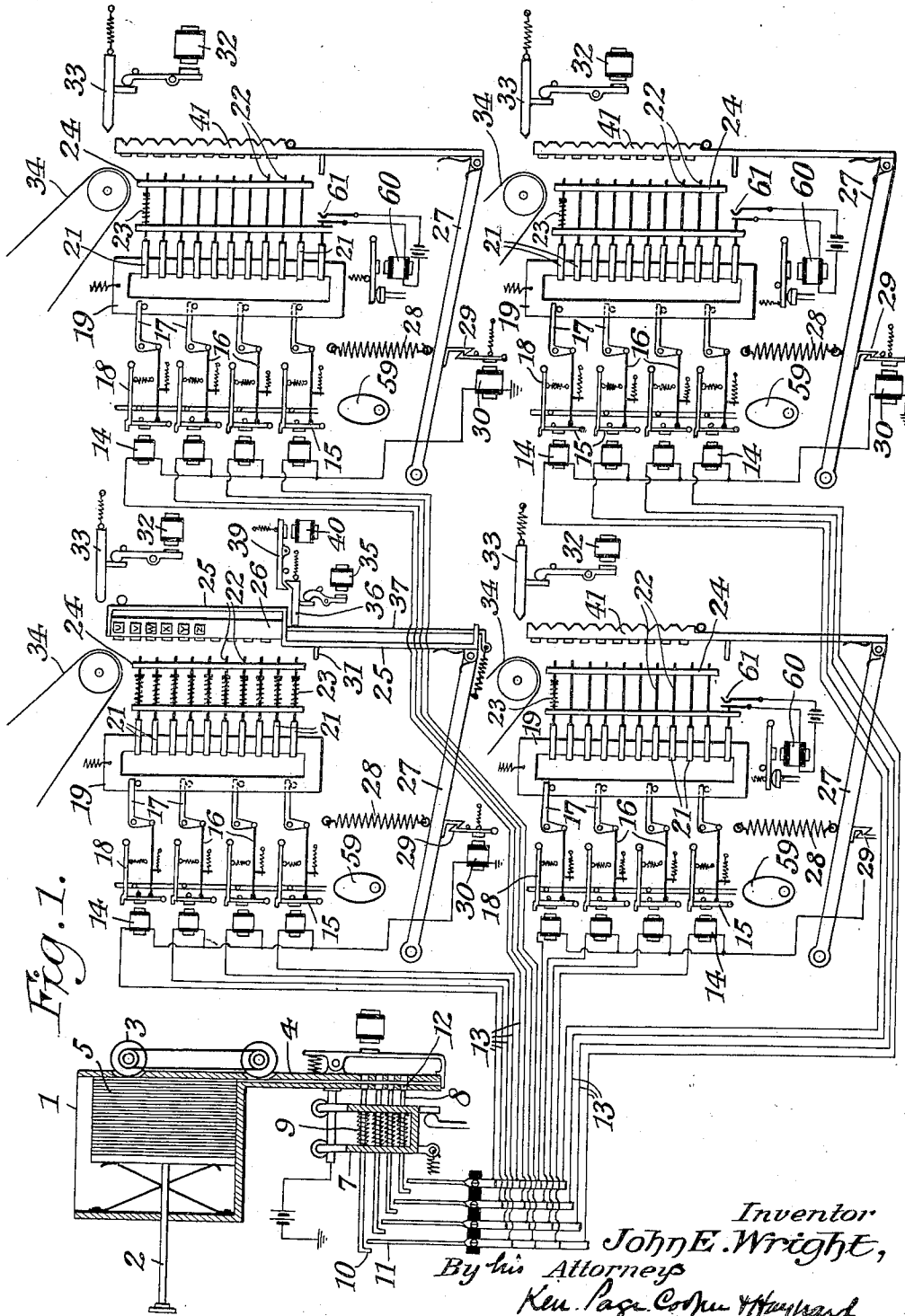


J. E. WRIGHT.
 TABULATING MACHINE.
 APPLICATION FILED SEPT. 24, 1918.

1,333,890.

