

July 28, 1925.

1,547,744

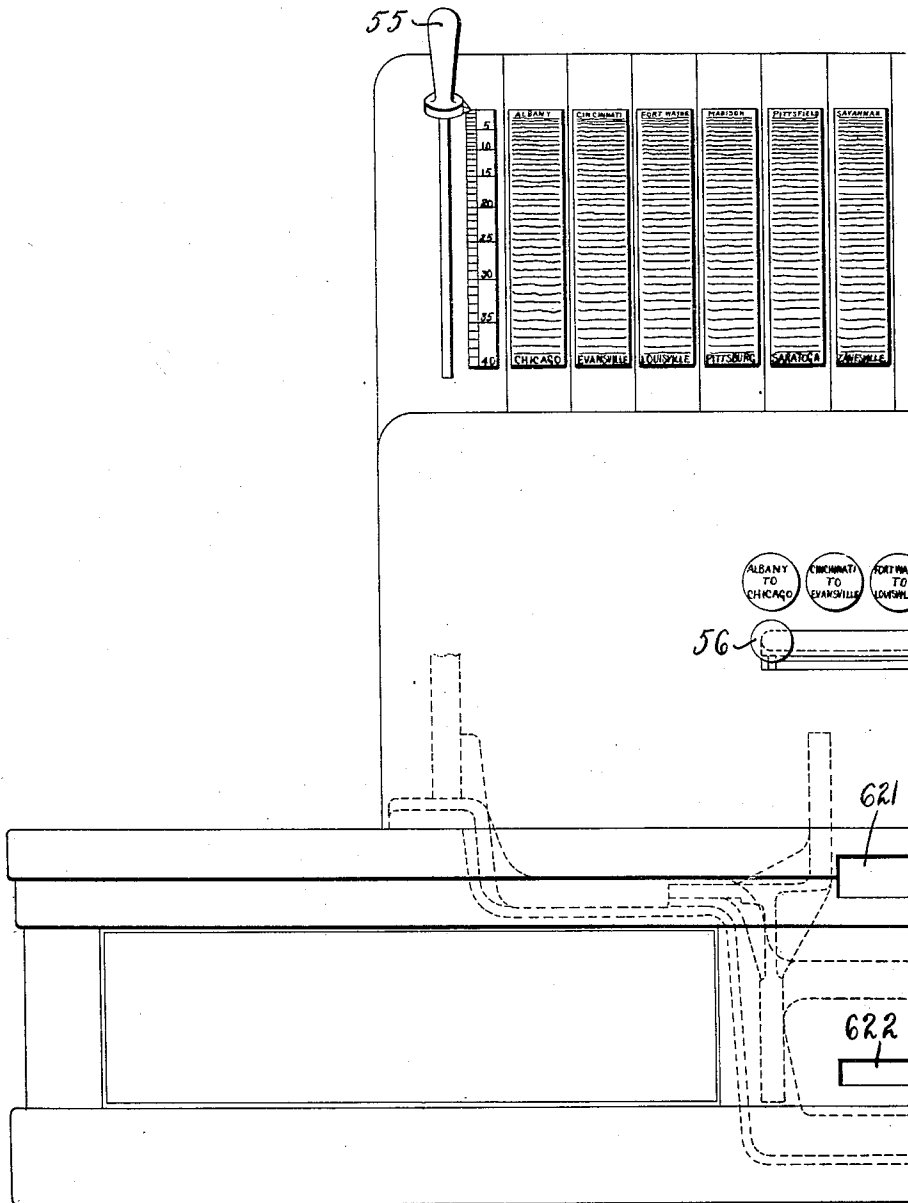
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 1

FIG. 1A.



Inventor
FREDERICK L. FULLER
by *R. C. Sloan*
Earl Benet
Attorneys

July 28, 1925.

1,547,744

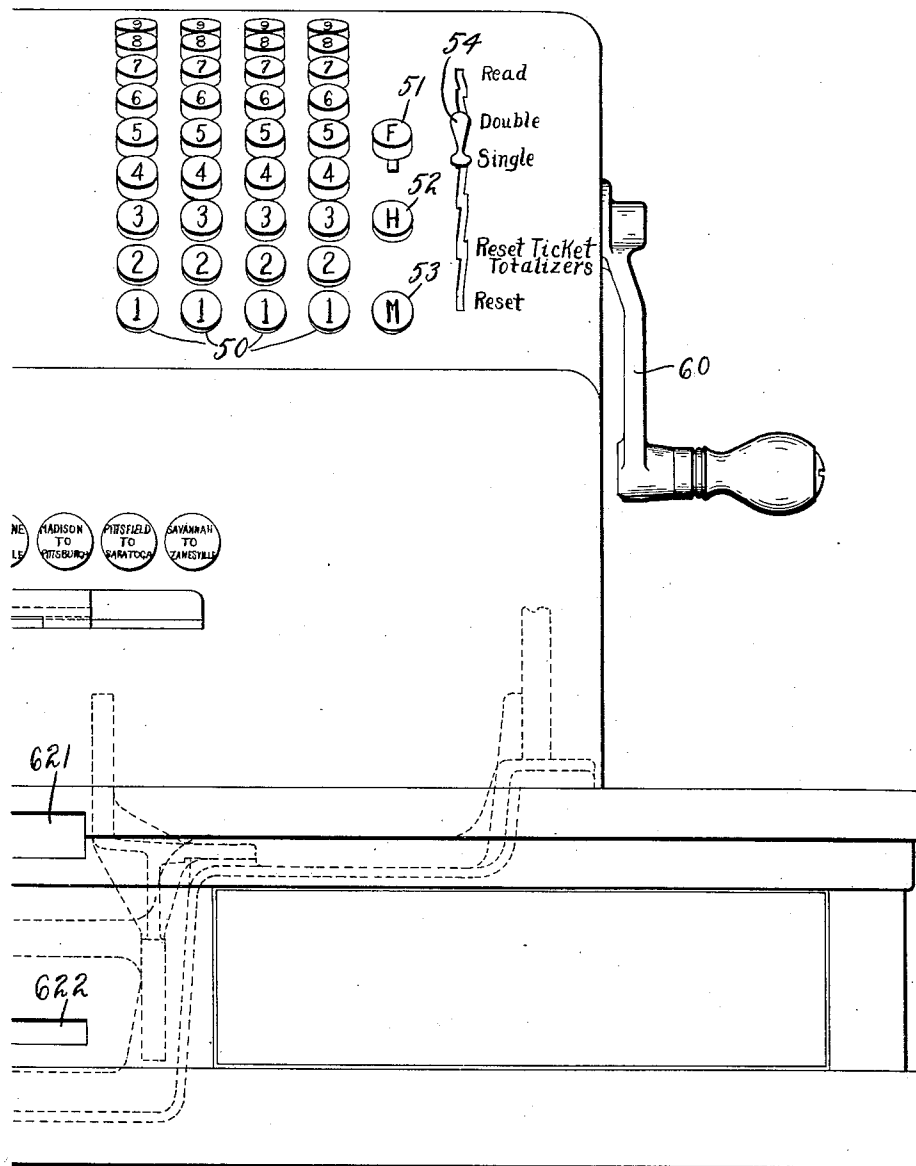
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 2

FIG. 1B.



Inventor
FREDERICK L. FULLER
by *R. A. Hines*
Earl Benest
Attorneys

July 28, 1925.

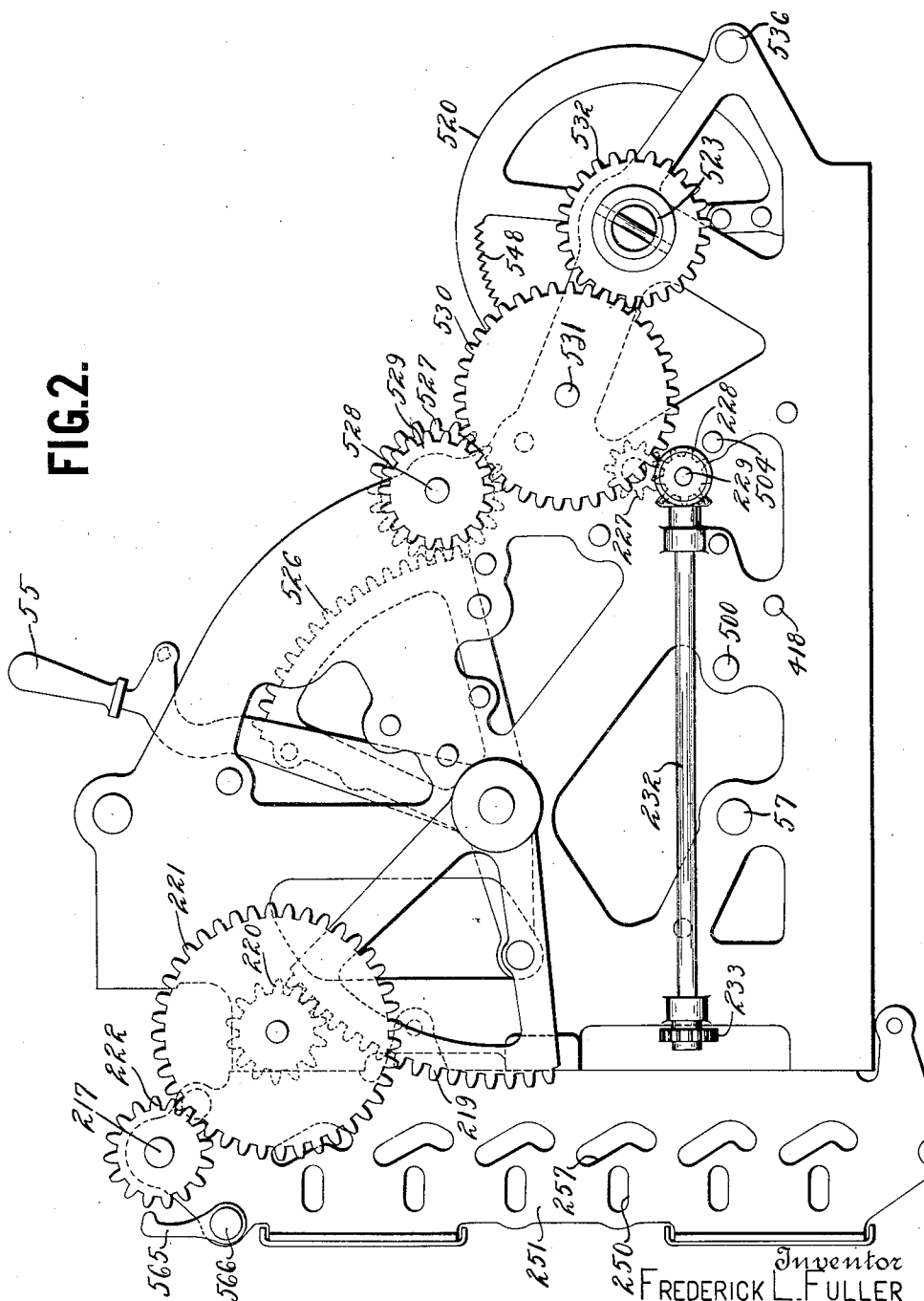
1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 3



Inventor
FREDERICK L. FULLER
by R. Schuss
Carl Benst
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 4

FIG. 3.

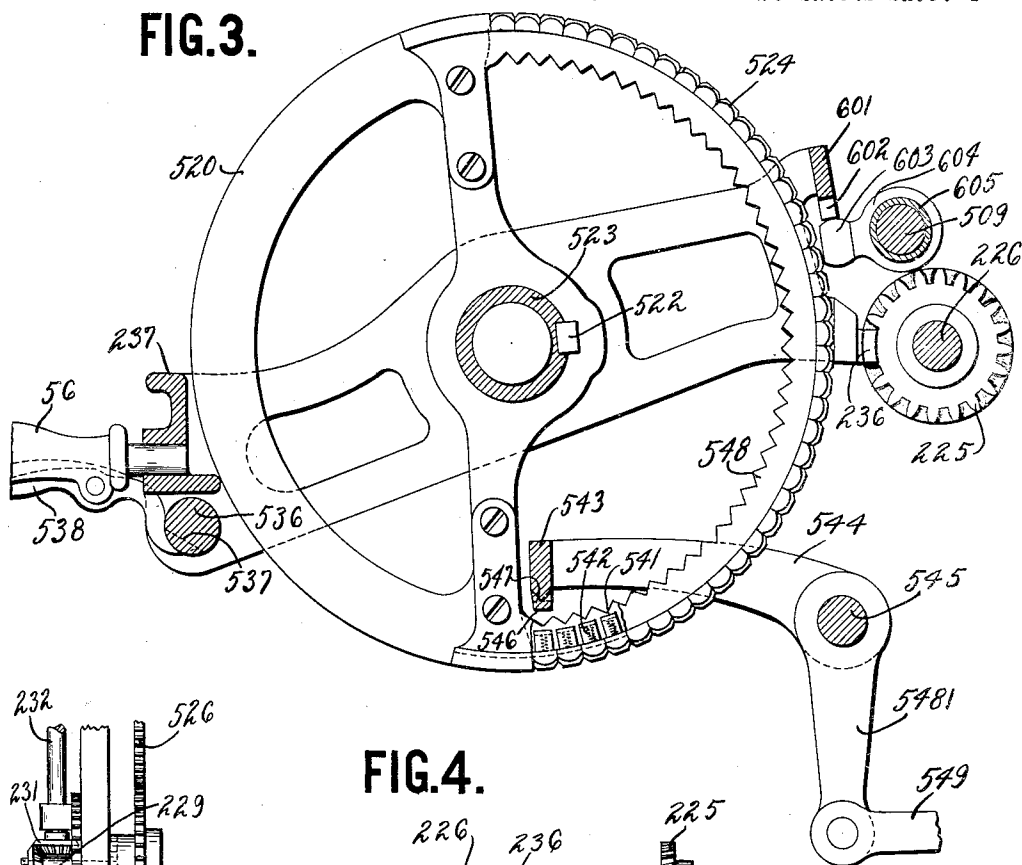
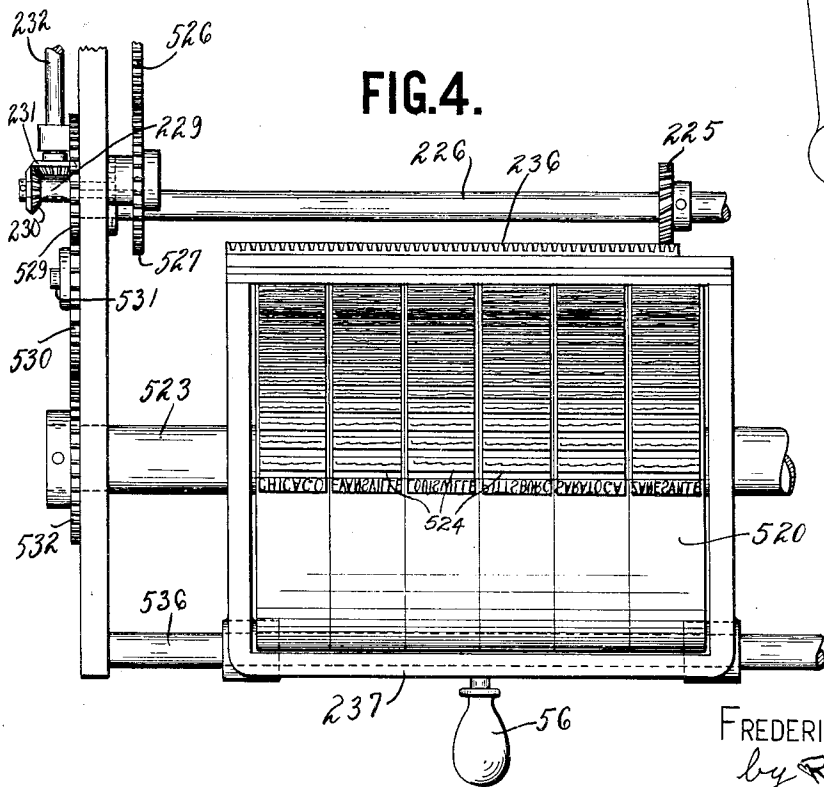


FIG. 4.



