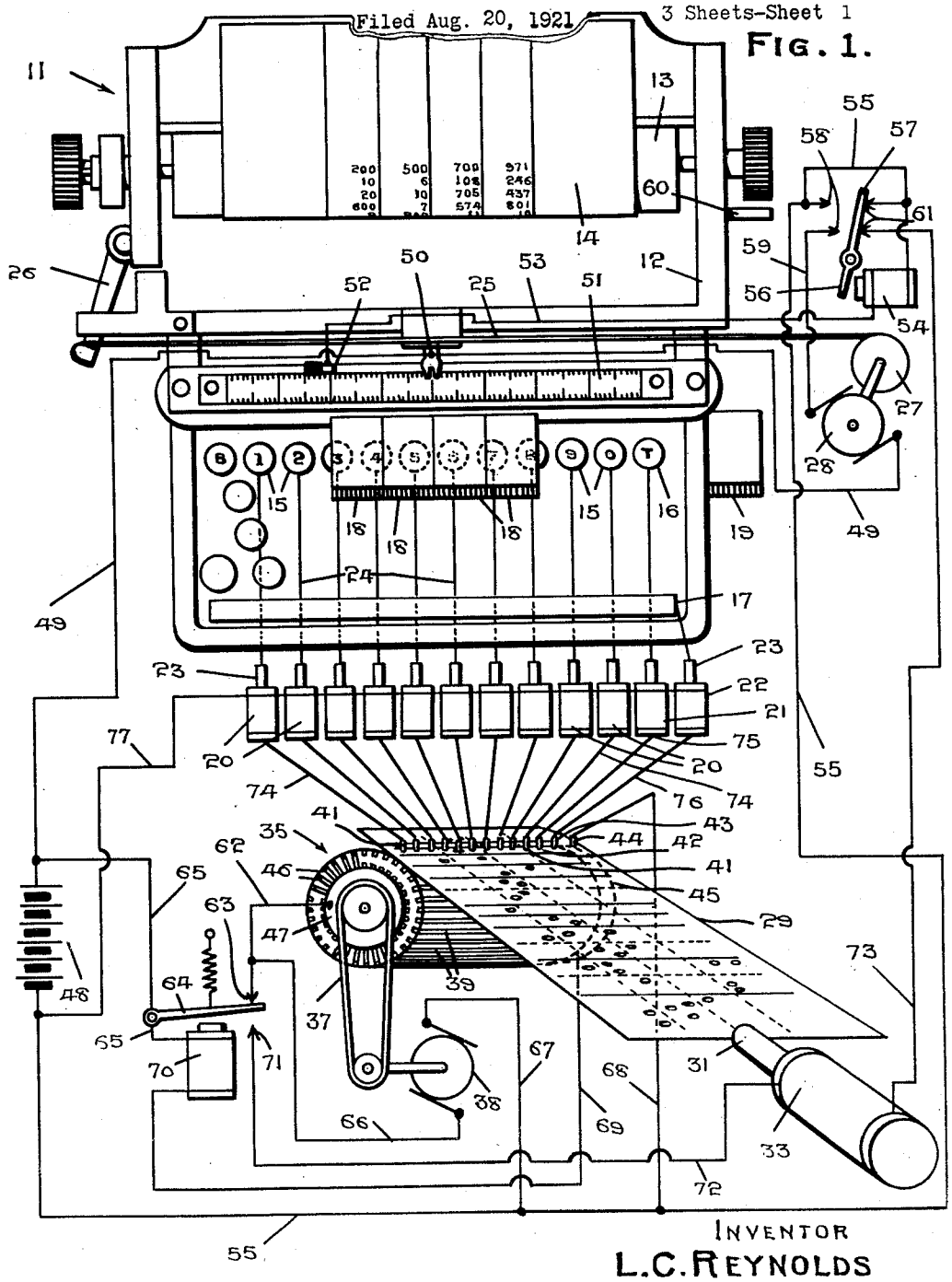
Dec. 9, 1924. 1,519,054

L. C. REYNOLDS

TABULATING MECHANISM

Filed Aug. 20, 1921 3 Sheets-Sheet 1

FIG. 1.



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TABULATING MECHANISM

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FIG. 2.

