding readings in other records according to another system of perforations.

2. A duplicating punching apparatus comprising a combination with means for reading at the will of the operator punched records which are perforated in accordance with either or both of a plurality of forms of perforations such as combinational hole perforations and digit hole perforations, means for translating the readings thus obtained, and means controlled by said last mentioned means for effecting punching of blank records in accordance with different system or systems of perforations than those of the records from which the readings were originally derived.

3. A duplicating punching apparatus comprising means for handling punched cards and means for handling blank cards, and means including reading devices and punching devices controlled thereby for reading the punching designations of punched cards which are punched in accordance with the combinational hole system or the digit system or both systems, and means for translating the readings thus obtained and punching corresponding punchings in blank cards according to a different system of perforations.

4. A duplicating punching apparatus including in combination with means for handling punched cards and blank cards, said punched card handling means having provision for handling either combinational hole punched cards or digit hole punched cards and both of said types of card, said blank card handling means having provision for handling either or both types of blank cards, punching means cooperating with the said blank cards, means for reading the perforated punched cards and means for controlling the punching of the blank cards in accordance with the readings thus derived and in accordance with a varying type or form of perforations.

5. A duplicating punching apparatus comprising means for duplicating perforated records, said duplicating means including in combination means for reading combinational hole system perforated records, means for translating said readings into a different form, and means for punching other records in the digit form of perforations with said translated readings derived from combinational hole readings.

6. A duplicating punching apparatus comprising means for duplicating perforated records, said duplicating means including in combination, means for reading digital hole system perforated records, means for translating said readings into a different form, and means for punching other records with said translated readings and in accordance with combinational hole systems of perforations.

7. A duplicating punching apparatus comprising in combination, with record feeding means for punched records and blank records, means for reading either combinational hole or digital hole systems in said perforated records, means for translating the readings thus obtained into a different form, and means for effecting perforations of blank records in accordance with said translated readings whereby the resulting perforated records represent data derived from the original records by a different system of perforations.

8. A duplicating punching apparatus comprising, in combination with means for reading the perforation designations of records which are perforated in accordance with one system of perforations, means for translating the readings thus obtained into another form, and means for effecting perforations in blank records in accordance with said translated reading whereby the resulting perforated records represent data derived from the original records by a different system of perforations.

9. The invention set forth in claim 8 in which means is provided for suppressing the making of perforations in certain fields of the blank cards.

10. The invention set forth in claim 8 in which selecting means is provided operable at the will of the operator for suppressing the transferring of data from fields of the original records as selected by the operator.

In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.