Inventor
FREDERICK L. FULLER
by *R. C. Glass*
Earl Beust
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 5

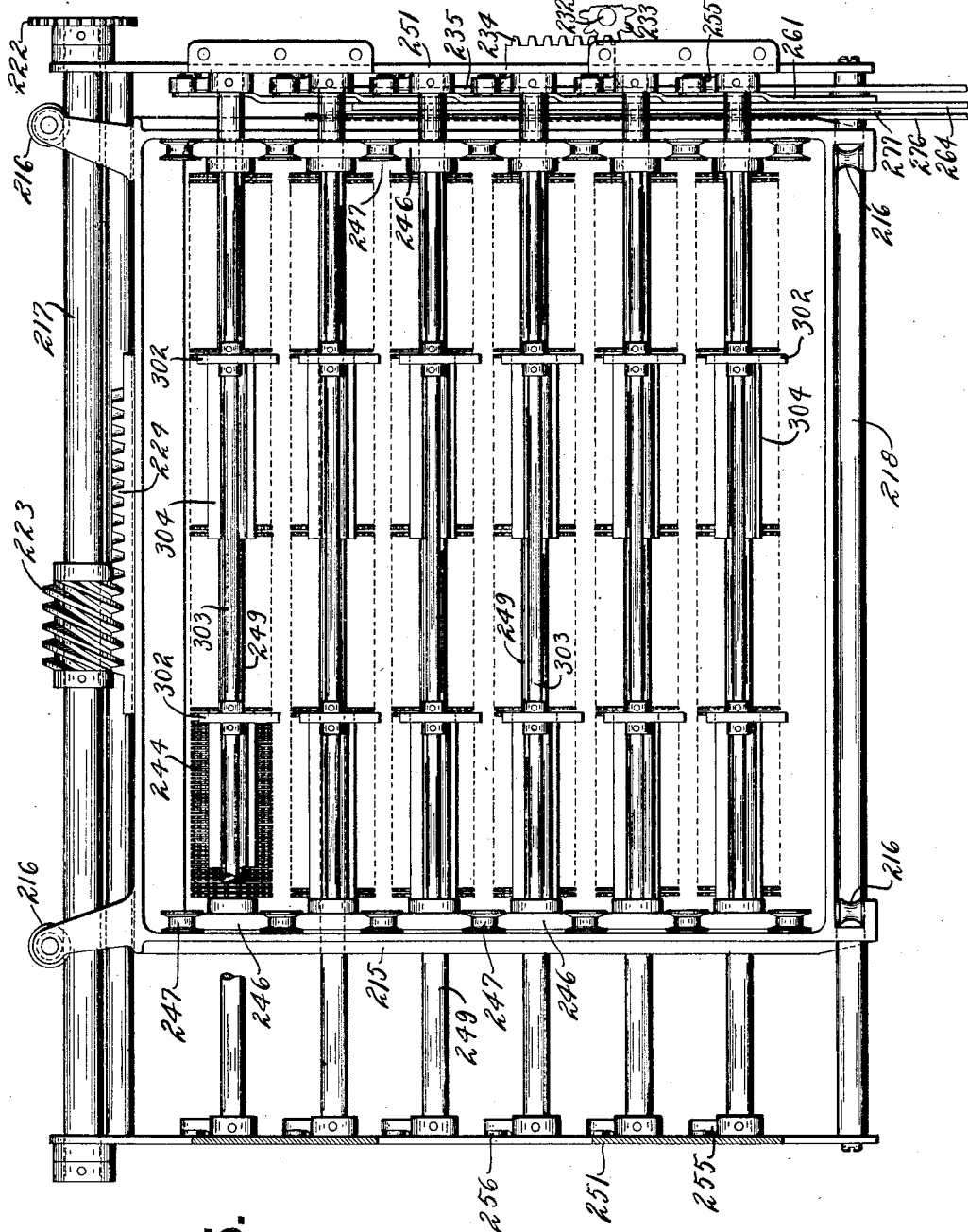


FIG. 5.

Inventor
FREDERICK L. FULLER
by *R. C. Chase*
Carl Beust
Attorneys

July 28, 1925.

1,547,744

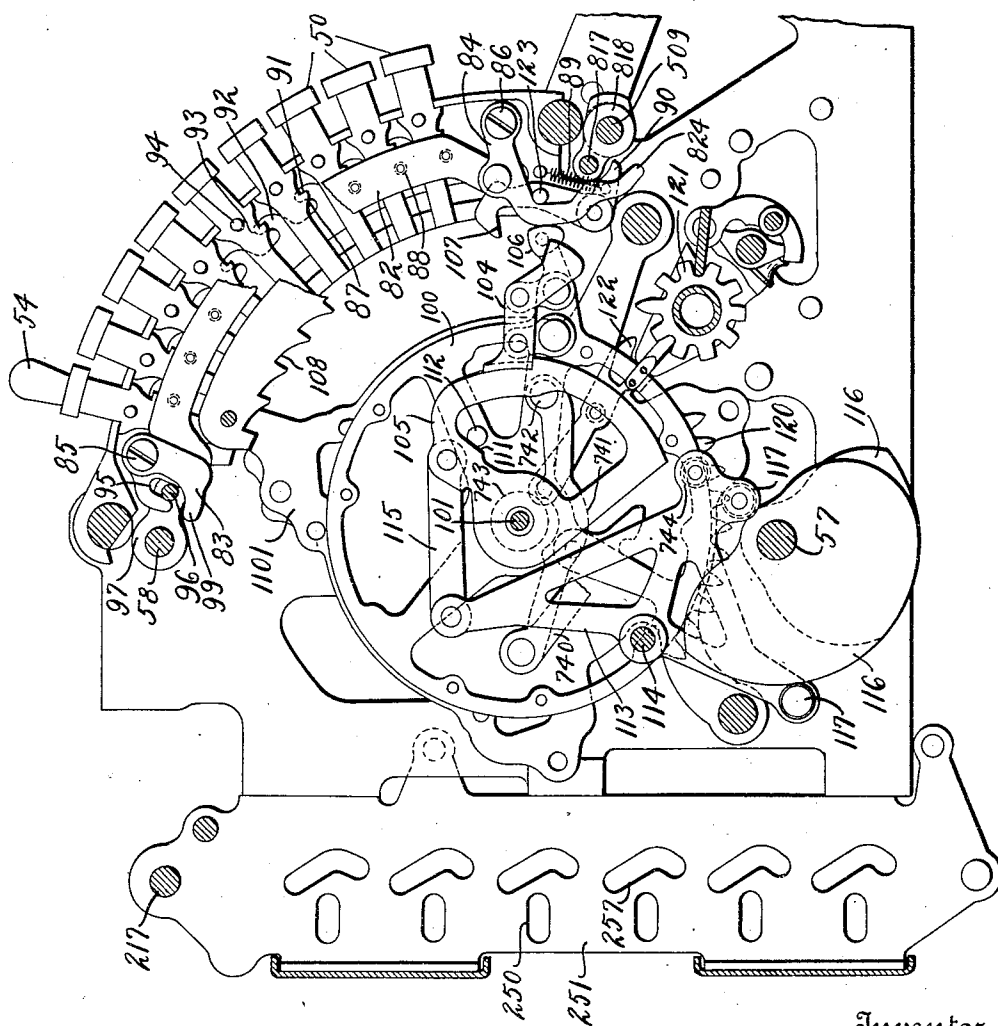
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 6

FIG. 6.



July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 7

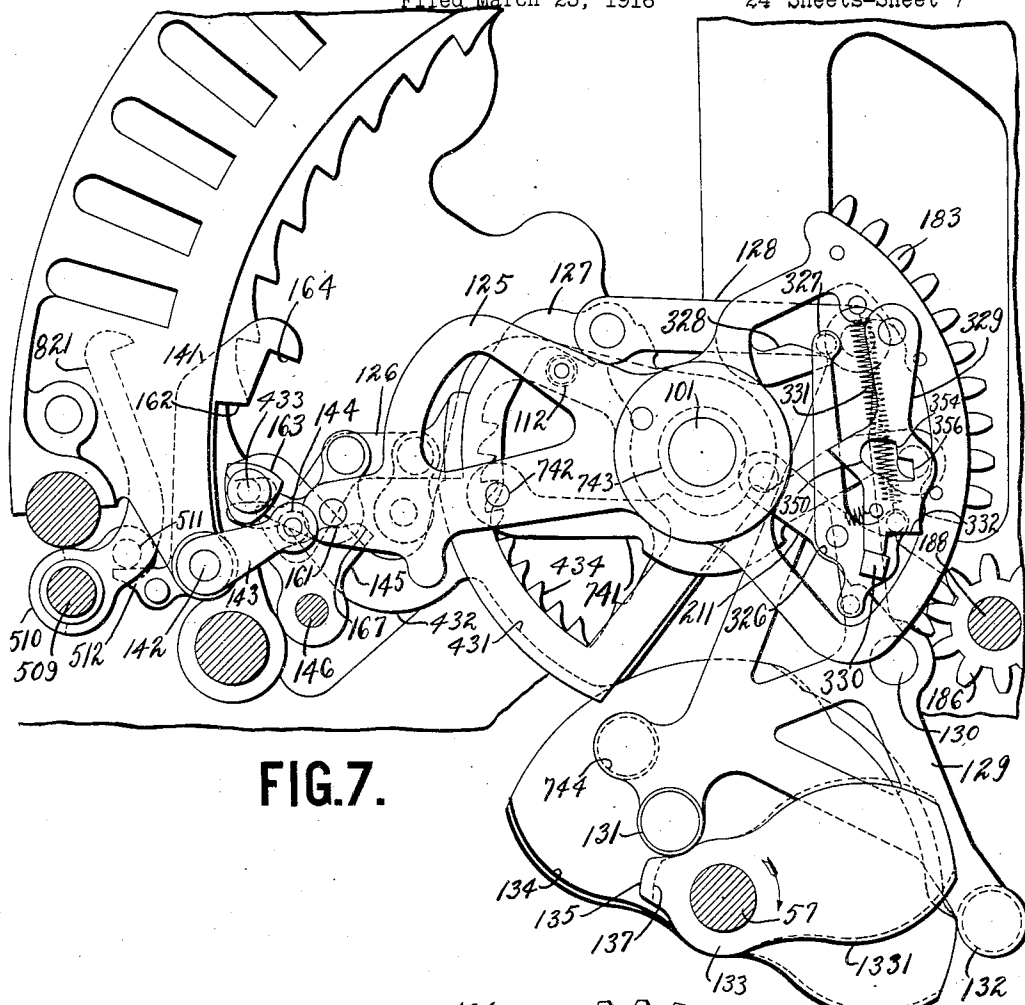


FIG. 7.

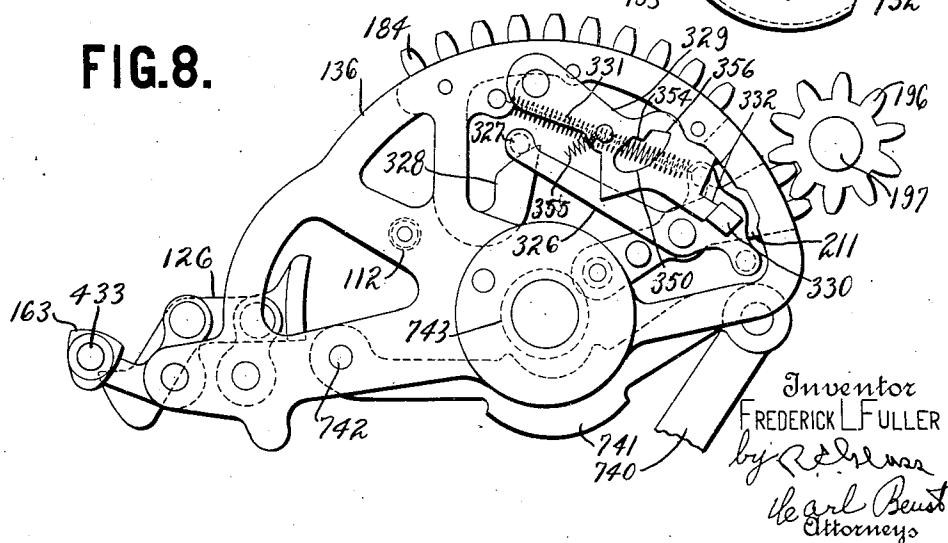


FIG. 8.

Inventor
FREDERICK L. FULLER
by *R. E. Deane*
Legal Beust
Attorneys

July 28, 1925.

1,547,744

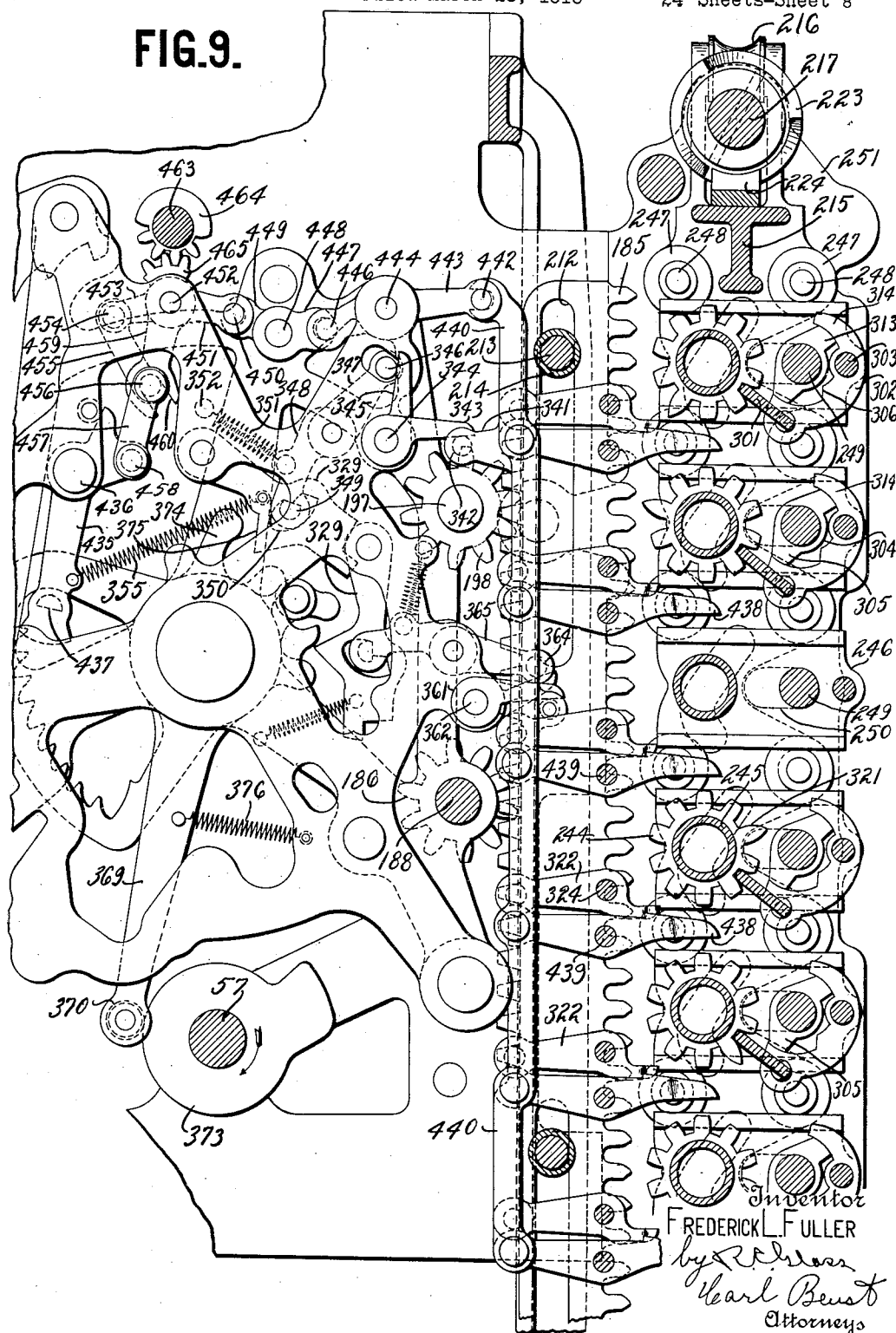
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 8

FIG.9.



July 28, 1925.