Patented Mar. 16, 1920.
 4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

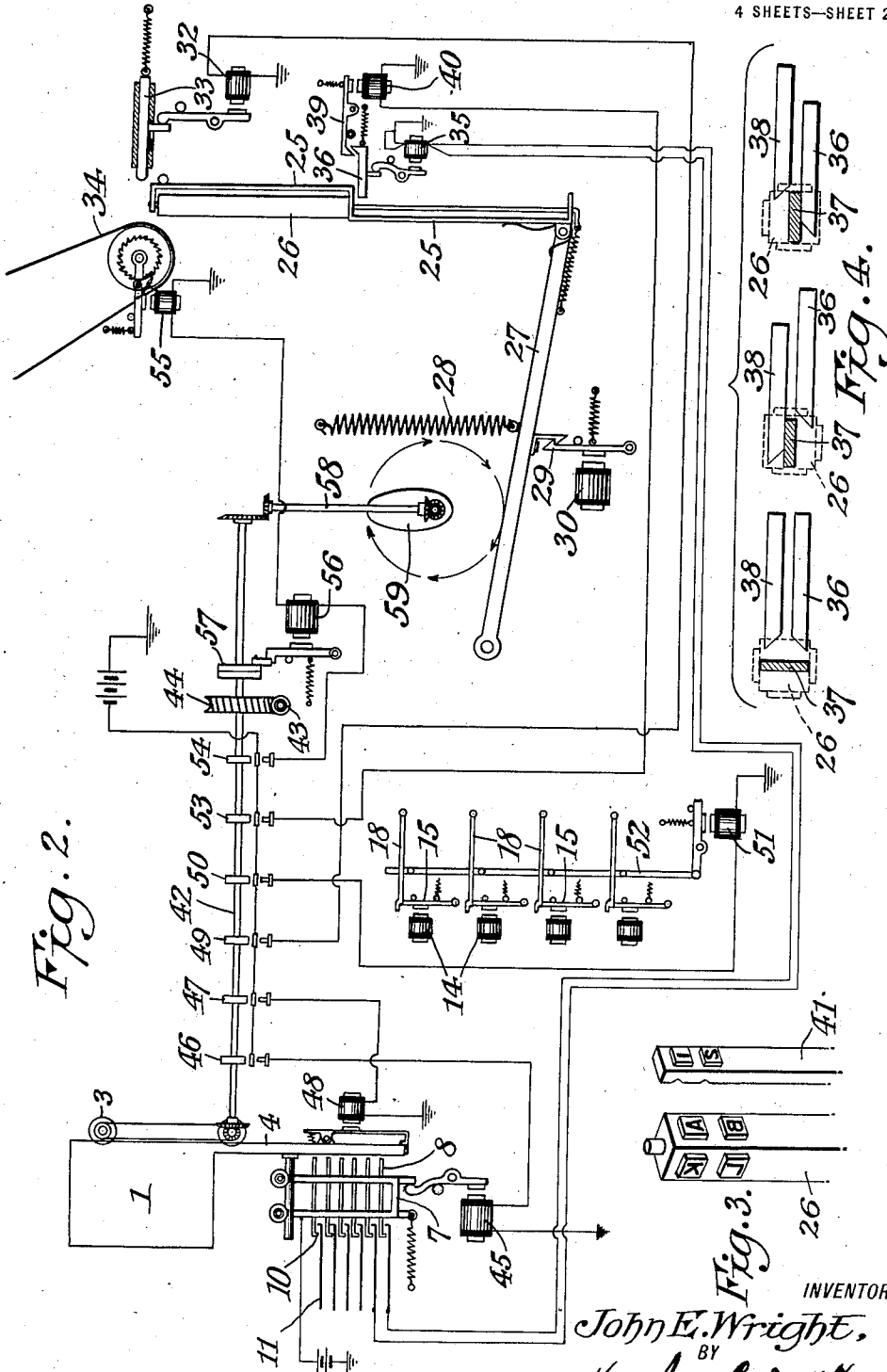


Fig. 3.
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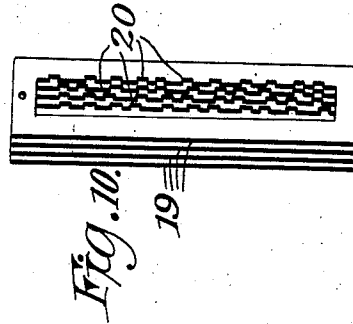
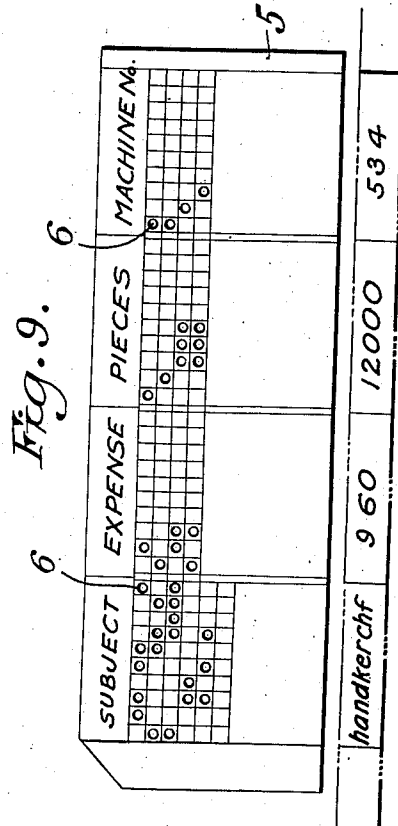
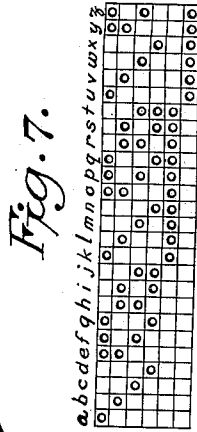