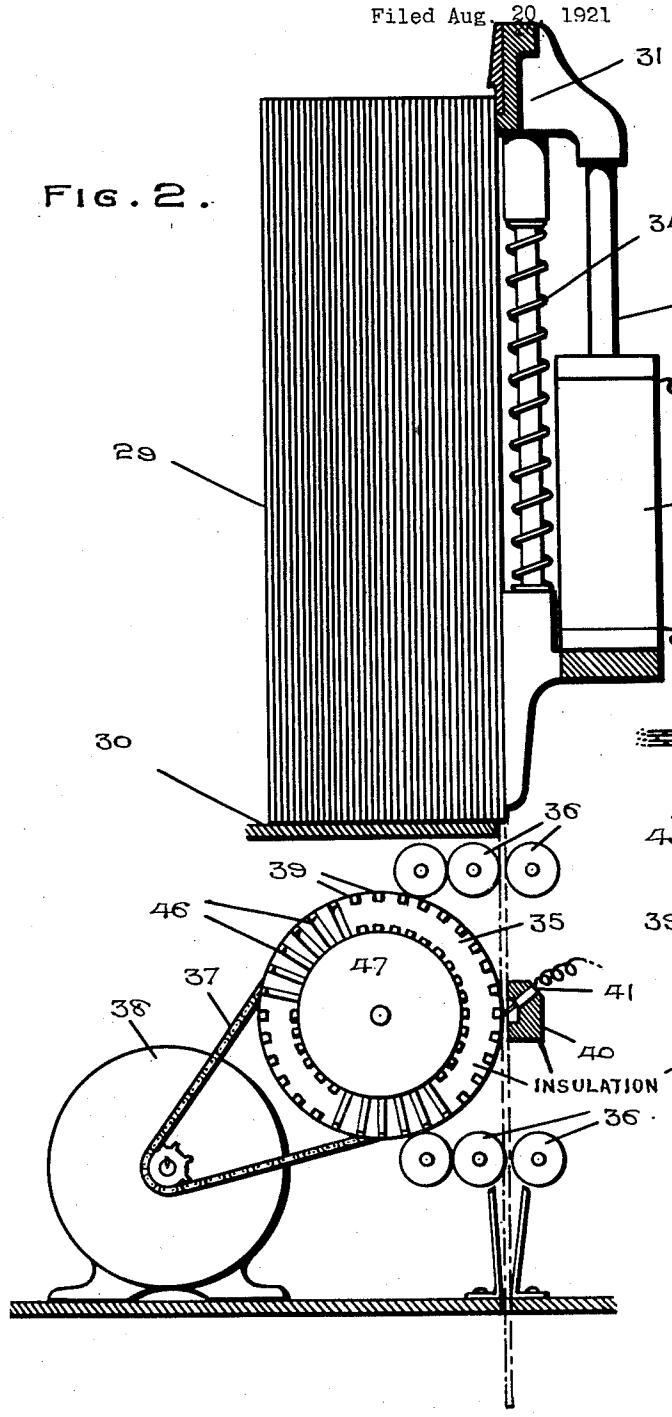
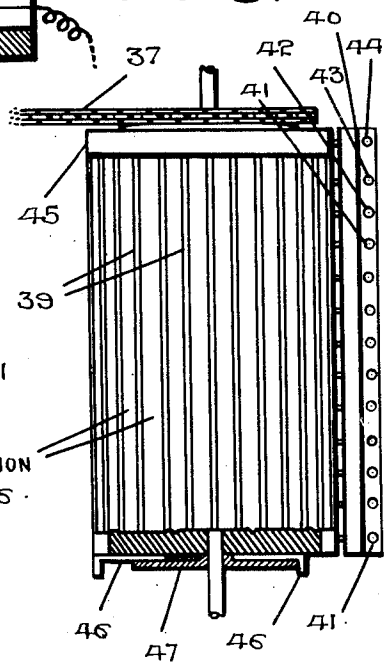


FIG. 3.