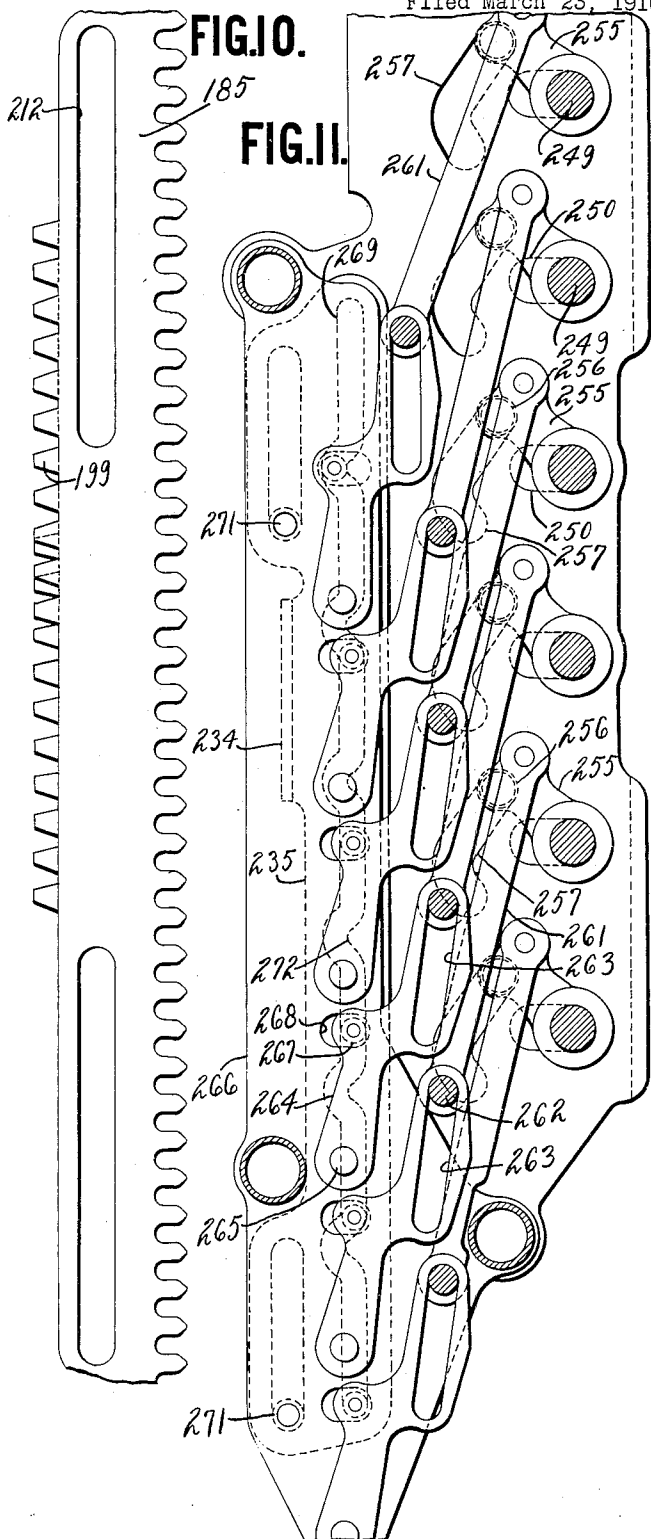
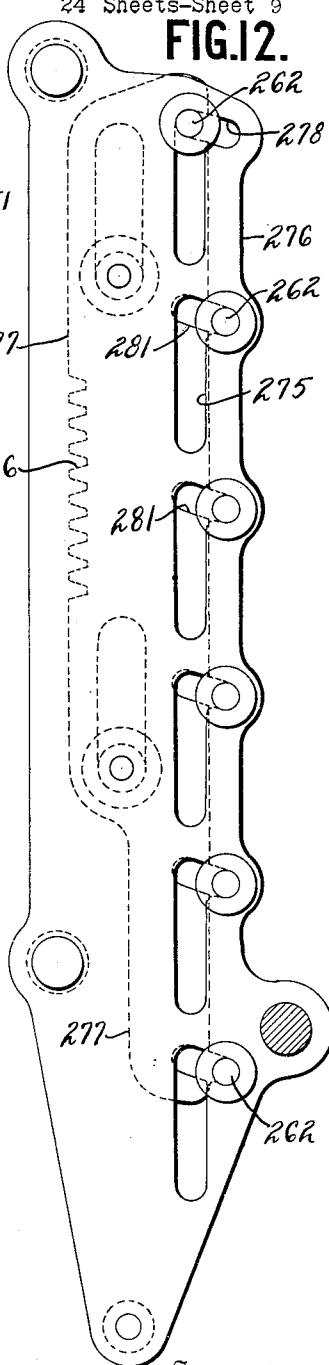
1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 9



Inventor
FREDERICK L. FULLER
by *R. C. Glass*
Earl Beust
Attorneys

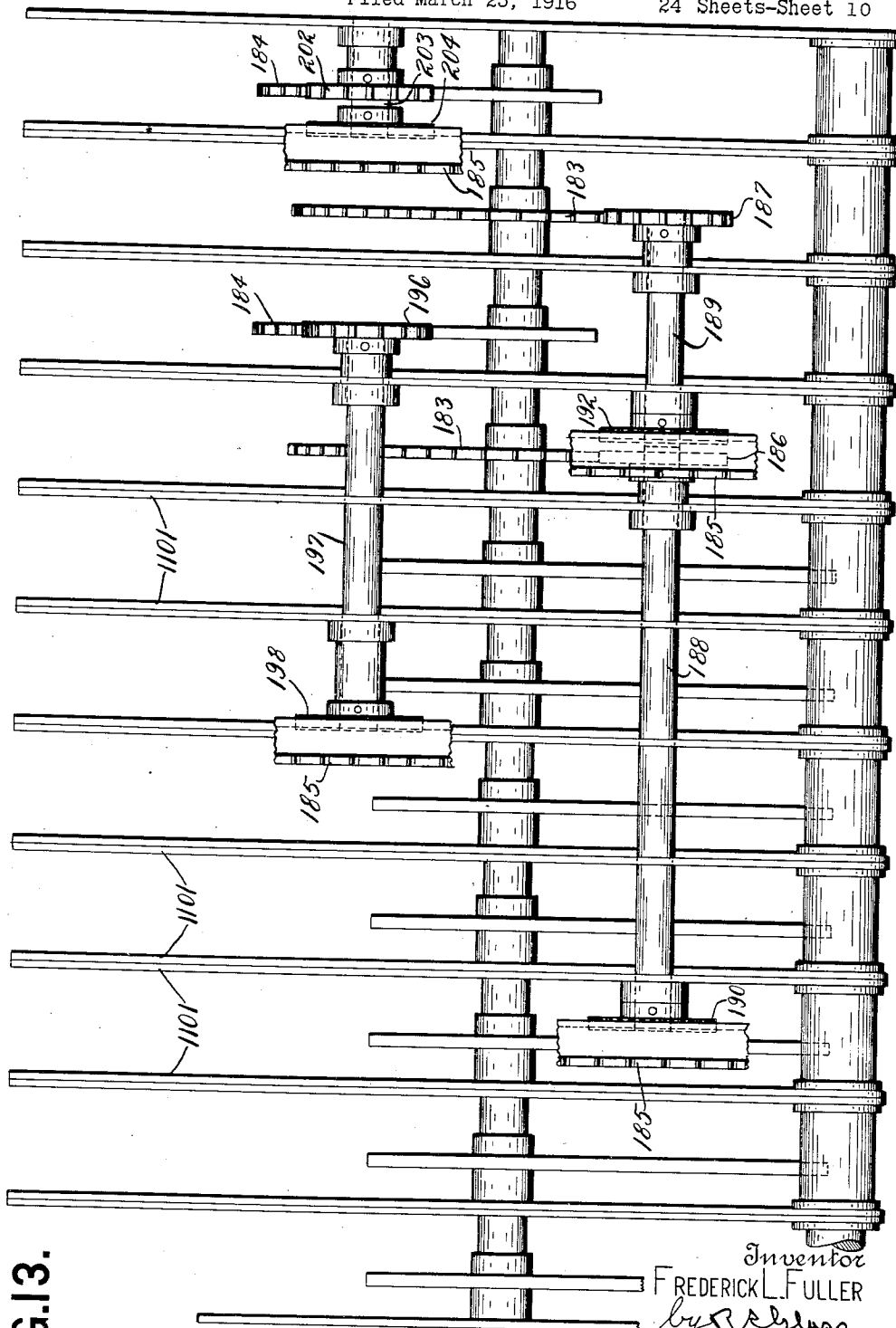
FIG. 3.

Inventor
FREDERICK L. FULLER
by *R. S. Sloss*
Charles Beust
Attorneys

Inventor
FREDERICK L. FULLER

by R. S. Sloss

Heart Beus
Attorneys



July 28, 1925.

1,547,744

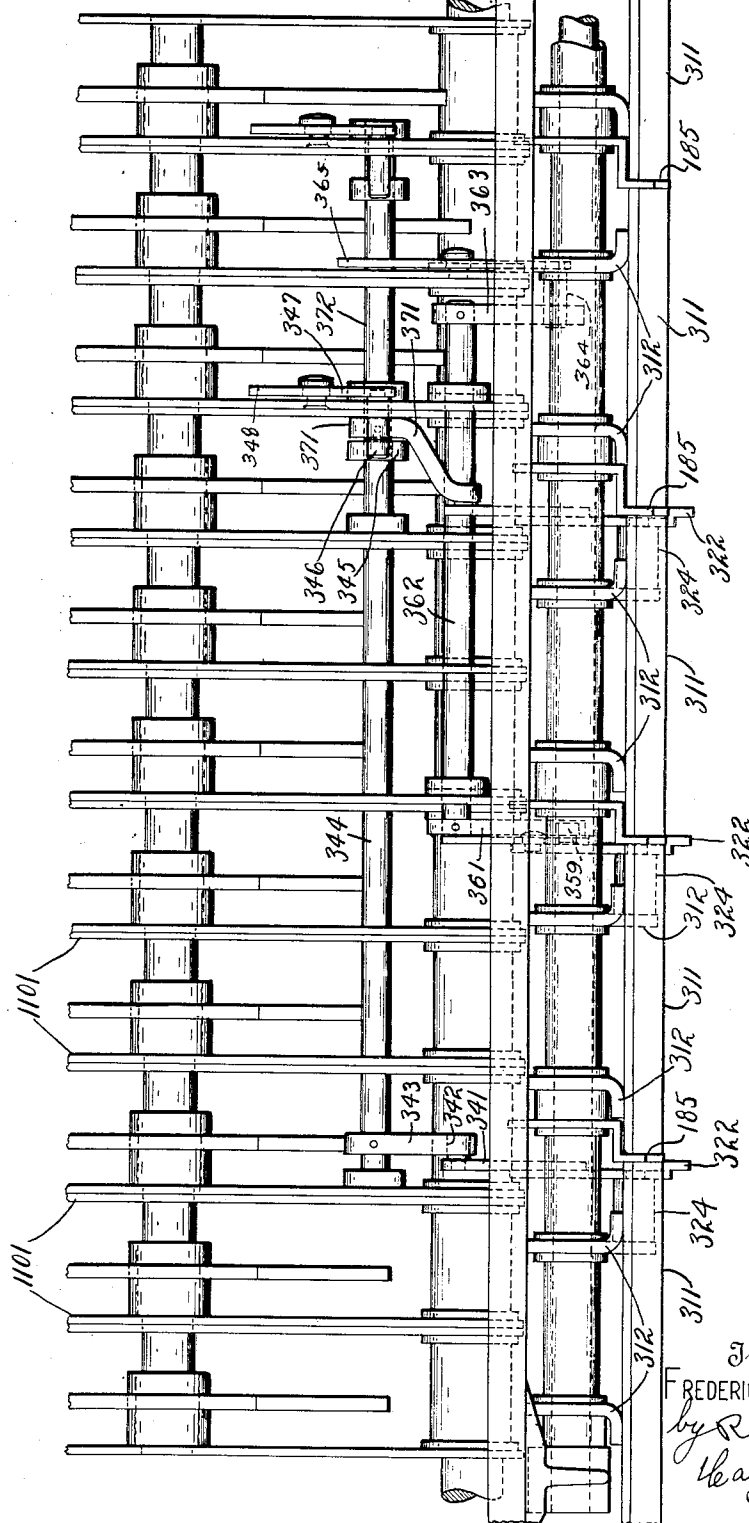
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 11

FIG. 14.



Inventor
FREDERICK L. FULLER
by *R. C. Glass*
Harold Benoit
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 12

FIG. 15.

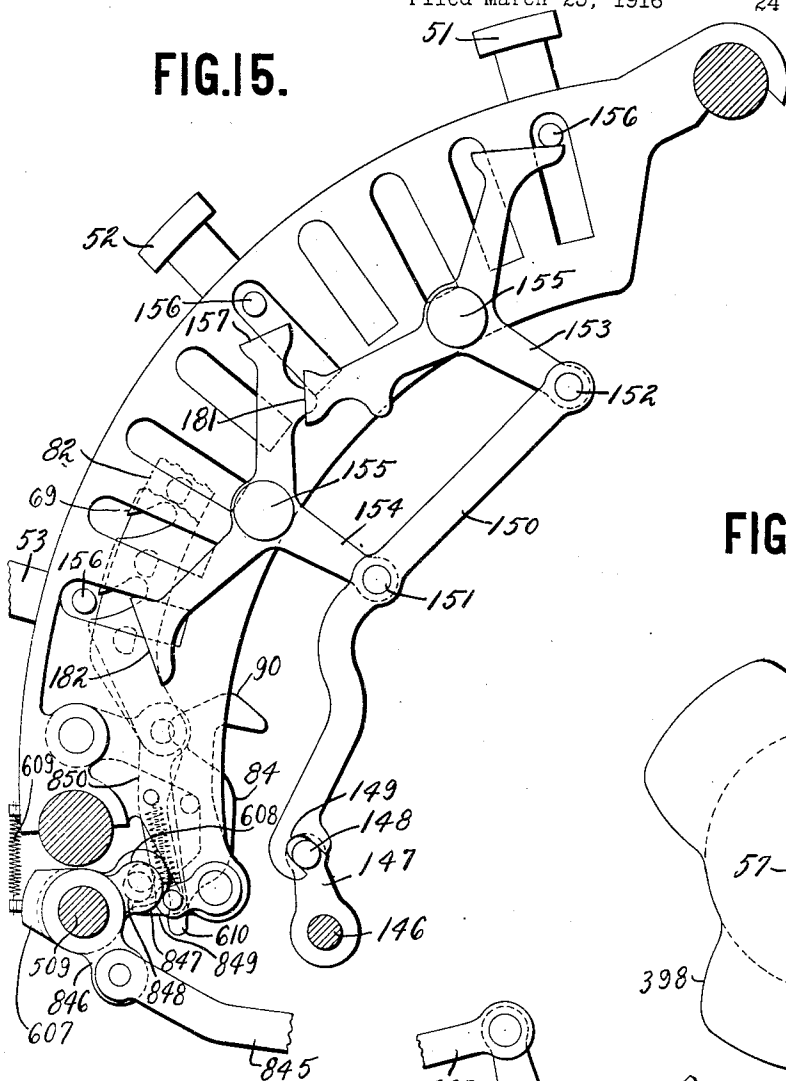


FIG. 16.

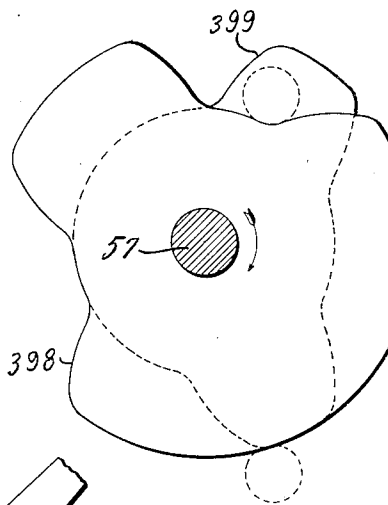
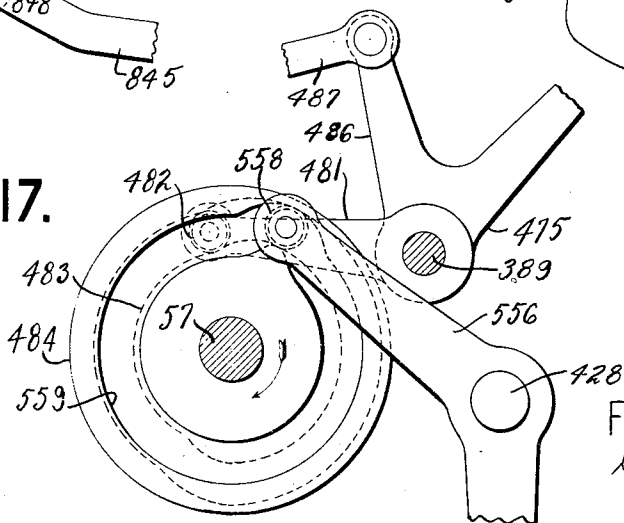


FIG. 17.



Inventor
FREDERICK L. FULLER
by *R. C. H. H. H.*
Earl Beust,
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 13

FIG.18.