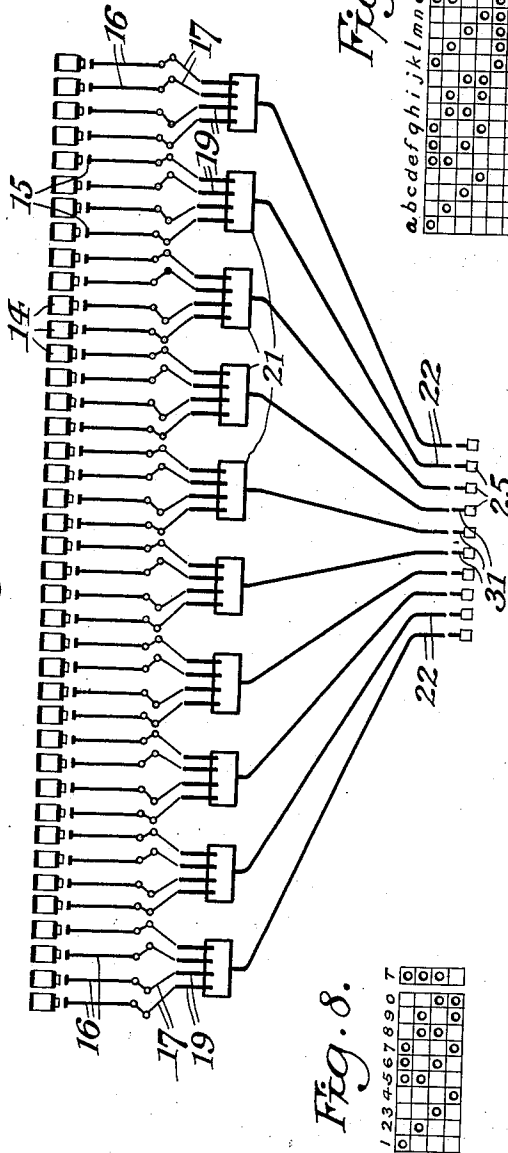
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UNITED STATES PATENT OFFICE.

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TABULATING-MACHINE.

1,333,890.

Specification of Letters Patent. Patented Mar. 16, 1920.