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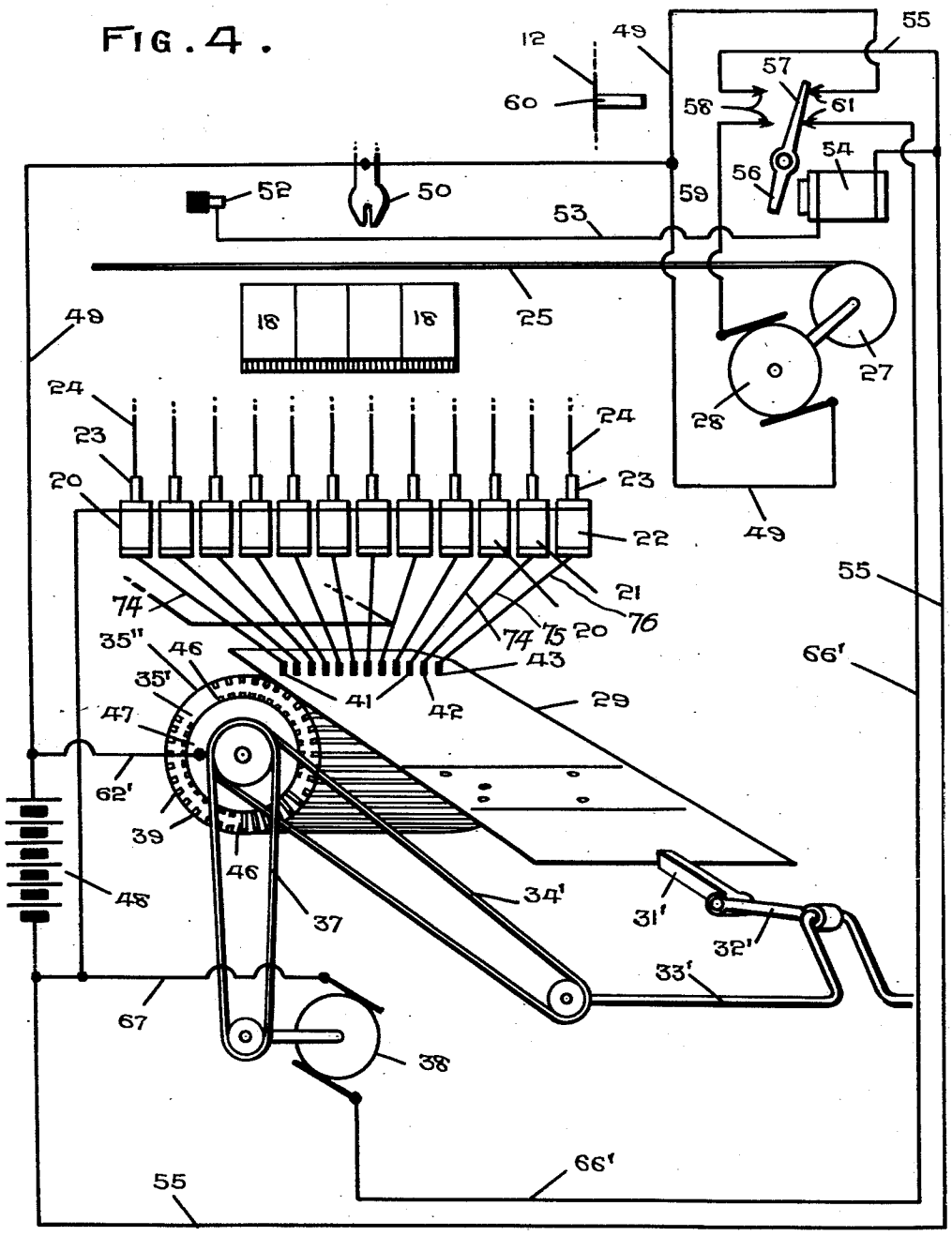
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TABULATING MECHANISM

Filed Aug. 20, 1921 3 Sheets-Sheet 3

FIG. 4.



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Patented Dec. 9, 1924. 1,519,054

UNITED STATES PATENT OFFICE.

LYNUS CLYDE REYNOLDS, OF WASHINGTON, DISTRICT OF COLUMBIA.

TABULATING MECHANISM.

Application filed August 20, 1921. Serial No. 494,022.

To all whom it may concern:

Be it known that I, LYNUS C. REYNOLDS, a citizen of United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Tabulating Mechanisms, of which the following is a specification, reference being had therein to the accompanying drawing.

The present invention relates to tabulating machines, and more especially to those controlled by cards having apertures punched therein to record numerical data or statistics.

It is well known in this art to use cards having column of digits with apertures or holes punched in the digit spaces of the columns according to the numerical data to be recorded, and such cards are run (longitudinally of the columns) through tabulating machines so that the apertures or holes in the cards control the totalizers, for obtaining totals from the corresponding columns of a series or set of cards. The tabulating machines in use are quite complicated and expensive.