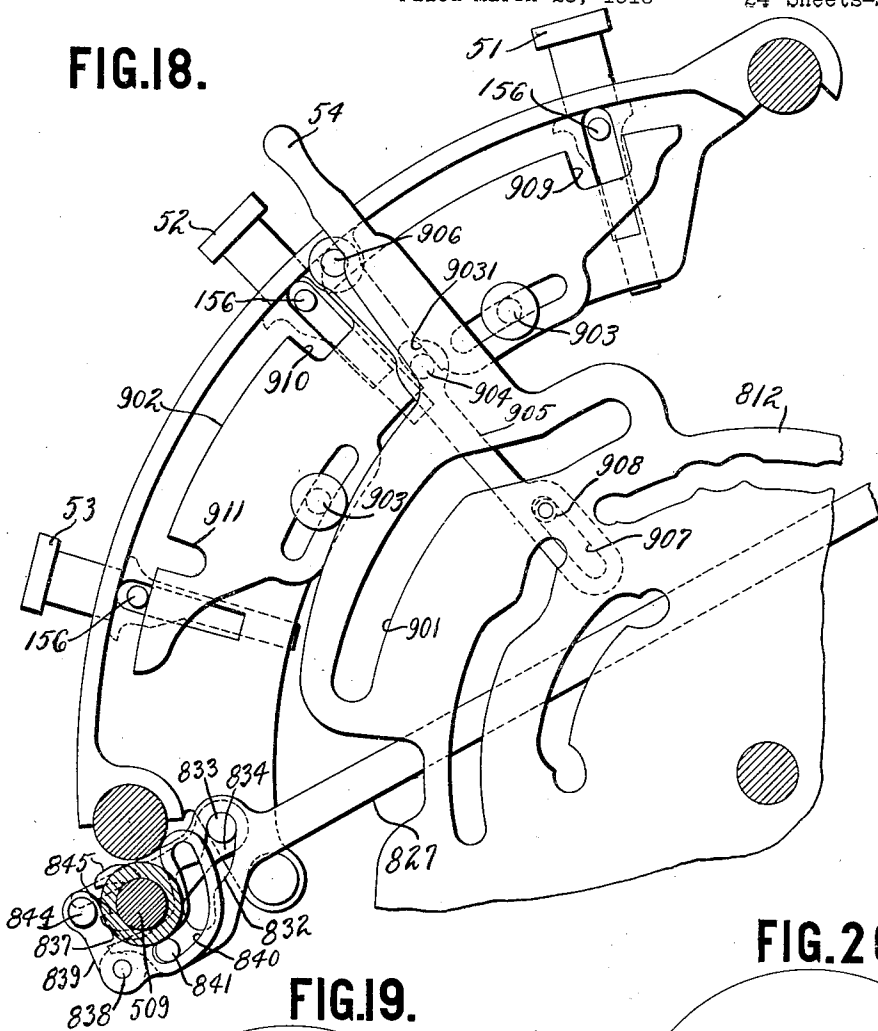


FIG.19.

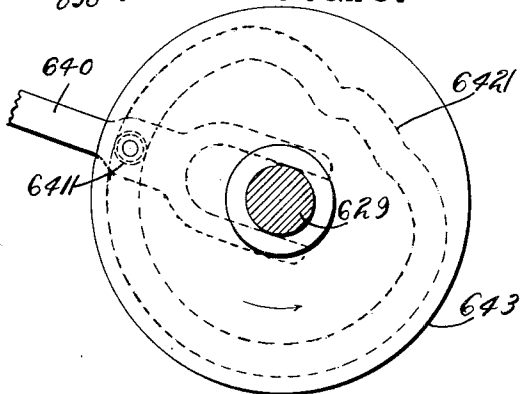
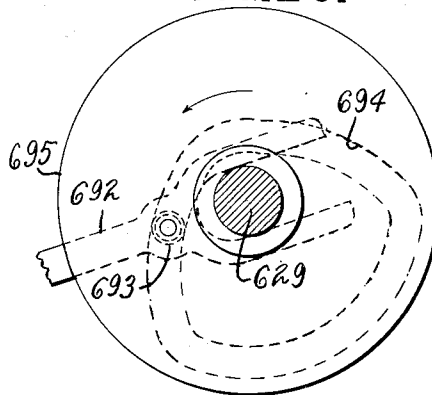


FIG.20.



Inventor
FREDERICK L. FULLER
by *R. C. H. H. H.*
Heard Beust
Attorneys

July 28, 1925.

1,547,744

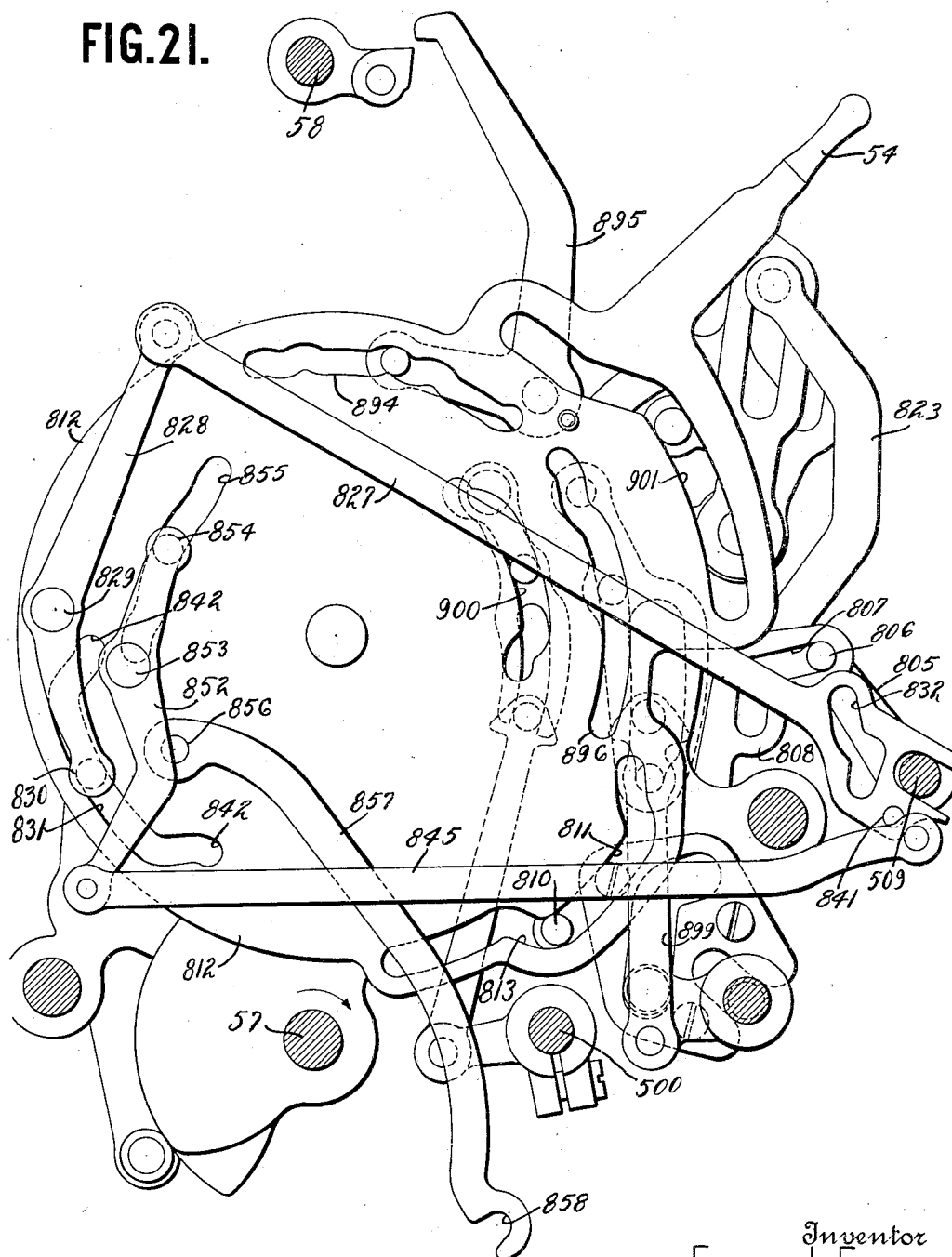
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 14

FIG. 21.



Inventor
FREDRICK L. FULLER
by *R. A. Glavin*
Earl Beust
Attorneys

July 28, 1925.

1,547,744

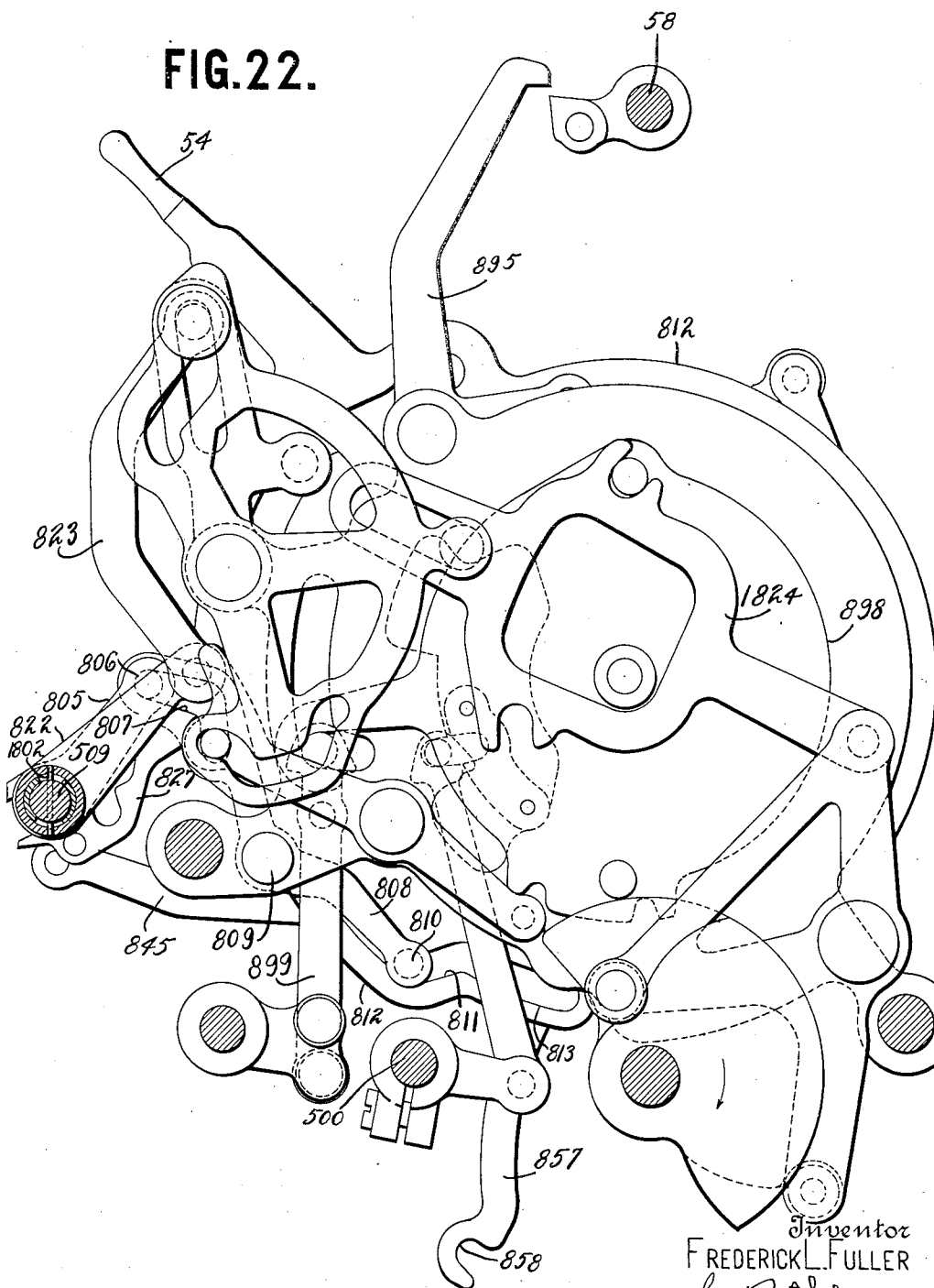
F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 15

FIG. 22.



Inventor
FREDERICK L. FULLER
by *R. Chase*
Karl Beust
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 16

FIG. 23.

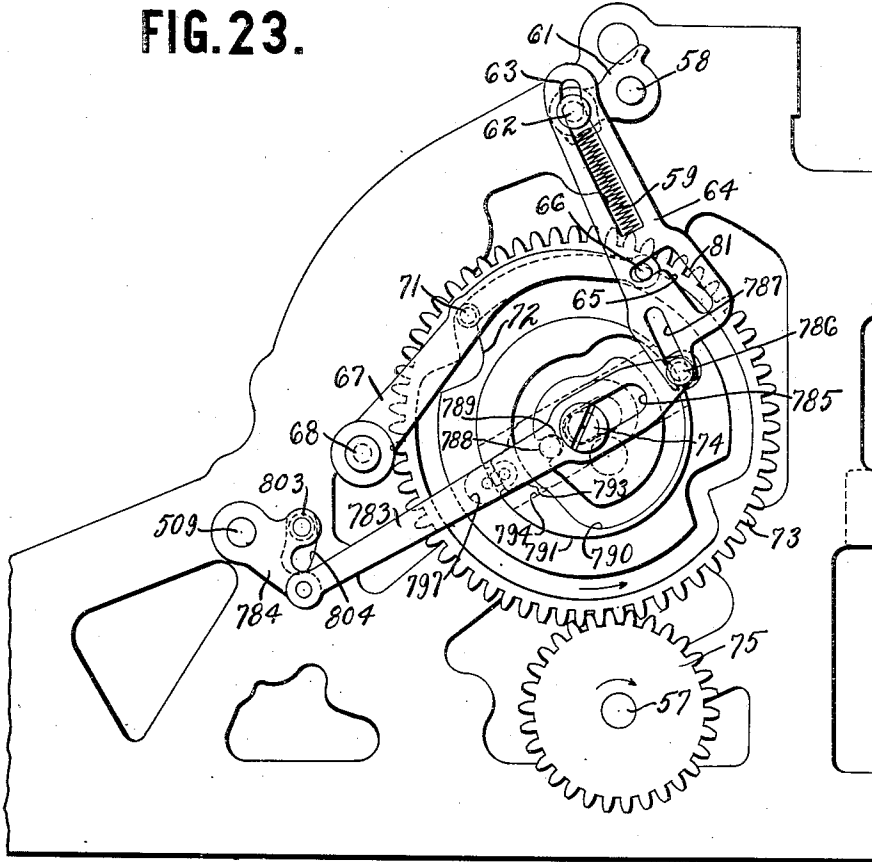


FIG. 24.

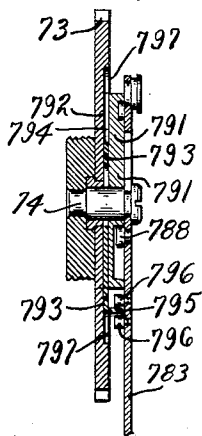


FIG. 25.

0780	ALBANY
1265	CHICAGO
0031	CINCINNATI
0001	EVANSVILLE
0121	FORT WAYNE
0035	LOUISVILLE
0320	MADISON
0479	PITTSBURG
0000	\$ 3728.50

825

FIG. 26.

X.Y. Z. R.R. Co.	
GOOD FOR ONE PASSAGE	
NEW YORK	AND
ALBANY	
0738	F \$-- 3.50

FIG. 27.

4124	MAY 21 1915

Inventor
FREDERICK L. FULLER

by *R. B. Bess*
Earl Bess
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 17

FIG.28.

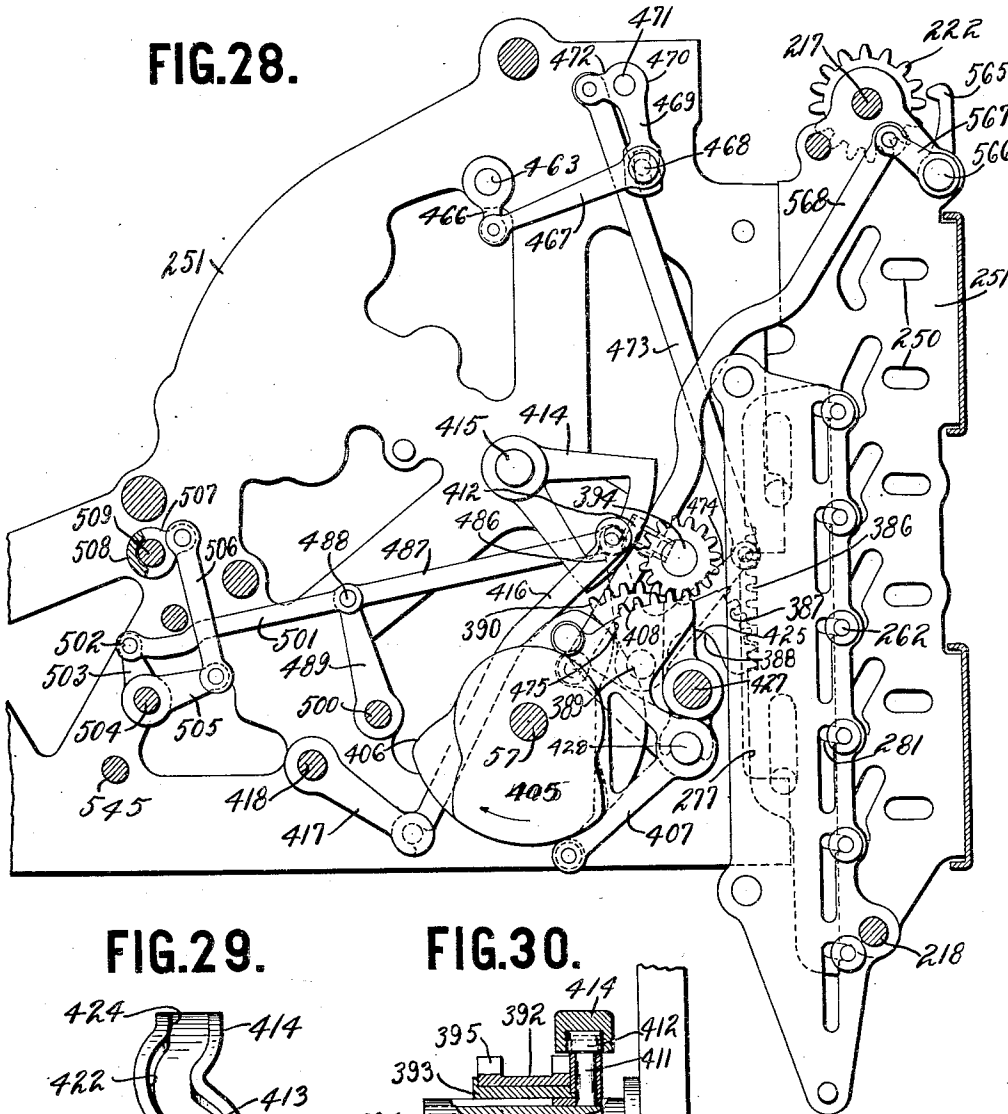


FIG.29.