Application filed September 24, 1918: Serial No. 255,424.

To all whom it may concern:

Be it known that I, JOHN E. WRIGHT, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Tabulating-Machines, of which the following is a full, clear, and exact description.

The invention upon which this application for Letters Patent is based is an improvement in tabulating machines. In general, these machines are now well known, being in extensive use, although their specific purposes and functions may very widely differ. For a more ready comprehension of the nature of my present improvement, however, it may be stated that in various commercial and other undertakings it is customary to punch cards with certain distinctive holes, which, by their number or position therein, indicate given things such as the character of certain articles of commerce, the number sold, the cost, the machine by which they were produced or what not, and at any time when such a computation may be desired, selected groups of these cards are run through a tabulating machine which produces a record, printed or otherwise, of the number of pieces, their cost, and the totals of such other items indicated by the punched holes as may be required.

Heretofore one method of carrying out these operations has been to use a series of pins, equal in number to the maximum number of distinctive holes that might be punched in the cards, and to bring such pins against the face of the cards successively, so that those pins that register with punched holes will pass through the card and act through suitable instrumentalities to record, print or totalize the items corresponding to the punched holes. In a general sense, my improved apparatus herein set forth pertains to this class of mechanism, but it accomplishes certain new results and performs these and others in a more simple, effective and economical manner than any of the devices for this purpose which have preceded it.

In carrying out my invention, I use a smaller number of punched holes than has heretofore been required for indicating the data which it is desired to record. For example, I propose by my device to punch in the cards holes to represent all of the letters of the alphabet, whereby a card

will indicate, for example, the article to which it is intended to relate, and which will be printed by the device, and for this purpose I use only six holes, the different permutations and combinations of which in the card represent the different letters.

For the ten digits from 0 to 9, I use but four holes, and as there are but ten combinations required I am not required to use more than two holes to indicate any given figure. The cards when punched as required are sorted in the usual manner into groups, and then by the means hereinafter described I print on a strip or sheet of paper the letters corresponding to the holes in one part or section of the cards, the numerals corresponding to those in other and different sections, and the totals of any number of numerical items that may be desired.

The means which I employ for this purpose are illustrated chiefly in diagram in the accompanying drawings, in which,

Figure 1 is a diagram illustrating the complete system.

Fig. 2 is also a diagram illustration of the character and the purpose of the elements of the tabulating mechanism.

Fig. 3 is an enlarged view of a portion of the printing bars for characters and numerals.

Fig. 4 is an enlarged detail of the means for turning the character bar in a horizontal plane.

Fig. 5 is a perspective view on a somewhat larger scale of the mechanism employed.

Fig. 6 is a diagrammatic illustration of mechanism.

Fig. 7 illustrates a key of the holes, their number and position, which, when punched in a card, indicate the various letters of the alphabet.

Fig. 8 is a similar illustration of a key to the holes which indicate numbers or totals.

Fig. 9 represents a punched card and the printed record corresponding thereto, and

Fig. 10 is a perspective view of the leaves of one of the translators used in the device, showing the notches in said leaves which are brought into line by the movements of said leaves.

The punched cards which are used with this device are usually of a certain kind or class sorted out from a large number by a

sorter, a well known form of mechanism, and are placed in a receiver 1 and pressed forward by a suitable device 2 against driven rollers 3, which, by each complete revolution, move one card down into a chute 4. We may assume, for purposes of this case, that each card 5 is like that shown in Fig. 9, that is to say, the first section to the left is marked "Subject" and contains ten vertical rows in which holes 6 are punched in different numbers and positions to indicate letters of the alphabet. As a matter of convenience, no word of over ten letters can be printed in full, such words being abbreviated. The succeeding sections, in this case three in number, bear appropriate designations and contain each ten vertical rows with holes to indicate numerals, the object being to provide for any number in each section containing a maximum of ten digits.