It is the primary object of the present invention to provide a tabulating mechanism which is quite simple in construction and inexpensive, as compared with the tabulating machines which are on the market, and which will do the work in an efficient and satisfactory manner, as well as obtaining added advantages. To this end, the mechanism utilizes a tabulating typewriter or other ten digit key machine suitable for the purpose, with automatic means controlled by the punched cards for operating the type writer or tabulator.

Another object is to provide novel means for operating the digit keys, and also the tabulating key and space bar of the typewriter or tabulator, by the movement of the cards longitudinally of themselves or transversely of the columns for the successive operation of the keys according to the apertures or holes of the successive columns, whereby the numbers can be printed by the typewriter or tabulator and the totals of the several columns registered.

A further object is the provision of a novel contact device past which the cards are movable transversely of the columns thereof, and including an arrangement whereby the circuits can be opened or rendered inoperative for certain columns of the cards which are not used in making the tabulations for the particular work at hand. By such arrangement, the typewriter or tabulator is automatically operated by the apertures of certain columns of the cards, and will not be operated or controlled by the apertures in the other columns, according to a predetermined selection.

A still further object is the provision of novel means for the return of the typewriter or tabulator carriage, and for synchronizing the operation of the typewriter and card feeding means so that there is a proper cooperation between the component elements of the mechanism or organization.

With the foregoing and other objects in view, which will be apparent as the description proceeds, the invention resides in the construction and arrangement of parts hereinafter described and claimed, it being understood that changes can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a diagrammatical view of the mechanism.

Fig. 2 is a fragmentary side elevation of the card feeding means and contact device, portions being shown section.

Fig. 3 is a plan view of the contact device, portions being shown in section.

Fig. 4 is a diagrammatical view showing certain modifications.

The mechanism uses as the tabulator a typewriter 11 or other suitable ten digit key machine which may have a suitable number of totalizers or registers controlled at the different positions of the carriage 12. The carriage 12 carries, as usual, the platen 13 around which the paper or sheet 14 extends for the printing of the numerals thereon in columns, as when tabulating. The typewriter or tabulator has the ten digit keys 15, the tabulator key 16 for bringing the carriage to the desired tabulating positions in succession as well known, and the space bar 17 for the movement of the carriage one step at a time without printing. The typewriter has mounted thereon or associated therewith a suitable number of totalizers or registers 18, as well known in tabulating typewriters, for indicating the totals of columns of figures written by the machine, there being a totalizer or register

for each column, and subtractors can also be used, when both credits and debits are to be tabulated. A cross totalizer or register 19 is also preferably used for indicating the cross totals of the columns. The foregoing construction consists in the ordinary tabulating typewriter, which is used for the purposes of the present invention, it being understood that when the numbers are typewritten in the different columns, the corresponding amounts are added to or subtracted from the totals indicated by the totalizers or registers 18, and the totalizer 19 carries a cross total for the several columns jointly.

In order to automatically operate the typewriter, solenoids 20 or other suitable operators are used, having the movable cores 23 or other members connected by suitable connections 24 with the digit keys 15 of the typewriter. Another solenoid 21 or operator has its core or movable member similarly connected with the tabulator key 16, and a solenoid 22 or operator has its core or member connected to the space bar 17, so that when the solenoids 20 are energized the corresponding digit keys are depressed for printing the numerals, whereas the solenoids 21 and 22 operate the tabulator key 16 and space bar 17 for the movement of the carriage without printing. The solenoids or electromagnets may be conveniently used for operating the keys although other suitable operating means can be used.

Suitable carriage return means is provided, and, as shown, includes the cord or flexible element 25 connected to the carriage return lever or handle 26, so that when said cord is pulled, it will not only return the carriage but also turn the platen 13 to advance the sheet 14 one line or step longitudinally of the columns. The record 25 is wound on a drum 27 which is operated by an electric motor 28, so that when the motor is operated, the cord is wound on the drum to return the carriage, although other equivalent means can be used. The punched cards 29 are fed from a magazine 30 in which they are disposed to be moved longitudinally from the magazine or transversely of the columns on the cards. A reciprocatory feeder 31 feeds or starts the cards one at a time from the magazine, and, as shown in Fig. 2, carries a movable core 32 of a solenoid 33 for the electrical operation of the feeder to advance the cards in succession, said feeder being returned by a spring 34 when the solenoid is deenergized.