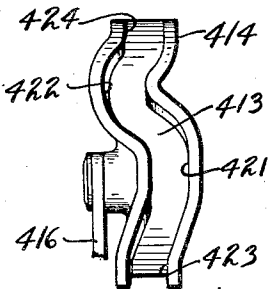
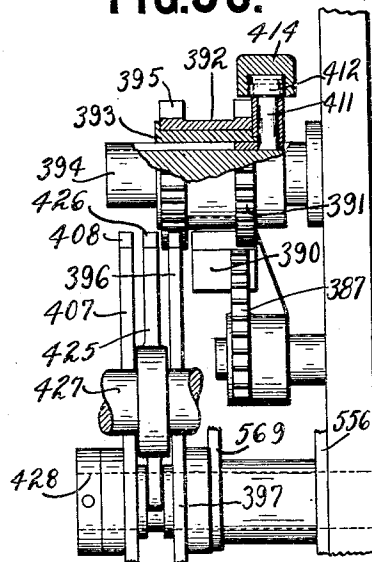


FIG.30.



Inventor
FREDERICK L. FULLER
by *R. B. Benson*
Charles Benson
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 18

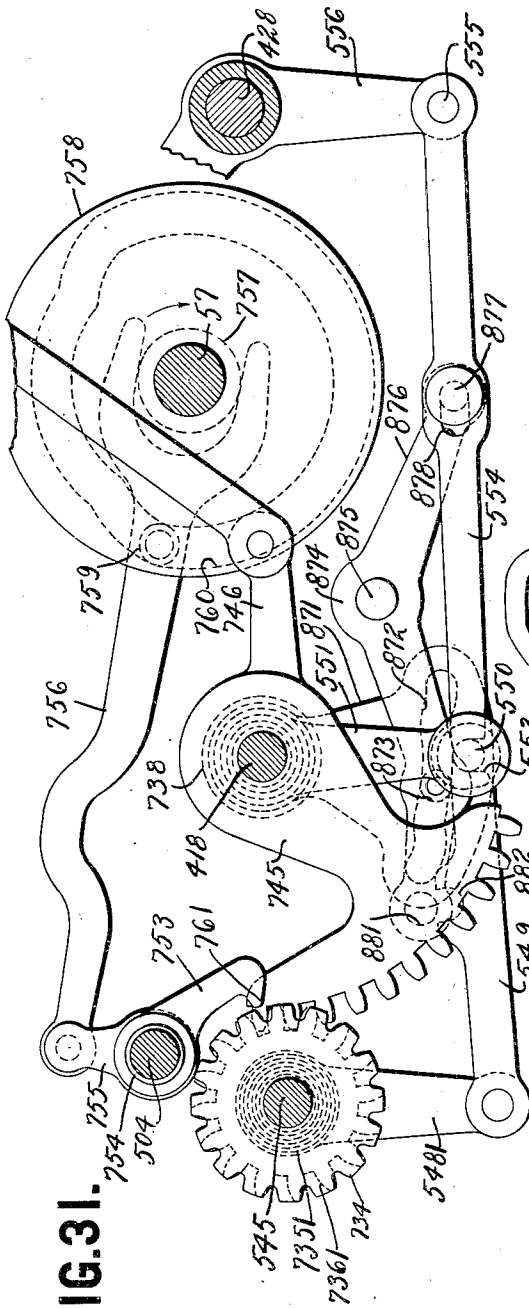


FIG. 31.

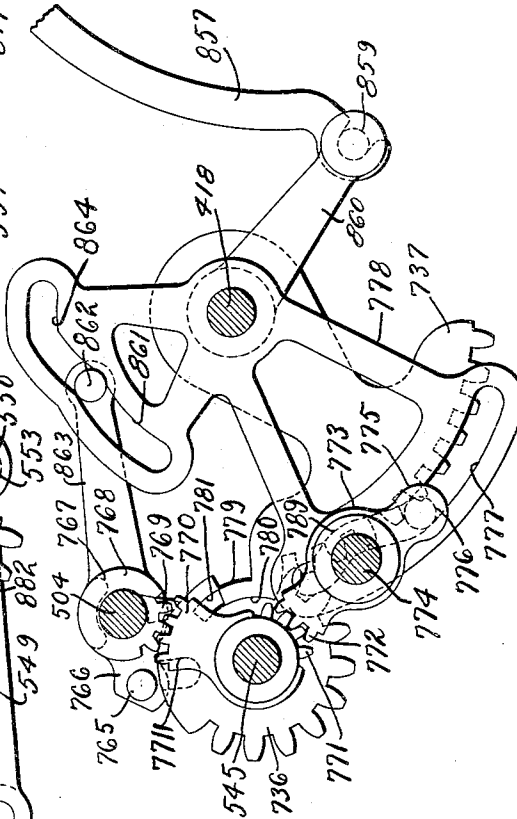


FIG. 32.

Inventor
FREDERICK L. FULLER
by *R. L. Long*
Charles Benoit
Attorneys

July 28, 1925.

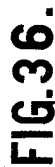
1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 19



Inventor
FREDERICK L. FULLER
by R. H. Cross
Charles Benoit
Attorneys

July 28, 1925.

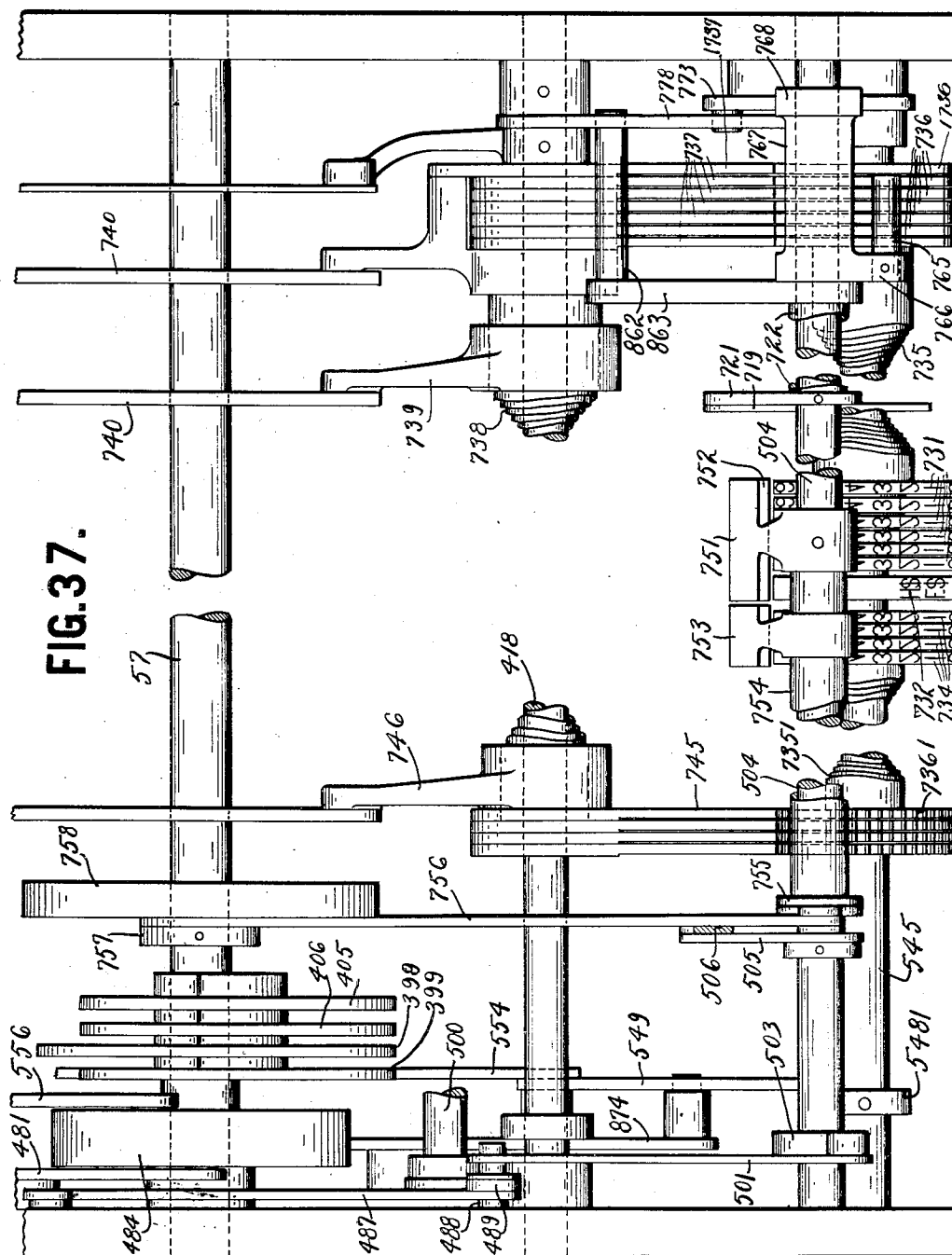
1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 20



Inventor
FREDERICK L. FULLER
by *R. C. Glass*
Earl Beust
Attorneys

July 28, 1925.

F. L. FULLER

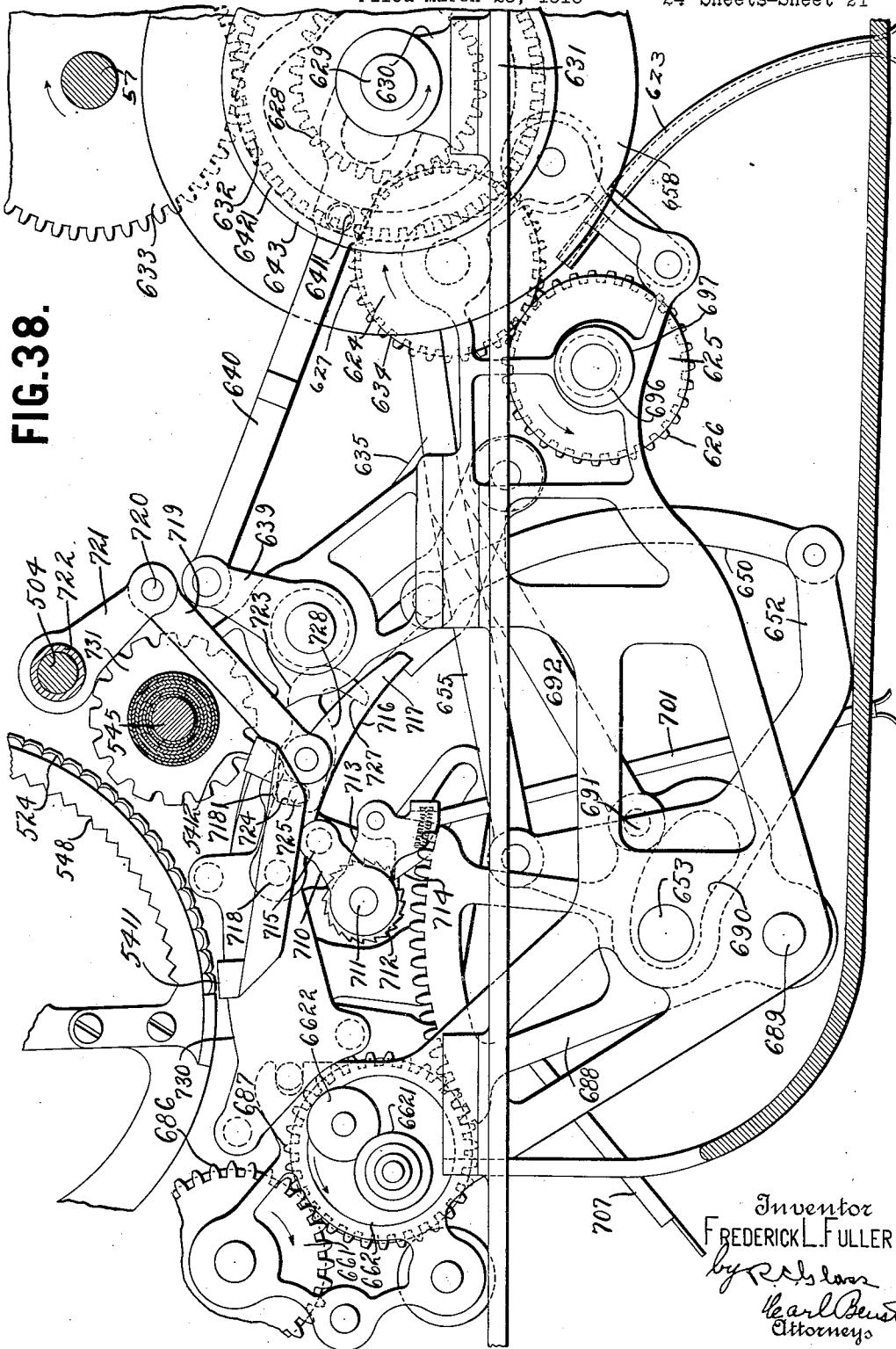
1,547,744

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 21

FIG. 38.



Inventor
FREDERICK L. FULLER
by *R. S. Lane*
Earl Beust
Attorneys

July 28, 1925.

F. L. FULLER

1,547,744

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 22

FIG. 40.

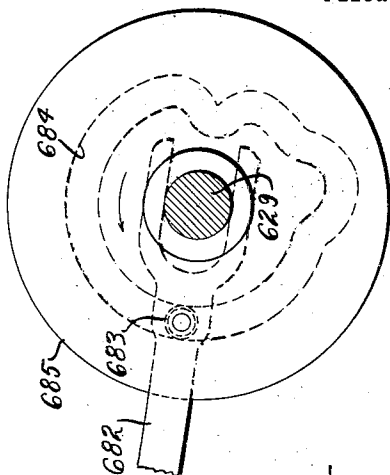


FIG. 41.

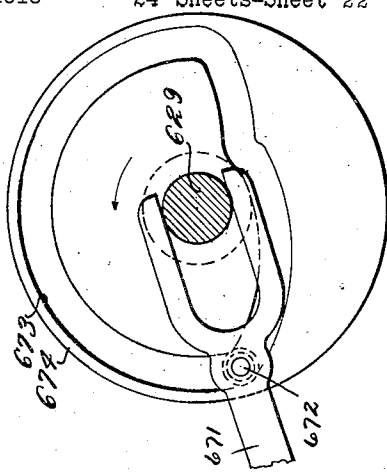
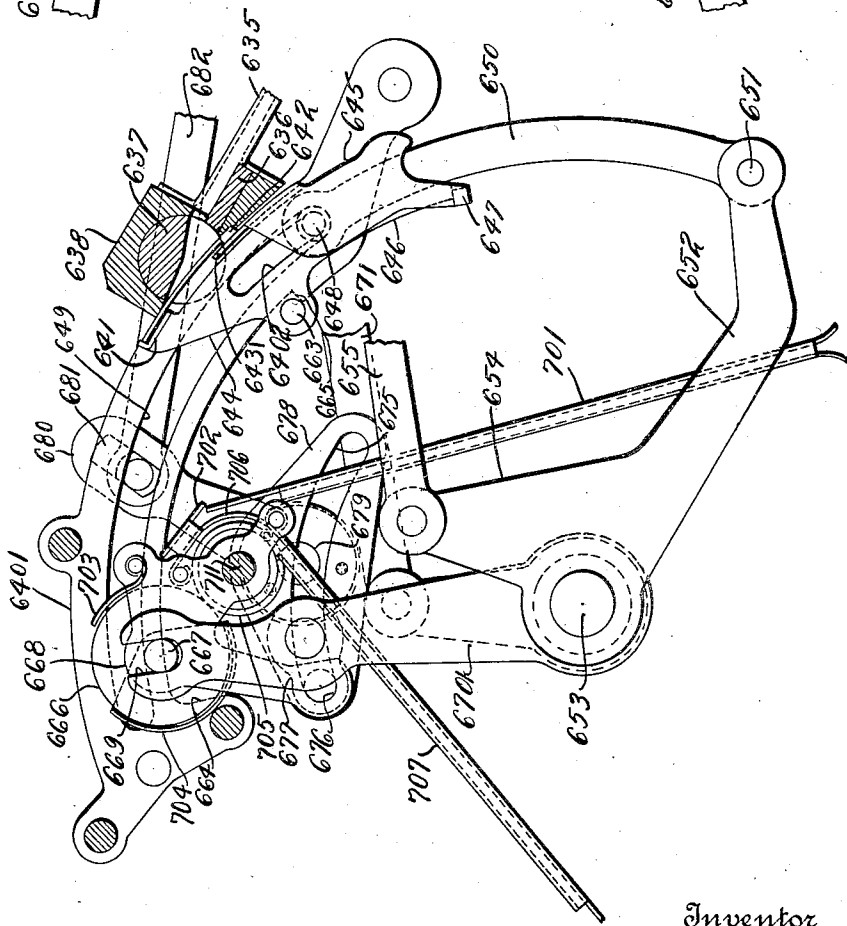


FIG. 39.