Back of the chute 4 in a laterally movable box or frame 7 are supported pins 8 equal in number to the maximum number of holes that might under any circumstances be used to indicate all of the different characters and numbers. Each pin is surrounded by a spiral spring 9 which permits it to yield when, the box or frame being forced forward, its end meets a fixed resistance, and each pin has a hooked end 10 which is adapted to engage a spring or pivoted contact 11 when the pin is moved forward a given distance. When a card, therefore, is passed down into the chute 4 and the pins are carried forward by their box or frame support, all of said pins will pass through holes 12 in the wall of the chute, but those pins only which register with punched holes in the card will pass through the latter and thereby move forward sufficiently to engage with the contacts 11.

From each contact 11, and there are as many contacts as there are pins, a connecting wire 13 leads to an electro-magnet 14, and, for convenience, we may first consider those magnets of the first group marked "Subject," which operate to print letters. It will be understood that over the area of the first section of the card there are sufficient pins to register with all the holes that may possibly be punched to indicate the twenty-six letters of the alphabet.

The magnets may be considered as arranged in groups of four, and each magnet has an armature 15, see Fig. 5, connected by rod 16 with a pivoted bell-crank lever 17. When a magnet is energized, it draws forward its armature which is normally in its retracted position, but is locked in its advanced position by a spring actuated catch 18, and this operates to depress the long arm of the lever 17, which engages with a pin set on a translator leaf or rectangular plate 19. These plates 19 are arranged in

groups of four and contain notches 20 along the inner edges of their forward sides. Light rectangular frames 21, carrying pins 22 and actuated by springs 23, surround the forward sides of the leaves 19 and are prevented from moving under the force of these springs by the high or unnotched portions of the sides.

The holes in a card which correspond to a certain letter will permit one or more pins 8 to move forward and this will result in one or more of a group of magnets 14 shifting the leaves of the translator and by such shifting a line of notches in one of the group of four adjacent leaves 19 will be brought into line under frame 21, and that frame will consequently move forward and project its pin 22 for a given distance beyond the front guide plate 24.

Each group of translator leaves or plates 19, controls in this way the movements of ten pins 22, and every letter indicating hole or group of holes in the card will cause one of the pins in one of the ten translator groups of four leaves to project beyond the front guide plate.

In front of each vertical row of the pins 22 is a bar or frame 25 which carries a type bar 26. These type bars are on spindles mounted in bearings in projecting bent portions of the bars 25 and are capable of rotation therein. On the side of the type bar which is normally presented to the printing platen are the type for the first ten letters of the alphabet, or A to J inclusive; on the side normally to the right, are the type for the next ten letters or K to T, and on the side to the left are the type for U to Z.

The rods 25 and type bars 26 are pivoted to the end of long levers 27, to which are connected springs 28. Normally the levers 27 are held down against the force of these springs by catches 29 controlled by electro-magnets 30 in series with each of the four magnets 14, so that when any one or more of these latter is energized and operates to throw out a pin 22, magnet 30 is also energized and releases the lever 27, which thereupon forces the type bar upward until a pin 31 on the rod or frame 25 encounters that pin 22 which has been projected by the translator. Each type bar is thus capable of assuming ten different vertical positions and if the letter desired is on the side normally presented to the platen that letter may be printed by an impulse of current through an electro-magnet 32 which throws forward a plunger 33 that rocks the type bar and causes the desired type thereon to print upon a sheet of paper 34.

If the letter to be printed, however, is on either the right or the left side of the type bar, the latter is turned to the left or the right, as the case may be, to bring the desired letter into the proper plane for printing.

ing. This is accomplished by using two holes in the cards for controlling the position of the type bar laterally. In Figs. 7 and 9 these holes are shown as occurring in the fifth and sixth horizontal rows, and when a letter is to be printed which is, say on the left hand side of the type bar, a hole in the sixth row sends a current to an electro-magnet 35, which shifts a slide bar 36 with a beveled end that engages with the left hand edge of the prolongation 37 of the type bar spindle and which is flat as shown in Fig. 4, and thereby turns the said spindle, as shown at the right in said figure, and this brings the desired letter into the printing plane. If the letter is on the right hand side of the type bar another magnet 35, Fig. 5, shifts another slide 38 and turns the bar in the opposite direction.