A contact device is provided for the passage of the cards one at a time from the magazine, and includes a drum 35 mounted for rotation in a position transversely of the cards or parallel with the columns thereof, so that said drum has a rolling contact with the cards as they move past the drum. Feed rolls 36 can be geared to or rotated with the drum 35 to assist in moving the cards past the drum. The drum 35 is of insulating material and has inserted in the circumference thereof an annular series of contact bars 39 parallel with the axis of the drum, there being one cotnact bar 39 for each column of the card 29. At that side of the path of the cards through the contact device opposite to the drum 35 there is disposed a bar 40 of insulating material carrying a series of digit contact brushes 41 (one for each key 15) and also contact brushes 42, 43 and 44. Said brushes are arranged in a series transversely of the cards and parallel with the bars 39. The brushes 41, 42 and 43 can contact with the bars 39 through the apertures or holes in the cards, for closing the circuits of the corresponding solenoids 20, 21 and 22, as will hereinafter more fully appear, while the brush 44 contacts with a contact ring 45 on the drum 35 and insulated from the bars 39, said brush 44 only contacting with the ring 45 when there is no card between the brushes and drum.

The drum 35 is connected, as at 37, with an electric motor 38 for rotating said drum and the feed rolls 36 when the motor operates.

The drum has means for the selective bringing of the bars 39 into an electrical circuit, including switches 46 slidable radially at one end of the drum, as shown, behind a disk 47. Thus, when the switches 46 are shoved inwardly away from the bars 39, the circuits of the corresponding bars are opened, whereas when the switches are moved outwardly into engagement with the bars 39, the circuits of such bars are closed at such points. In this way, the selected bars 39 can be connected in the circuit, while the other bars 39 remain dead, and it is thus possible to select those columns of the cards from which the tabulations are to be made, while the other columns are not used. To make the selection, the operator, before the machine is operated, simply moves the corresponding switches 46 outwardly or inwardly to correspond with the columns of the cards which are used and those which are to be disregarded.

Reference is had to Fig. 1 for the electrical circuits. The electrical energy is supplied from a battery 48 or other suitable source, having one pole connected by a conductor 49 with the pointer or index 50 of the carriage 12 which moves along the scale 51, and an insulated contact 52 is mounted adjustably on the typewriter frame to be positioned at different points along the scale 51 for starting the return of the carriage when the pointer 50 meets or engages the contact 52. This is for the purpose of returning the carriage when it has moved for the printing of the number in the last column, the con-

tact 52 being set at such a position to return the carriage when it has moved to complete the printing of the numbers in the several columns. The conductor 49 is also connected to one terminal or brush of the motor 28. The contact 52 is connected by a conductor 53 with one terminal of an electro-magnet 54 which has its other terminal connected to a conductor 55 leading to the other pole of the battery 48, so that when the pointer 50 touches the contact 52, this will energize the magnet 54. An armature 56 is attracted by the magnet 54 and operates a switch 57 to bring said switch against the contacts 58, when the armature is attracted to said magnet, which will close the circuit of the motor 28 for the return of the carriage. Thus, the conductor 49 is connected to one terminal or brush of the motor, as above stated, and the other terminal or brush is connected by a conductor 59 with one contact 58, while the other contact is connected to the conductor 55, to complete the circuit when the switch 57 engages the contacts 58. The carriage 12 has a tripping member 60 to engage the switch 57 when the carriage is returned, for removing said switch from the contacts 58 and returning the switch against contacts 61. A conductor 62 is connected to the disk 47 and to a contact 63 engaged by a switch 64 which is connected by a conductor 65 with the conductor 49 and corresponding pole of the battery. One terminal or brush of the motor 38 is connected by a conductor 66 with the conductor 62, and the other terminal or brush is connected by a branch conductor 67 with the conductor 55. The brush 44 is also connected by a conductor 68 with the conductor 55, while the ring 45 is connected by a conductor 69 with one terminal of an electro-magnet 70 having its other terminal connected to the conductor 65, said magnet 70 influencing the switch 64 to remove it from the contact 63 and bring it against a contact 71. The contact 71 is connected by a conductor 72 with one terminal of the solenoid 33 which has its other terminal connected by the conductor 73 with one contact 61, the other contact being connected to the conductor 55. The brushes 41 are connected to the magnets 20 by conductors 74, and the brushes 42 and 43 are connected by the respective conductors 75 and 76 with the magnets 21 and 22, while the other terminals of said magnets 20, 21 and 22 are connected by a conductor 77 with the conductor 55.