Inventor
FREDERICK L. FULLER
by *Carl Beust*
Attorneys

July 28, 1925.

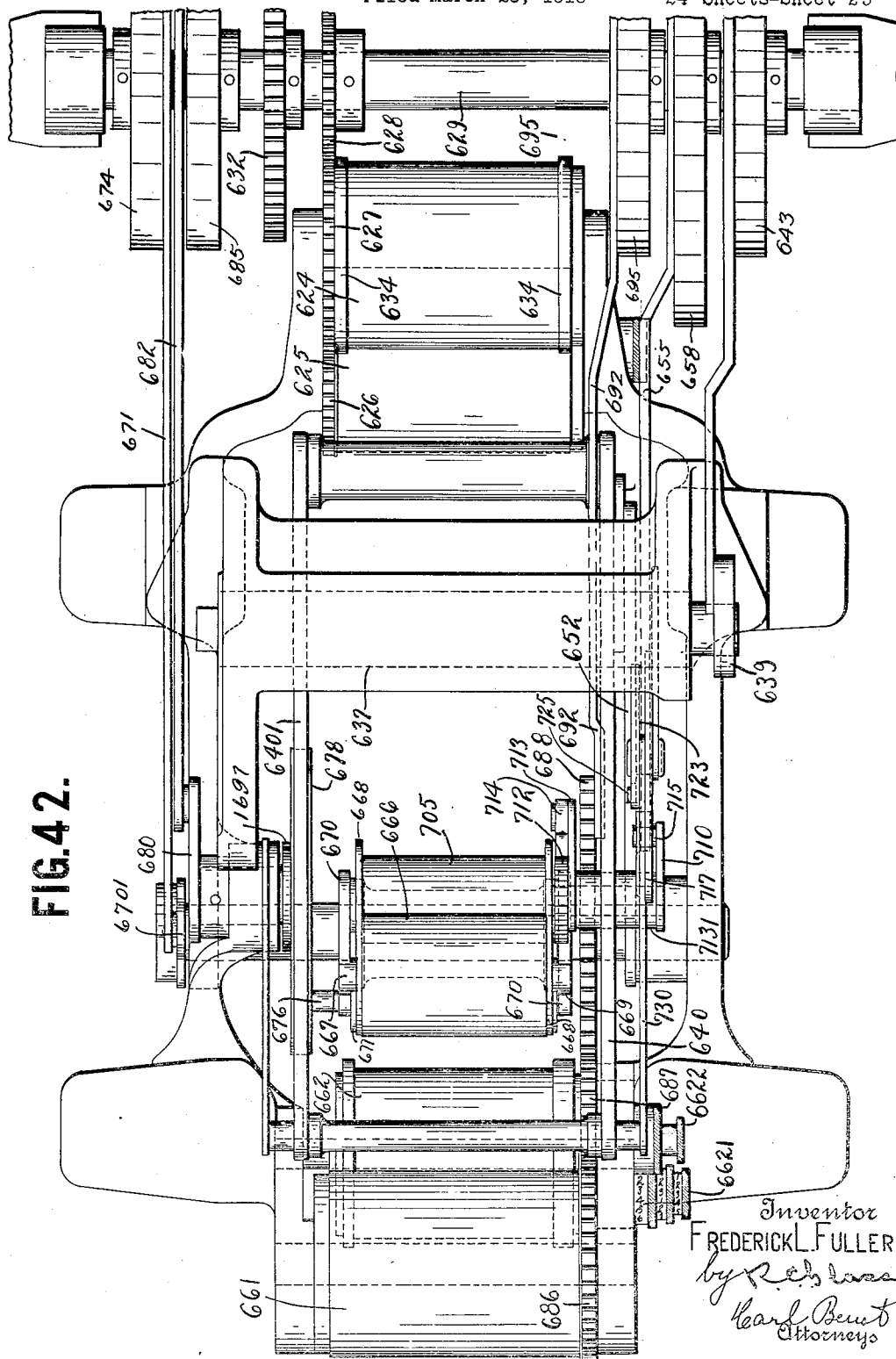
F. L. FULLER

1,547,744

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 23



Inventor
FREDERICK L. FULLER
by *R. C. Ross*
Lead Bent
Attorneys

July 28, 1925.

1,547,744

F. L. FULLER

TICKET PRINTING MECHANISM

Filed March 23, 1916

24 Sheets-Sheet 24

FIG.43.

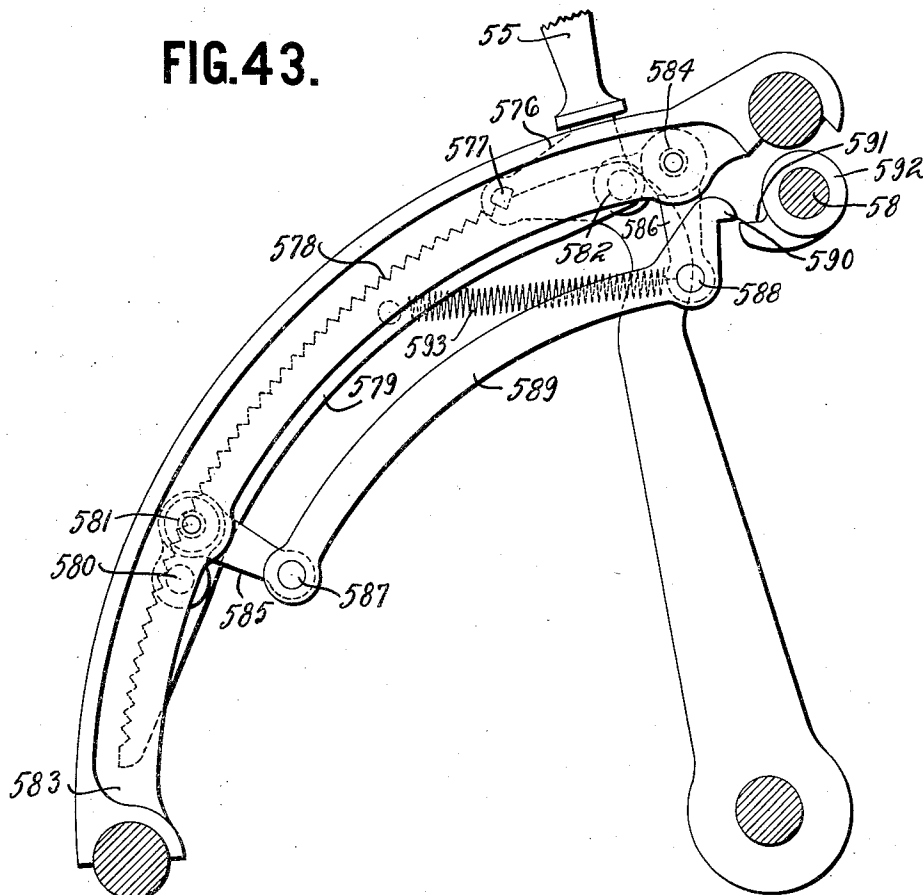


FIG.44.

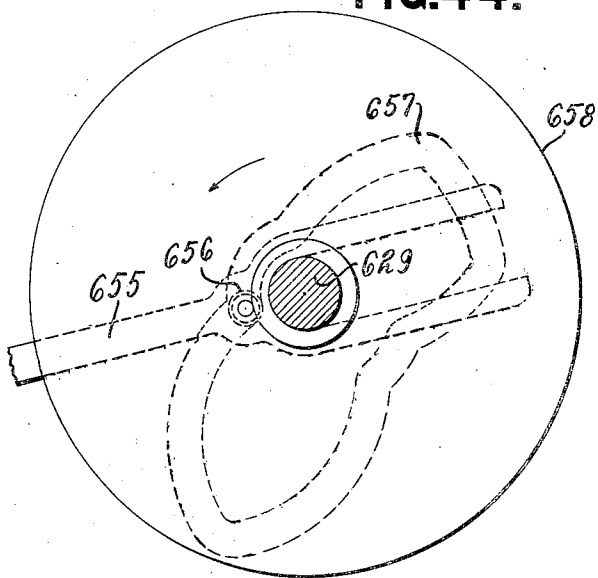
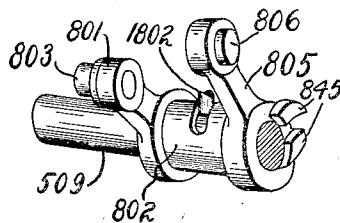


FIG.45.



Inventor
FREDERICK L. FULLER
by *R. L. Bess*
Earl Bess
Attorneys

Patented July 28, 1925.

1,547,744

UNITED STATES PATENT OFFICE.

FREDERICK L. FULLER, OF DAYTON, OHIO, ASSIGNOR TO THE NATIONAL CASH REGISTER COMPANY, OF DAYTON, OHIO.

TICKET-PRINTING MECHANISM.

Application filed March 23, 1916. Serial No. 86,088.

To all whom it may concern:

Be it known that I, FREDERICK L. FULLER, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Ticket-Printing Mechanism, of which I declare the following to be a full, clear, and exact description.

10 This invention relates to ticket issuing machines and has more particular reference to that class of machines adapted for use in issuing tickets for railroad and steamship lines or other analogous uses.

15 In the accompanying drawings the invention is shown applied to a machine such as is shown and described in Letters Patent of the United States, No. 1,230,864, dated June 26, 1917, issued to W. A. Chryst, and

20 having some of the improved controlling and other mechanism shown and described in Letters Patent of the United States, No. 1,242,170 dated Aug. 9, 1917, issued to F. L. Fuller, the present applicant. This embodiment is illustrative only, and it is not the

25 desire to confine the invention thereto.

The broad object of the invention is to provide a satisfactory machine for use in the ticket offices of railroads, steamship

30 lines and similar places where it is necessary to issue and accurately account for the money received in payment for a number of different kinds of tickets. In the present instance the machine is arranged to take

35 care of both full and half-fare tickets good between the station at which the issuing machine is located and each of a number of other stations. It will be apparent that the mechanism disclosed is capable of embodiment either in part or as a whole in

40 machines designed to serve other purposes without departing from the broad spirit of the invention.

One of the further objects of the invention is to provide improved devices for retaining in the machine a record of the tickets sold to the various stations and numbering the tickets under the control of said devices as an incident to printing the tickets.

45 In this embodiment these devices are shown as totalizers arranged in six groups of forty each, or two hundred and forty totalizers in all, this particular machine being designed to take care of ticket sales to that

50 number of different stations. When the

machine is operated to issue a ticket to a certain station the corresponding totalizer is first actuated to add one to the previous total in case the ticket is a half fare or two in case of a full fare and is then operated to control the setting of type carriers to print the new number or total on the ticket being issued. Both the adding and the type carrier controlling operations of the totalizer occur during the same operation of the driving mechanism.

The two hundred and forty totalizers are supplied with connections whereby any desired totalizer may be engaged with a common set of operating racks. These racks are actuated twice during each ticket issuing operation, once to add and effect transfers and once to operate the engaged totalizer to control the setting of the number printing type carriers. Both movements of the racks are imparted by differential segments such as shown in the Chryst patent above referred to. These segments are controlled in the adding operations by an oscillating arm carrying stops positioned to differentially control the movement of the units registering segment and having connections to the special key bank whereby the arm may be differentially oscillated by selectively operating the keys. This method of controlling a registering segment constitutes one of the objects of the invention.

Still another object of the invention is to provide improved means for printing upon tickets issued from a single strip the name or other information pertaining to any one of the stations to which tickets are sold. In the illustrative machine the names of the stations are printed from type carriers arranged around the periphery of a drum, in six rows of forty carriers each. This drum is arranged to be given both endwise and rotary movement, thereby making it possible to bring a type carrier in any row in position to cooperate with a ticket printing platen. Two manipulative devices are provided, one to rotate the drum and the other to shift it endwise. Either of these devices may be operated singly or both may be operated simultaneously depending upon the adjustment to be given to the drum.

After the station type carrying drum has been positioned, a device normally given an invariable extent of movement projects the selected type carrier to printing position



and also locks the drum against movement. An invariably moved platen then presses the paper against the type carrier to print. One of the objects of the invention is to provide means for disabling the invariably moved platen in printing operations where it is not desired to print the name of a station.

Still another object of the invention is to provide in machines having a plurality of groups of totalizers a means whereby any totalizer in any group may control the positive operation of a single set of transfer devices. The transfer devices employed in this machine are of the type fully shown and described in the Chryst patent mentioned above, and comprise a single set of actuators common to all of the totalizers. Each of these actuators is in two sections. Normally the two sections are positively held together by a latch and move as a unit. If no transfer is to be turned in, stops normally in the path of the latch will serve to disengage the latch and hold one of the sections stationary during the final movement of the other. If carrying is to be performed, one or more of the stops mentioned will be moved to ineffective position by rotation of lower order totalizer wheels acting through common intermediate connections and the two sections of the actuator will then remain positively latched together and will operate as a continuous rack. The effect is to lengthen the rack so as to turn the corresponding totalizer wheel an additional division. This invention provides connections whereby any totalizer in any of the six rows of ticket totalizers may control the position of the single set of transfer latch operating stops.

With these and incidental objects in view, the invention consists in certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form of embodiment of which is hereinafter set forth with reference to the drawings which accompany and form part of this specification.

Of said drawings:

Figs. 1^A and 1^B combined comprise a front elevation of the assembled machine with certain of the frames shown in outline.

Fig. 2 is a left side elevation of the machine with the outside casing and certain parts of the mechanism omitted.

Fig. 3 is a detail of the station type carrying drum and mechanism associated therewith.

Fig. 4 is a plan view of the station type carrying drum and some of the connections whereby movement of the drum selects the ticket totalizer.

Fig. 5 is a rear view of the ticket totalizer frame and some of the totalizer selecting

mechanism. In this figure only one group of totalizer elements of the totalizers is shown for the sake of clearness.

Fig. 6 is a vertical cross section taken to the left of one of the amount registering banks and looking toward the right.

Fig. 7 is a partial sectional view of the units bank looking to the left and showing the differential mechanism for operating the ticket totalizers.

Fig. 8 shows a differential segment and transfer mechanism for operating higher order ticket totalizer wheels.

Fig. 9 is a partial vertical section through the machine looking to the left and shows the connections for operating the ticket totalizers and some of the mechanism controlled by said totalizers in ticket printing and total taking operations.

Fig. 10 is a detail view of the ticket totalizer operating racks.

Fig. 11 is a detail view of some of the mechanism for engaging the ticket totalizers with the operating racks.

Fig. 12 is a detail of the totalizer engaging plate.

Fig. 13 is a rear plan view of the various main differential segments and shows the operating connections between the main differential segments and the actuating racks.

Fig. 14 is a top plan view of the connections for controlling both the single set of transfer devices common to all of the ticket totalizers and the devices for stopping the ticket differential segments under the control of their totalizers.

Fig. 15 is a right hand detail view of the special or controlling bank of keys and some of the mechanism immediately associated therewith.

Fig. 16 is a right hand detail of the pair of cams employed to engage the ticket totalizers with the operating racks in ordinary ticket printing operations.

Fig. 17 is a right hand detail of the double cam and some of the connections for operating the aligning device for the amount type carriers and for projecting the station printing type carriers to printing position.

Fig. 18 shows the special key bank and mechanism whereby the position of the total lever controls the operation of the special keys. This figure also shows some of the mechanism whereby the position of the total lever controls the operation of the zero stops.

Fig. 19 is a detail of the cam for operating the ticket severing knife.

Fig. 20 is a detail of the cam for driving the operating segment for one of the ticket feeding and printing cylinders.

Fig. 21 is a left hand detail assembly of the total lever and connections controlled thereby.

Fig. 22 is a right hand detail assembly

view of the total lever and the totalizer engaging mechanism controlled by said lever.

Fig. 23 shows part of the driving mechanism.

Fig. 24 is a cross section of certain of the parts shown in Fig. 23.

Fig. 25 is a fragmentary view of the summary strip.

Figs. 26 and 27 respectively show the front and back of one of the tickets.