When the slides 36 or 38 have been forced forward they are held in that position by a catch lever 39, controlled by an electromagnet 40 which releases them at the proper time as will be hereinafter explained. In this way any word of ten letters may be printed on the sheet 34.

The numerals are printed by the same means as the letters except that for the ten digits, but four holes are required in groups of not more than two, and the type bars 41 for numerals contain type on only one side and are not shifted as are those for letters. It is also desirable that the plunger or slide 33 for the numeral type bars should have a pointed end that enters a correspondingly shaped notch in the type bar whereby the latter is correctly alined for printing.

The mechanism by means of which the device is operated is illustrated in Fig. 2 to which reference is now made. In this figure 42 is a shaft continuously driven during the operation of the device by a worm gear 43 and a pinion 44. This shaft transmits motion to the card shifting disks 3, its rate of rotation being one half that of the said disks. When, therefore, a card has passed fully into the chute 4, a contact 46 carried or operated by the shaft 42 closes the circuit of an electro-magnet 45, which operates to throw forward the pin box or frame 7. The pins are thus adjusted as above described to set the translators and their functions for that operation have then ended. The magnet 45 which is only momentarily energized then permits the pin frame to be retracted and the next operation is the result of the closing by a contact device 47 on shaft 42 of the circuit of a magnet 48, which opens the bottom of the chute and permits the card therein to fall out while another card is descending into the chute.

The next operation is the closing by a contact device 49, on shaft 42, the circuit to

the printing magnets 32, it being understood that by this time the type bars have been set to their proper positions. Then by a contact device 50 on shaft 42 the circuit is closed to a magnet 51 which raises a bar 52 that raises the catches 18 and permits the armature levers 15 to return to their normal positions. The next operation is the closing of a circuit by a contact device 53 to magnet 40, which raises catches 39 and permits the slides 36 or 38 to be retracted and the type bars to resume normal positions, and finally a contact device 54, on shaft 42 closes the circuit to the magnet 55 which feeds the paper to a magnet 56 which controls a clutch 57 on shaft 42 and thereby connects with such shaft a cam shaft 58 which operates to rotate an elongated cam 59, which engages with the levers 27 and depresses such as have been raised back into engagement with their catches 29. This cycle of operations follows the introduction of every card.

If it be desired to print the total of any column of figures, eleven instead of ten pins 22 may be used with a group of four translator leaves and this extra pin may be operated by a special or total hole punched in a card to close the circuit to an electro-magnet 60, Fig. 1, by bringing together by the pin operated by such hole two contacts 61. This magnet may work or control the totalizing key of any suitable adding device.

It will be observed that with each translator element for numerals ten pins or rods are normally used and these pins may be regarded as the equivalents of the levers which are actuated whenever the keys of an adding machine are depressed. That is to say, the four holes or any of them punched in a card such as shown herein, call for the ten digits, by means of the translator, as completely as if the card contained a punched hole for each digit, and the forward movement of a pin 22 may be considered as having the same effect on an adding machine as would the depression of a key. The mechanism, in other words, which is controlled by the translators may be an adding machine with a printing attachment so that not only are the punched indications in the cards reproduced in letters and numerals but the totals of any number of numerals in any column may be printed in response to a total hole or holes punched in any card.

The mechanism herein described is very much less complicated and cumbersome than those now used for this purpose. It has also greater capabilities and is adapted for general and widely varying uses.

Having now described my invention, what I claim is:—

1. In a tabulating machine, the combina-

tion with means for holding a punched card and means for forcing yielding pins against the card, of a series of magnets energized by those pins which register with
 5 and pass through perforations in the card, translators operated or adapted to be set by the action of said magnets, type bars, some containing letters of the alphabet and others numerals, each of said type bars being
 10 adapted to be set in positions determined by the condition of those translators which have been set by the magnets, means for printing the characters thus brought to the printing position, and means for controlling
 15 the setting and the return to normal position of the several parts of the apparatus.