The operation of the mechanism is as follows: Supposing that a card 29 is between the drum 35 and contact brushes 41, 42, 43 and 44, such card will break the circuit of the magnet 70 between the brush 44 and contact ring 45, thereby releasing the switch 64 so that said switch bears against the contact 63. This connects the disk 47 and motor 38 with the battery 48, and the motor 38 is therefore operated to rotate the drum 35 and rolls 36 to advance the card longitudinally, or transversely of the columns thereof past the contact brushes which cooperate with the drum. During such movement of the card through the contact device, the contact brushes will contact with the bars 39 of the drum 35 through the apertures or holes in the card. The magnets 20 are thus energized in succession according to the apertures, while the magnets 21 and 22 are energized when the brushes 42 and 43 contact with the corresponding bars 39 when the card is punched for the spacing of the type writer carriage one or more steps to the desired columns. When certain columns of the cards are to be disregarded, the corresponding switches 46 of the drum are moved inwardly, thereby disconnecting the corresponding bars 39 from the circuit, so that the brushes in contacting with such dead bars, will not energize the magnets 20. The desired columns can thus be selected for which the data is to be tabulated on the typewriter or tabulator. The bars 39 register with the corresponding columns of the successive cards as they pass from the magazine through the contact device, so that the position of the switches 46 will bring the columns of the cards into or out of control, and the desired selection of columns and elimination of the others from the tabulation is thereby conveniently obtained. The typewriter or tabulator is automatically operated according to the apertures in the columns of the cards, and the amounts or numbers indicated by the apertures on the cards are written on the sheet 14 in the corresponding columns, the carriage 12 moving step by step and from one column to another. In the arrangement shown, there are four columns in the tabulation being made, taking the amounts from the corresponding columns of the cards. When the amounts have been written in the several columns and added to the amounts indicated by the totalizers 18, the pointer or contact 50 comes into engagement with the contact 52, which closes the circuit of the magnet 54, including the battery 48, conductor 49, pointer 50, contact 52, conductor 53, magnet 54, and conductor 55. The magnet 54 being energized will move the switch 57 from the contacts 61 against the contacts 58, which closes the circuit of the motor 28, including the battery 48, conductor 49, motor 28, conductor 59, contacts 58 and switch 57, and conductor 55. The carriage-returning motor 28 is thus operated to return the carriage and advance the platen 13 and sheet 14 for the next line of numerals. When the carriage is returned, the tripping member 60 moves the switch 57 from the

contacts 58 against the contacts 61, thereby opening the circuit of the motor 28, to stop the motor and carriage. As soon as the carriage starts to return, the pointer 50 is removed from the contact 52, thereby opening the circuit of the magnet 54, but the switch 57 will remain against the contacts 58 until moved by the member 60 against the contacts 61. In other words, the switch 57 will remain in either position until reversed by the magnet 54 or tripping member 60. The carriage may be returning while the card is still going through the contact device, after the selected columns of the card have moved between the contact brushes and drum, thereby saving time inasmuch as the carriage may be returned before the card has gone through the contact device. When the card passes from between the brushes and drum of the contact device, the brush 44 engages the contact ring 45, thereby closing the circuit of the magnet 70, including the battery 48, conductor 65, magnet 70, conductor 69, ring 45, brush 44, conductor 68 and conductor 55. The magnet 70 will attract the switch 64, thereby removing it from the contact 63 and opening the circuit of the motor 38. This will stop the drum 35 the moment that the card has passed from between the brushes and drum, and, furthermore, the circuit of the bars 39 is opened between the contact 63 and switch 64, so that the brushes 41, 42 and 43 contacting with the corresponding bars 39 will not energize the solenoids 20, 21 and 22. The switch 64 is moved by the magnet 70 against the contact 71, and if the carriage has been returned and the switch 57 moved against the contacts 61, this will immediately start the next card through the contact device to repeat the operation. Thus, the circuit of the solenoid 33 of the card feeder is closed, including the battery 48, conductor 65, switch 64, contact 71, conductor 72, solenoid 33, conductor 73, contacts 61 and switch 57, and conductor 55. The next card is therefore moved between the brushes and drum of the contact device, and as soon as the card passes between the brush 44 and ring 45, the circuit of the magnet 70 is opened, and the switch 64 is released so that it again engages the contact 63, thereby starting the motor 38 and the operation is repeated as before. The successive cards thus pass through the contact device and operate the typewriter or tabulator automatically, to write the amounts or numerals on the sheet 14, and the column totals are indicated or registered by the totalizers 18, while a cross total of the several columns is kept by the cross totalizer 19. The totalizers 18 and 19 are in common use on tabulating typewriters, as well known, and will indicate the totals for the individual columns as well as the aggregate total. Such total amounts as indicated by the totalizers can be noted, when the columns are written, and, if desired, the totals can be manually typewritten on the sheet in accordance with the usual manual operation of the typewriter.