Fig. 28 is a right hand section taken just inside of the left hand frame omitting certain parts but showing the mechanism for changing the time of engagement of the ticket totalizers with their operating racks and certain connections associated with the ticket differential mechanism.

Fig. 29 is a detail view of the cam for controlling the engagement of the ticket totalizers with their actuating racks.

Fig. 30 is a rear view of mechanism controlled by the cam shown in Fig. 29.

Fig. 31 is a right hand sectional view of the ticket numbering type carriers and connections for setting them, and mechanism controlled by the total lever for preventing station type carriers being moved to printing position.

Fig. 32 is a detail of mechanism controlled by the total lever when the machine is operated to reset the ticket totalizers and print their totals.

Fig. 33 is a plan view of mechanism for operating zero stops in total and subtotal operations and some of the devices for determining whether the driving mechanism is to have one or two cycles of movement.

Figs. 34 and 35 are details of operating connections between the ticket totalizers and the common transfer mechanism.

Fig. 36 is a detail of mechanism operated by the ticket totalizers to control the differential mechanism in subtotal and total printing operations.

Fig. 37 is a plan view, partially broken away, the purpose of the figure being to show the arrangement of the amount and number printing type carriers and operating and aligning mechanisms therefor.

Fig. 38 is a left hand view partly in section of the ticket and summary strip printing devices.

Fig. 39 shows the platen operating mechanism, also the ticket severing and ticket delivering mechanism.

Fig. 40 is a detail view of the cam for actuating the impression platen.

Fig. 41 is a detail view of the cam for shifting the platen to print from the station type carriers and from the amount and ticket numbering type carriers.

Fig. 42 is a top plan view of the printing mechanism assembled complete with the ex-

ception of the type carriers and the ticket carriage.

Fig. 43 is a detail of the lever for rotating the ticket type carrier drum and the machine locking mechanism cooperating therewith.

Fig. 44 is a detail of the cam employed for swinging the ticket carriage from one impression taking position to another.

Fig. 45 is a perspective of an element forming a part of the mechanism for controlling the extent of movement of the driving mechanism.

The machine shown in the drawings is, as hereinbefore stated, constructed to issue either full fare or half fare tickets good between the station at which the machine is located and any one of two hundred and forty other stations. Either one or two tickets may be issued at an operation as desired. All of the tickets are printed and severed from a single blank ticket strip. When they are delivered from the machine they have printed on their faces the usual invariable matter such as the name of the railway company, the name of the issuing station and so on. This invariable matter is printed from plates attached to one of the rolls for feeding the strip. In addition, each ticket has printed on its face the name of the destination station, a number from which the cash value of the tickets sold to said station may be ascertained, a character indicating whether the ticket is a full fare or a half fare, and the amount paid for the ticket. This additional matter is all printed from various type carriers adjusted to printing position either as a preliminary to or during a ticket issuing operation of the machine. On the back of each ticket is printed the date of issue and a consecutive number which increases by one as each ticket is issued. The date and consecutive number are printed from type carriers mounted in one of the ticket strip feeding rollers in a manner well known in the art. Said feeding roller may also have attached thereto a type carrying plate to print on the backs of the tickets any announcement or condition of sale desired. The plates or type carriers for printing the names of the various destination stations are mounted in parallel rows partially extending around the periphery of a drum. This drum, as before stated, may be both rotated and shifted endwise on its supporting shaft to bring any desired one of the type carriers into position to print on the ticket. In addition to this the type carriers may be given a slight outward movement, to project the type carrier which is to print, far enough out of the drum to cooperate with a platen having an invariable extent of impression taking movement. This outward movement of the positioned

type carrier is effected by a device which is given an invariable movement at each ticket issuing operation and is constructed not only to hold the type carrier in printing position but also to lock the drum against movement until near the end of the ticket printing operation.

The two hundred and forty station totalizers are mounted in six horizontal rows in a frame adjustable back and forth across the rear of the machine to any one of forty positions to bring the vertical row containing the desired totalizer into operative relation with a common set of operating racks. The totalizer elements are denominationally grouped so that only a comparatively slight movement of the frame is necessary. Each of the six rows or groups of totalizers is independently movable in the supporting frame to engage the selected totalizer with the operating racks, the racks being movable in vertical planes to operate the totalizer to add or to print totals and sub-totals.

The movement of the totalizer supporting frame to bring a totalizer into alignment with the operating racks is imparted through suitable connections as an incident to rotating the station type carrying drum. When the drum is shifted endwise to bring a desired row of type carriers above the printing platen, a connection is established whereby the totalizer to be operated will be drawn into relation with the operating racks when the machine is operated. In this way the totalizer corresponding to the station printing type carrier positioned by two movements of the drum may be operated either to add or to print.

The operating racks for the station totalizers are actuated by oscillating differential segments similar to those shown in the above mentioned patents. At each ticket issuing operation these segments have two oscillating movements, first, a movement to add and effect transfers, and then a movement to an extent controlled by the corresponding totalizer element whereby to print on the ticket being issued the sub-total or number carried by the totalizer. In this embodiment the adding is performed by the units segment. Movement of this segment is controlled by an oscillating arm carrying stops arranged to limit differentially the movement of the units actuator, the extent of the oscillatory movement of the arm being controlled by fare classification keys in the special key bank.

The printing mechanism is constructed to print tickets only during ticket issuing operations. The mechanism, however, comprises a summary strip which is printed when taking a statement from the machine, as for example, when the ticket office at which the machine is used is being checked up by the auditor. In taking the statement

the machine is operated a sufficient number of times to clear each of the two hundred and forty totalizers, the name of each station and the number taken from the corresponding totalizer being printed on the summary strip. The machine is then operated again to clear the cash totalizer and print the amount on the strip. The summary strip is always in position to print but in ticket issuing operations impressions which would otherwise fall upon the strip are taken by the ticket. In taking the statement from the machine, the ticket feeding mechanism is disabled so that no ticket is fed into position to interfere with the printing of the strip. At the same time the summary strip feeding mechanism, which is always ineffective during ticket printing operations, is rendered effective so that as the station totalizers are cleared and the station names and totals printed by successive operations of the machine the strip will be suitably spaced between the various printings.

When the total or sub-total of the amount contained in the cash totalizer is printed on the summary strip the machine must be operated with one of the station printing type carriers opposite the platen. The name of the station can not be printed, however, as the amount of the cash total is printed in the space in which the name of the station would appear if printed. It is on this cash total printing operation that the device for projecting the station printing type carrier to printing position is disabled. On the other hand, the amount printing type carriers must be prevented from printing in operations to clear ticket totalizers and print the numbers. When the machine is prepared for such operations, the amount type carriers are all turned back from their zero position to blank or non-printing positions.

After the summary strip is printed showing the name of each of the two hundred and forty stations and the number taken from the corresponding totalizer, the auditor can ascertain the cash value of the tickets sold to each station by multiplying the number in question by the half fare rate to that particular point. The various products can then be added together and the result compared with the cash on hand and the amount printed on the strip from the cash totalizer.

The keyboard of the machine comprises four banks of amount keys 50 (Figs. 1^A and 1^B), a bank of special keys 51, 52, and 53 controlling a machine lock and motor connections, and a lever 54 which is usually spoken of herein as the total lever. The keyboard also comprises a lever 55 by means of which the station type carrier drum may be rotated and a handle 56 by which the

drum may be shifted endwise, that is laterally of the machine. The amount keys 50 are depressed at the beginning of an operation to set up the fare or cash value of the ticket, the full fare key 51 or the half fare key 52 then being depressed to release the driving mechanism and control the differential operation of the units actuator for the ticket totalizer. The key 53 is operated only to release the machine lock and close the motor circuit in operations to clear ticket totalizers and print the totals on the summary strip.

Driving mechanism

The driving mechanism comprises a shaft designated by the numeral 57 in the various figures. This shaft extends the width of the machine and is given either one or two complete rotations, depending upon the result to be obtained, by means of either a motor (not shown) or an operating handle 60. Normally, that is, in ticket printing operations, the shaft makes but a single rotation. It also makes but a single rotation in clearing each ticket totalizer and printing the total number on the summary strip, but when two tickets are to be issued and in operations to print totals or sub-totals from the cash totalizer, the shaft is permitted to make two rotations by mechanism hereinafter described.

The driving mechanism is normally locked against movement and the motor circuit held open by mechanism controlled by a rock shaft 58 (Figs. 6 and 23). This mechanism is not shown or described herein, as it is fully shown and described in applicant's prior patent hereinbefore referred to. It is sufficient to state that upon operation of a special key or adjustment of the lever 54 to certain positions, latching mechanism is disabled by movement of a plate 69 (Fig. 15) permitting the shaft 58 to be rotated a short distance clockwise (Fig. 23) by a spring 59, thereby releasing the driving mechanism and closing the motor circuit. The spring 59 acts through arm 61 fast on the shaft 58 to oscillate the shaft an extent defined by a stud 62 on said arm and the upper end of a slot 63 in a plate 64. This plate also has a bayonet slot 65 through which projects a stud 66 on the rear end of an arm 67 pivoted at 68 to the side frame of the machine. On the arm 67 is a roller 71 projecting into a cam groove 72 formed in the side of a gear 73 rotatably mounted on a stud 74 projecting from the machine frame. The gear 73 meshes with a gear 75 fast to the driving shaft 57, and is twice the diameter of said gear 75 so that for each rotation of the driving shaft 57 the gear 73 makes half of a rotation. Near the end of each half rotation of the gear 73 the plate 64 is reciprocated by the cam groove 72 and

arm 67, first downward and then back to original position. On account of the engagement of the upper end of the slot 63 with the stud 62 the shaft 58 will be rocked slightly counter clockwise beyond the normal position in which it is shown in Fig. 23, the purpose being to restore the machine locking mechanism to effective condition, and to release depressed keys as hereinafter explained.

When the driving mechanism is to operate twice the plate 64 is drawn forward so that the portion 81 of the slot 65 is alined with the stud 66 during the first half of a rotation of the gear 73 and the shaft 58 is not moved. Shortly after the first half rotation is completed the plate 64 is restored to its original position so that the movement imparted to the arm 67 during the second half of the rotation of the gear 73 will rock the shaft 58 backward as above explained to lock the driving mechanism against further movement and incidentally to release any depressed keys. The connections whereby the plate 64 is moved to effect the results stated will be described later.

Amount differential mechanism.

The four banks of amount keys 50 (Figs. 1^B and 6) control differential mechanism like that described in the Chryst and Fuller patents and only a brief general description is necessary here. The keys are depressible against the tension of springs (not shown) and are temporarily latched in depressed position by detent plates 82. These plates 82 are pivotally supported by arms 83 and 84 loosely mounted on studs 85 and 86 respectively, attached to the key frames. As the keys are depressed inclined shoulders 87 thereon engage pins 88 on the plates 82 and cam the plates downward against the tension of springs 89 acting through zero stop pawls 90 and the arms 84. This is effected by the engagement of pins 123 on the pawls 90 with the downward extension of arm 84. As the shoulders pass the pins the plates are returned slightly by the springs 89 so that the pins engage notches 91 in the edges of the keys, thereby latching the keys in depressed position.

The keys of all amount banks are locked against manipulation when the shaft 58 is rocked to release the machine. A plate 92 for each bank of amount keys is provided with hooks 93 to cooperate with pins 94 projecting from the sides of the keys. The plates 92 are loosely supported by arms (only the upper one of which is shown) pivotally mounted on the studs 85 and 86. Each of the upper arms is provided with a slot 95 engaging a rod 96 supported at its ends by arms 97 fast on the rock shaft 58. When the shaft 58 is rocked counter clockwise (Fig. 6) the rod 96 will be elevated

and will raise the plates 92, thereby bringing the hook shaped projections 93 above the pins 94 of depressed keys and under the pins 94 of keys which remain in undepressed position.

As previously stated, when the rock shaft 58 is restored by the arm 67 and plate 64 it is restored slightly beyond its first or normal position. This causes the rod 96 to move the plate 92 down far enough to disengage the hooks 93 from the pins 94 and also carries said rod into engagement with projections 99 on the arms 83 so as to cam the arms and detent plates 82 down far enough to disengage the pins 88 from the notches 91 and allow the keys to return to their original positions.

Associated with each bank of amount keys is a differentially movable element 100 (Fig. 6) for actuating the cash totalizer and controlling the setting of the type carriers. Each of the elements is pivoted on short studs 101 supported by pairs of plates 1101 suitably mounted in the machine. Each of the elements carries a latch plunger 104 normally in engagement with a shoulder of an invariably moved driving frame 105 so that movement of the frame is transmitted to the differential element until a trip 106 strikes the inner end of a depressed key 50 or, in case no key in a bank is depressed, a shoulder 107 of the zero stop 90. When the trip 106 strikes either a key or a zero stop, the plunger 104 is withdrawn from engagement with the driving frame 105 and projected into one of a series of notches 108 formed in a plate attached to the key frame. When the driving frame is restored to its original position a shoulder 111 thereon engages a stud 112 on the differential element 100 and restores said element to its original position, shown in Fig. 6. When the element is being restored a spring (not shown) will re-engage the plunger 104 with the driving frame 105 ready for the next operation.

The driving frames 105 are given their invariable movement by rock frames 113 pivoted at 114 and connected by links 115 to the driving frames. The rock frames 113 are rocked by pairs of cams 116 fast on the driving shaft 57 and acting upon rollers 117 carried by the rock frames. For each rotation of the driving shaft 57 the driving frames 105 are oscillated over an arc of approximately 90 degrees, first counter-clockwise and then clockwise (Fig. 6).

Each of the differential elements 100 carries a rack 120 for driving the associated element 121 of the cash totalizer. Pivoted to the side of each differential element is an arm 122 which is employed for transferring operations. The manner in which the totalizer is actuated and transfers effected is fully explained in the patents here-

inbefore cited, and need not be gone into in detail here, although the operation of similar transfer mechanism must be explained somewhat at length later on in connection with the construction and operation of the ticket totalizers.

The zero stops 90 are normally in position to engage the latch trips 106, but if a key in a bank is depressed the zero stop is withdrawn so as to permit the latch trip to pass into engagement with the operated key. For this purpose the zero stops are provided with the pins 123 before referred to projecting laterally across the forward edges of the arms 84. When the detent plates 82 are moved downwardly by depression of the keys the arms 84 will cam the zero stop pawls 90 back against the tension of their springs 89 to withdraw the shoulders 107 from the path of the latch trips 106. It is by this same cooperation of the detents 82 and pawls 90 that the springs 89 act to hold the detents elevated.

The zero stops are also withdrawn to permit passage of the latch trips in printing totals from the totalizer 121. The mechanism whereby this is effected will be explained in connection with the cash and ticket total taking mechanism.

Station totalizer differential mechanism.

The main differential mechanism for operating the two hundred and forty ticket totalizers is located to the left (Fig. 1^B) of the four banks of amount keys 50. It comprises four differentially movable elements, two of which, the units and the tens, are shown respectively in Figs. 7 and 8. Only the first or units element 125 is differentially operated in adding operations, the three higher order elements 136 during the adding period having simply sufficient movement to effect transfers from lower to higher orders. Addition and transfers are effected during the early part of the rotation of the driving shaft 57, after which all four segments are swung upward by the enlarged portions 1331 of cams 133 until they are stopped by mechanism controlled by the reverse rotation of the elements of which ever ticket totalizer may at the time be engaged with operating racks driven by the main differential elements. Each of the four ticket differential elements is normally connected by means of a plunger 126 constructed and operated like the plunger 104 for the amount banks, to a driving frame 127 connected by a link 128 with the upper end of a rock frame 129. The frame 129 is pivoted at 130 and carries rollers 131 and 132 cooperating respectively with the cams 133 and 134 fastened to the driving shaft 57. The cam 133 for the units differential element 125 has a portion 135 of sufficient radius from the center of the driving shaft

57 to rock the frame 129 for the units segment far enough to raise the driving frame 127 three steps, after which the units cam 134 returns the frame to the normal starting point. The tens differential element 136 (Fig. 8) and the other two higher order elements are, during the adding period, successively carried up a single step by portions 137 of the associated cams 133 and are then restored to the starting point by their cams 134. This first movement of the higher order elements 136 is to effect the transfers.

The differential movement of the units element 125 is controlled by a stepped arm 141 (Fig. 7) rigid on a short shaft 142. Fastened to the other end of the shaft 142 is an arm 143 carrying a roller 144 engaging the upper edge of a cam 145 fastened to a shaft 146. This shaft 146 extends toward the right and near its right hand end carries an arm 147 (Fig. 15) having a stud 148 engaging a notch 149 in a link 150 loosely supported at 151 and 152 by three armed elements 153 and 154 pivoted at 155 to the special key bank frame. After the half fare key 52 is pressed part of the way in, its pin 156 will engage the portion 157 of the element 154 and thrust the link 150 downward far enough to rock the shaft 146 one step. This will move the cam 145 far enough to bring the portion 161 thereof under the roller 144 and cam the arm 141 far enough to move the zero step 162 on the arm out of the path of the trip 163 and bring the units step 164 into the path of the trip. If the full fare key 51 is depressed its pin will immediately engage the three armed lever 153 and cause the shaft 146 to move two steps to bring portion 167 of the cam 145 under roller 144. This will rock the arm 141 to carry the step 164 out of the path of the trip 163. When this occurs there is nothing to interfere with a full three step movement of the units differential element 125, this being the condition when "2" is to be added upon the ticket totalizer. An additional step might be provided on the arm 141 to positively limit the three step movement of the trip 163, but this is unnecessary because of the fact that the operating projection 135 on the driving cam 133 is arranged to give no more than the required three steps of movement.