2. In a tabulating machine, the combination of a series of type bars adapted to be moved and brought to such positions that
 20 the desired type thereon will stand in the printing position, devices operating on punched cards for so setting said type bars, according to the number and position of the holes in the cards, a translator in coöperative relation to each type bar, electromagnets fewer in number than the possible positions
 25 of the type bars for setting or operating the translators, means for setting and printing from the type bars when set, controlled by holes in the cards and means for controlling such apparatus and returning the parts to normal position after each printing operation.

3. In a tabulating machine, the combination with a holder for punched cards and yielding pins adapted to be forced against the cards so that those pins which register with holes in the cards will pass through the same, of a series of type bars having type for
 40 letters of the alphabet operated by certain of the holes in the punched cards, other type bars having numerals and operated by other holes in the cards, a translator in coöperative relation to each type bar, electro-magnets fewer in number than the possible positions
 45 of the type bars for controlling the operation of the translators and means for setting the type bars according to the conditions set up in the translators by the passage of pins through holes in the cards, means for positioning the characters on the type bars thus brought to printing position, and means for controlling these and the other necessary operations of the apparatus.

55 4. In a tabulating machine, the combination with means for holding punched cards, of translators and means for setting or operating the same, according to the number and position of the holes in the cards, type bars controlled by the setting of the translators, certain of which have letters of the alphabet adapted to be operated by one set of holes in a card to bring to the printing position the letters of given words, and other type
 60 bars having numerals adapted to be oper-

ated by other sets of holes in the card to bring into printing position the digits of a given number.

5. In a tabulating machine, the combination with means for holding punched cards, of translators and means for operating the same according to the combinations of not more than six holes in a card, type bars each of which is controlled by a translator and having the twenty-six letters of the alphabet
 70 thereon on three faces or sides of the same, means for moving the type bars longitudinally to different points according to the number of positions of the holes in a card and means also controlled by one or more
 75 holes in a card for partially rotating the type bars in either direction to present the desired column of letters in the printing plane, and means for printing the letters thus brought to position.

6. In a tabulating machine, the combination with means for holding punched cards, of translators and means for setting or operating the same according to the combinations of not more than four holes in the cards, type bars controlled as to longitudinal position only by said translators when set, and each having the ten digits thereon, means for moving said type bars to positions determined by the conditions of the translators and means for printing the numerals
 90 thus brought to the printing position.

7. In a tabulating machine, the combination with means for holding punched cards, of a series of type bars each having at least ten characters in a vertical row thereon, translators for controlling the setting of such bars to bring any desired character in a row to the printing position, electro-magnets less than ten in number for controlling
 105 the setting or operation of the translators according to the number and position of the holes in the cards, means for printing from said bars and means for setting and restoring the several parts after each printing
 110 operation.

8. In a tabulating machine, the combination with a group of longitudinally and rotatably movable type bars having letters of the alphabet thereon, and one or more
 115 groups of longitudinally movable type bars having the digits thereon, of translators one for each type bar adapted to be operated by holes in a punched card and suitable mechanism controlled thereby for setting a stop
 120 at the desired elevation, means for moving the type bars up to said stop and means for printing the characters thereon which by such means have been brought to such elevation and into printing position.

9. In a tabulating machine, a series of type bars movable in line with and around a longitudinal axis, of a holder for punched cards and means controlled by the number and position of holes in each card for setting
 125

the type bars in the corresponding position along the line of their axes, and of rotating them to bring the desired character into the printing plane.

- 5 10. In a tabulating machine, the combination with a series of parallel type bars, a certain number carrying type corresponding to the letters of the alphabet, and the others type corresponding to the digits 1 to 0, there
10 being one of such bars for each of six holes or combination of six holes in a punched

tabulating card, electro-magnets adapted to be energized by means coöperating with said punched holes in a card, translators adapted to be set or controlled by said magnets and 15 adapted to set the several type bars according to the number and position of the holes, to present in printing position the bars which correspond to said punched holes.

In testimony whereof I hereunto affix my 20 signature.

JOHN E. WRIGHT.