A modified arrangement is shown in Fig. 4 wherein the brush 44, ring 45, switch 64, magnet 70 and corresponding parts are eliminated, and the card feeder 31′ is operated with the drum 35′, such as by a mechanical connection including the link 32′ connecting the feeder with a crank shaft 33′ which is connected, as at 34′, with the drum 35′. The contact drum and feeder thus operate in unison, and the drum cooperates in the same manner with each card as the cards move past the drum. The drum may have a blank space 35″ to register with the space between the cards, so that the brushes 41, 42 and 43 may touch the drum in the blank space 35″ without closing the circuits of the solenoid 20, 21 and 22 when there is no card between the brushes and drum. The cards are fed in succession through the contact device in regular order and with uniform spaces between the cards, for the proper cooperation of the drum with the cards in succession. The disk 47 is connected direct by the conductor 62′ with the conductor 49 and battery 48. One brush or terminal of the motor 38 is connected by the conductor 67 with the conductor 55, while the conductor 66′ leading from the other brush or terminal of the motor 38 is connected to one contact 61, and the other contact 61 is connected to the conductor 49, so that the switch 57, in this arrangement, controls the circuits of the motors 28 and 38. Other than just stated, the mechanism is substantially the same as hereinbefore described, in connection with Fig. 1. The solenoids 20, 21 and 22 are energized by the engagement of the brushes 41, 42 and 43 with the corresponding bars 39 through the apertures in the card 29, for operating the typewriter or tabulator. With this arrangement, several columns of each card may be used for the tabulations, or a single column of each of a set or group of cards. Thus, if several columns of each card are used, the typewriter carriage 12 will complete its movement for each card to bring the pointer 50 against the contact 52, which will close the circuit of the magnet 54, thereby moving the switch 57 away from the contacts 61 and against the contacts 58. This will open the circuit of the motor 38, including the battery 48, conductor 67, motor 38, conductor 66′, contacts 61, and conductor 49, so that the drum 35′ is stopped. The motor 28 is brought into operation, so as to return the carriage, and when the carriage is returned, the tripping member 60 moves the switch 57 back against the contacts 61, there-

by stopping the motor 28 and again bringing the motor 38 into operation. This will continue the movement of the card feeder, bringing the next card into position between the contact brushes and drum for the operation of the typewriter. It will be noted that as soon as the pointer 50 strikes the contact 52, the motor 38 and drum 35 are stopped and the motor 28 operated to return the carriage, and when the carriage is returned, the motor 28 is stopped at once and the motor 38 again brought into operation, said motors operating alternately.

The same mechanism can be used for the tabulation of several columns from different cards of a group or set. Thus, the first card of a group may simply operate the typewriter for the first column, the second card for the second column, and so on. Thus, as the successive cards of a group or set pass through the contact device, each card controls the typewriter for one column only, and the typewriter may have as many totalizers or registers 18 as there are cards to each set or group. When the group or set of cards have passed between the contact brushes and drum, the carriage 12 will have moved sufficiently to bring the pointer 50 against the contact 52, thereby stopping the motor 38 and drum 35' and returning the carriage, whereby the operation is repeated by the next group or set of cards. The arrangement as shown in Fig. 4 therefore lends itself for the control of the typewriter by cards individually or groups or sets of cards, which is necessary and desirable for different kinds of tabulations.

By using an ordinary tabulator typewriter or similar ten digit key tabulator as a basis, and using the contact device and electrical or similar operating means for the typewriter or tabulator, a tabulating mechanism is provided which is not only efficient and practical in operation, but which is also simple and comparatively inexpensive. Furthermore, the typewriter can be used for general purposes, and the present invention therefore enables a tabulating typewriter to be used automatically when desired.

With the present mechanism, it is also possible to have the usual or suitable stops for the typewriter carriage, with provision for spaces to the side or between the columns of numerals, in which identification data or legends can be typewritten either manually or automatically. In other words, before a line is written, the typewriter can be operated manually or automatically for typewriting certain identification data or legends, according to the work being done, or such data could be typewritten between certain columns or at the end of a line. It is an easy matter to use the typewriter in this way, for typewriting suitable data in addition to the columns of numerals.

Having thus described the invention, what is claimed as new is:—

1. A tabulating mechanism comprising a tabulating typewriter having a movable carriage and keys for the movement of said carriage, means for feeding apertured cards, a contact device cooperable with said cards for controlling electrical circuits according to the arrangement of the apertures, electrical means controlled by said device for operating said keys, an electrical operator for said feeding means, an electrical carriage returning means, and circuit controlling means operable when the carriage has moved to a predetermined position for closing the circuit of said carriage returning means and opening the circuit of the electrical operator, and operable when the carriage has been returned for opening the circuit of the carriage returning means and closing the circuit of said electrical operator.

2. A tabulating mechanism including contact brushes cooperable with apertured cards movable transversely of the columns thereof, a member movable with each card and having bars to register with the columns on the card for the engagement of said brushes through the apertures, electrical operating means in circuits with said brushes and bars, and means for selectively disconnecting said bars from the circuits.

3. A tabulating mechanism including a set of contact brushes cooperable with apertured cards movable transversely of the columns thereof, a drum arranged to have a rolling contact with the cards and having contact bars thereon to register with the corresponding columns of the cards, operating means electrically connected with said brushes, and means for selectively connecting said operating means electrically with said bars.

4. A tabulating mechanism including a tabulator, a contact device for the passage of apertured cards movable transversely of the columns thereof and having independent contact members for registration with the corresponding columns of the card and means for selectively rendering said members operative and inoperative, and operating means for the tabulator controlled by said contact device.

5. A tabulating mechanism including a set of contact brushes cooperable with apertured cards movable transversely of the columns thereof, a member movable with each card and having bars to register with the corresponding columns of each card for the engagement of said brushes through the apertures, electrical operating means connected to said brushes, and switches for selectively connecting said operating means with said bars.

6. A tabulating mechanism including a set of contact brushes cooperable with apertured cards movable transversely of the columns

thereof, a rotary drum having contact bars thereon to register with the corresponding columns of each card for the engagement of said brushes through the apertures, electrical operating means connected with said brushes, and switches on the drum for selectively connecting said operating means with said bars.

7. A tabulating mechanism including a tabulator, means for feeding apertured cards transversely of the columns thereof, a contact device cooperable with the cards for closing electrical circuits through the apertures thereof, and electrical operating means for said tabulator controlled by said device, said device having means cooperable with the corresponding columns of the card and arranged for rendering the operating means operative and inoperative for the different columns of each card according to a predetermined selection.

8. A tabulating mechanism including a tabulator, means for feeding apertured cards transversely of the columns thereof, a contact device cooperable with the cards for control by the apertures of the cards, and operating means for the tabulator controlled by said device, said device including portions for cooperation with the corresponding columns of each card, and means cooperable therewith for rendering the operating means operative and inoperative for the different columns of the cards according to a predetermined selection.

9. A tabulating mechanism comprising a tabulator having a movable carriage and keys, means for feeding apertured cards transversely of the columns thereof, a set of contact brushes cooperable with the cards, a member movable with each card and having contact bars to register with the corresponding columns of the cards for the engagement of said brushes through said apertures, electrical operating means for said keys connected to said brushes, means for selectively connecting said operating means with said bars for selecting predetermined columns of the cards to control the tabulator, and means operable when the carriage has moved to a predetermined position for returning the carriage and stopping the card feeding means, and operable when the carriage is returned for the operation of the feeding means.

In testimony whereof I hereunto affix my signature.

LYNUS CLYDE REYNOLDS.