The three armed elements 153 and 154 also co-operate with the pins 156 in the keys 51, 52, and 53 in such a way that when one of the keys is depressed none of the others can be pushed in far enough to be retained by the temporary locking detent plate 82. For example, when the key 51 is depressed and the element 153 rocked, the portion 181 of the element will be thrown up far enough to interfere with movement of the key 52 while the portion 182 of the element 154 will be brought to a position where it will

prevent depressing the key 53. The same thing is true when the key 52 is depressed, for while the elements 153 and 154 will not be given as great a movement as when the key 51 is depressed they will still be moved far enough to prevent depressing the keys 51 and 53 far enough to be latched. When the key 53 is depressed and latched in depressed position its pin 156 will be in contact with the portion 182 of the element 154 thereby locking said element and the element 153 against movement and preventing operation of the keys 51 and 52.

The three highest order differential elements for the ticket totalizers have no arms 141 or normally effective zero stops such as shown and described in connection with the amount banks, the one step transfer movement of the elements being controlled solely by the arrangement of the operating projections 137 on the driving cams. After the additions and transfers have been effected the arm 141 is invariably withdrawn to ineffective position and all four of the ticket differential elements then travel up to whatever extent may be necessary in order to control properly the setting of the units type carrier in printing the total carried by the engaged ticket totalizer. The manner in which the arm is withdrawn will be explained fully later on, as will also the manner of giving the elements the extended travel in printing the totals from the ticket totalizers.

The teeth 183 of the units differential element 125 (Fig. 7) occupy a different position on the element from that of the teeth 184 (Fig. 8) on the element 136. This is because the four differential elements are close together while the operating racks for the ticket totalizers must be widely separated to permit each of them to cooperate with forty totalizer elements. As a result, intermediate driving connections must be provided.

The racks for the units and hundreds elements are similarly mounted while the tens and thousands racks correspond in that respect. The units and hundreds teeth 183 are positioned to cooperate respectively with the teeth of pinions 186 and 187 (Fig. 13) secured to shafts 188 and 189 in axial alignment. At the other end of the shaft 188 is a pinion 190 meshing with teeth 199 (Fig. 10) on the forward edge of the units ticket totalizer operating rack 185, while the shaft 189 carries a pinion 192 meshing with teeth on the hundreds rack 185. The teeth 184 of the tens differential element cooperate with the teeth of a pinion 196 fastened to a shaft 197 carrying a second pinion 198 meshing with teeth 199 on the forward edge of the tens actuating rack 185, while the teeth 184 of the thousands differential element drive a pinion 202 fastened to a short shaft 203

to which is also fastened a pinion 204 meshing with teeth on the rear of the thousands actuating rack 185.

Each of the four ticket differential elements comprises two parts, the toothed portions 183 and 184 of the main racks and arms 211 (Figs. 7 and 8) pivoted to the differential elements. These arms are provided at their outer ends with teeth normally in engagement with the pinions 186, 187, 196 and 202, just mentioned, and are to effect transfers in a manner which will be fully explained later on.

The operating racks 185 are provided with slots 212 (Figs. 9 and 10) receiving stationary rods 213 and are held in proper position on said rods by spacing sleeves 214 so that the racks are limited to movement in a vertical plane. In adding the racks 185 are first positioned and the selected ticket totalizer then engaged after which the racks are restored to their original positions.

Ticket totalizers.

The two hundred and forty ticket totalizers are carried in a rectangular frame 215 (Fig. 5) provided with rollers 216 engaging a shaft 217 and a rod 218 at the top and bottom respectively, to permit moving the frame back and forth across the rear of the machine to bring the totalizer to be operated opposite the actuating racks 185. The group containing the totalizer to be operated is then given a movement forward in the frame to engage the desired totalizer with the racks. As previously stated, movement is imparted to the frame 215 when the station type carrying drum is rotated and the mechanism for moving a group of totalizers relative to the frame to engage a totalizer with the racks is rendered effective by endwise movement of the drum.

The lever 55 for rotating the drum has rigid therewith a segment 219 (Fig. 2) meshing with a pinion 220. Rigid with the pinion 220 is a gear 221 meshing with a pinion 222 fast on the shaft 217. Secured to the shaft 217 is a worm 223 (Figs. 5 and 9) meshing with the diagonally disposed teeth of a rack 224 fastened to the totalizer frame 215. It is apparent that movement of the lever 55 will cause a sliding movement of the frame 215.

When the handle 56 is moved across the machine to shift the station type carrying drum endwise, a rack 236 (Figs. 3 and 4) on the rear of a sliding frame 237 rigid with the handle, cooperates with spirally arranged teeth of a pinion 225 to rotate a shaft 226. The shaft 226 carries a pinion 227 (Fig. 2) meshing with a pinion 228 fastened to a short shaft 229. Secured to the shaft 229 is a bevel gear 230 (Fig. 4) meshing with a bevel gear 231 fastened to a shaft 232 (Fig. 2) extending toward the rear of the

machine and carrying at its rear end a pinion 233 meshing with a rack 234 (Figs. 5 and 11) projecting laterally from a plate 235 controlling the totalizers engaging mechanism.

The six groups of ticket totalizer elements 244 are each rotatably mounted on a tube 245 (Fig. 9) supported at its ends in plates 246 slidably mounted between rollers 247 journaled on stubs 248 fastened to the side portions of the rectangular frame 215. By this arrangement the plates 246 are readily movable forward and back to engage and disengage the totalizer elements with and from the operating racks 185. Journaled in the plates 246 are shafts 249, the ends of which extend into slots 250 in stationary side plates 251. Fastened to these shafts at each end are arms 255 (Figs. 5 and 11) carrying rollers 256 projecting into cam slots 257 (Fig. 6) in the side plates 251. Pivoted to each of the arms 255 at the left-hand side of the machine is one end of a link 261 carrying at its lower end a stud 262 (Fig. 11) projecting laterally through a slot 263 in a plate 264 pivoted at 265 to a stationary plate 266. Each of the plates 264 carries a stud 267 projecting through a slot 268 in the stationary plate 266 and into a long slot 269 in the plate 235 above mentioned. The plate 235 is slidable vertically on studs 271 in the manner hereinbefore described and its slot 269 has shoulders 272 differentially spaced in the slot so that each vertical step of movement of the plate will cause a different shoulder 272 to engage a stud 267. By differential movement of the plate 235 any desired one of the plates 264 may be rocked on its pivot 265 and thereby swing the lower end of the connected link 261 towards the front of the machine. In Fig. 11, the upper link and arm are shown in operated position that is, the position to which they are swung when the associated shoulder 272 is in effective position.

Each of the studs 262 extends laterally through bayonet slots 275 in a stationary plate 276 and across the rear edge of a sliding plate 277 (Fig. 12). This sliding plate 277 is given an invariable extent of movement at each operation of the machine by mechanism hereinafter described. When the plate 235 is moved to cause one of its shoulders 272 to engage a stud 267, the corresponding stud 262 is withdrawn from the portion 278 of the bayonet slot 275 and engaged with its appropriate notch 281 in the invariably moved plate 277. The first movement of the plate 277 is downward, this movement normally occurring after the actuating racks 185 have been positioned. As the plate 277 moves down the engaged link 261 will be operated, thereby swinging the arms 255 counter-clockwise (Fig. 11). This, because of the shape of the slots 257, will

draw the shaft 249 and the sliding plates 246 for the selected totalizer group toward the front of the machine to engage the totalizer in alignment with the racks 185 with the teeth of the racks. This occurs after the racks have been raised by operation of their differential elements 125 and 136. The racks are then restored by the operation of the differential elements to enter the item on the totalizer. The plate 277 then returns to its starting point to disengage the totalizer from the racks and is then again operated to engage the totalizer and racks and hold them in engagement during the number printing operation of the totalizer.

The totalizer elements 244 are always in engagement with aligning devices except when being driven by the operating racks 185. For this purpose extending across each of the six groups of totalizers is an aligning plate 301 (Fig. 9) supported by two elements 302 fastened to rock shafts 303, extending the width of the frame 215. Co-operating with the elements 302 are camming elements 304 fastened to the shafts 249. When a shaft 249 is rocked the portions 305 of the elements 304 will engage shoulders 306 of the elements 302 and withdraw the aligning plate 301 from engagement with the totalizer elements. This, however, does not occur until just as the teeth of the totalizer elements enter into engagement with the teeth of the racks 185. Positioned between the racks 185 are aligning blades 311 (Fig. 14) held by fixed vertical plates 312. As the plates 301 are withdrawn and the totalizers complete their forward movement all of them except the one in alignment with the racks 185 are engaged with these aligning blades 311. As the totalizers are moved out of engagement the portions 313 of the elements 304 will engage the upper parts 314 of the elements 302 and move the aligning blades 301 back into engagement with the teeth of the totalizer elements. As shown in Fig. 5, the camming elements 304 are long enough to co-operate with the elements 302 in any position of the frame 215. It is clear that the aligning devices described provide a means whereby rotation of the totalizer elements independent of the operating racks 185 is at all times positively prevented.

Ticket totalizer transfer mechanism.

Each of the totalizer elements for the three lower orders has a long transfer tooth 321 (Fig. 9). These teeth act through a common set of connections to control the transfer arms 211 (Figs. 7 and 8) of the tickets differential elements. Said connections comprise six levers 322 for each denominational order, a lever for each group of totalizers, pivoted on studs 324 projecting

laterally from the vertical stationary plates 312 and loosely connected at their forward end to links 325 (see Figs. 9, 14, 34 and 35). The adding movement of the totalizer elements is always in a counter-clockwise direction (Fig. 9) and as the long teeth 321 engage the rear ends of the levers 322 the links 325 are first raised and then returned to normal position after the transfers have been effected.

As shown in Figs. 7 and 8, the transfer arms 211 have pivoted to their sides bell cranks 326. These bell cranks are provided with rollers 327 to engage hooks 328 rigid with the differential elements 125 and 136. Stops 329 are normally in position to engage studs 330 on the bell cranks 326, so that during the final restoring movement of the differential elements the bell cranks 326 will be stopped and rotated about their pivots to withdraw the rollers 327 from the hooks 328. When the differential elements are oscillated springs 331 will move the transfer arms 211 relative to the differential elements until they are stopped by the ends 332 of the stops 329 at which time the springs 331 will rotate the bell cranks 326 to engage their rollers 327 with the hooks 328 so that during the adding movement if the stops 329 have been withdrawn the teeth on the transfer elements 211 will form a continuation of the series of teeth 183 and 184.

The position of the stops 329 is controlled by the totalizer elements acting through the links 325. The link 325 actuated by the units totalizer element has a forwardly extending portion 341 (Figs. 9, 14 and 35) carrying a stud 342 extending beneath an arm 343 fastened to a shaft 344. On its other end the shaft 344 carries an arm 345 projecting upwardly to the rear of a stud 346 carried by an arm 347 pivoted to the frame of the machine. Rigid with the arm 347 is a second arm 348 carrying a stud 349 projecting through a stepped opening 350 in the transfer arm stop 329 associated with the tens differential mechanism. The arm 348 is at all times under the tension of a spring 351 between the stop and a pin 352 on the machine frame. It will be seen that when the transfer tooth on a units totalizer element strikes one of the levers 322, the link 325 will be raised thereby rocking the shaft 344 and the arms 347 and 348. This will disengage the stud 349 from the step 354 of the opening 350 in the stop 329 and a spring 355 will then swing the stop until the stud 349 engages the end 356 of the slot 350. In this position the stop will be out of the path of the stud 330 on the tens transfer arm 211. The roller 327 will thus remain engaged with the hook 328 and the transfer arm 211 thus locked to the totalizer

element. The tens differential element will be effective positively to rotate the tens totalizer element one division.

As seen in Figs. 14 and 34, the stud 359 on the link 325 for operating the transfer from tens to hundreds is carried by an arm 360 extending rearwardly from the link instead of forwardly the purpose of this variation being of course to conform to the different positioning of the transfer stop for the hundreds transfer arm. The stud 359 projects beneath an arm 361 fastened to a shaft 362 carrying at its other end an arm 363 engaging a stud 364 (Fig. 19) on the tripping arm 365 for the hundreds transfer stop. The mechanism for effecting transfers from hundreds to thousands is the same as that between the units and tens except that as shown in Fig. 14, an arm 371 fastened to a shaft 372 is curved to engage the stud 342 carried by the hundreds link 325.

As previously stated the adding and transfers are effected during the fore part of the rotation of the driving shaft 57, the latter part of the rotation being used to print on the tickets the number carried by the corresponding totalizers. This makes it necessary to restore all of the transfer arms 211 and stops 329 to normal condition before the ticket printing part of the operation begins. To restore the arms and stops there is provided a set of arms 369 (Fig. 9) carrying rollers 370 extending across the edges of cams 373 fastened to the driving shaft 57. Rigid with each arm 369 is an arm 374 adapted to engage bevelled projections 375 on the stops 329. Near the end of the first half of the rotation of the driving shaft 57 the arms 374 are operated, thereby camming the transfer stops 329 upwardly against the tension of their springs and allowing the springs 351 to rock the arms 347 and 363 to engage the studs 349 with the steps 354. As the cams 373 pass out of engagement with the arms 369 springs 376 return the arms to their original position thereby freeing the stops 329 ready for the next operation. This restoring movement of the arms 369 occurs after the differential elements 125 and 136 have completed approximately the first step of the counter-clockwise portion of their second movement at which time the studs 330 on the bell cranks 326 will have been carried down out of engagement with the ends 332 of the arms 329 so that the arms are free to be returned to their normal position.

Ticket totalizer sub-total and total taking mechanism.

It will be recalled that the ticket differential elements 125 and 136 have two oscillatory movements at each operation of the machine, one to add and effect transfers

and the other to print the number from the ticket totalizer which is at the time in operating position. In ticket printing operations the totalizer engaging slide 277 is operated twice, once just before the beginning of the return movement of the first or adding oscillation of the differential elements to engage the selected totalizer with the actuating racks and again just before the second operation of the racks. The construction is such that during this second operation the totalizer is held in engagement with the racks during movement of the racks in both directions, thereby first clearing the totalizer and then returning the amount to the totalizer. When in taking a statement from the machine it is operated to clear a ticket totalizer and print the number on the summary strip, the totalizer engaging slide 277 is operated to effect engagement of the totalizer once only and that is after the first or adding oscillation of the differential elements is completed. The slide 277 remains in its lower or effective position while the racks 185 are operated to turn the totalizer elements back to zero and is then restored to normal position to disengage the totalizer before the racks 185 are returned to their starting points. In this way the totalizer is left at zero. The slide is operated the second time in ticket printing operations and in operations of the machine to clear a totalizer at such a time as to engage the totalizer with the racks after the elements 125 and 136 have moved approximately one step and in ticket printing operations the totalizer is disengaged while the racks are one step away from normal during the return movement of the racks. The reason for this is that operated transfer devices are not restored to normal until during the time that the totalizer wheels are being turned to zero and it is necessary to wait until the transfer elements 211 are latched to the segments 183 and 184 before the totalizer is engaged with the racks. Otherwise in banks where the transfer had been tripped during the preceding operation the totalizer wheel would begin to turn immediately while in banks where the transfer devices were not tripped the totalizer wheels would not begin to turn until the segments 183 and 184 had moved far enough for the transfer arms 211 to be latched to the segments. This would result in an incorrect reading, a condition which is prevented by waiting until the arms 211 are all latched to the segments before moving the selected totalizer into engagement with the racks 185.

The mechanism for controlling the movements of the slide 277 and thereby the engagement of the ticket totalizers is shown in Figs. 28, 29 and 30. The engaging slide 277 is provided with rack teeth 386 on its

front edge in engagement with the teeth of a segment 387 formed on an element 388 journaled on a stud 389 attached to the machine frame. The element 388 is provided with a second segment 390 meshing with the teeth of a pinion 391 integral with a sleeve 392 rotatably mounted on a collar 393 slidable on a stud 394 on the machine frame. Fast to the sleeve 392 is a second pinion 395, normally in mesh with the teeth of a segment 396 formed on a rock frame 397, operated by cams 398 and 399 (Figs. 16 and 37) attached to the main driving shaft 57. The frame 397 and its several parts coincide exactly with the frame 407 in Fig. 28 and lies directly back of the latter. The frame 397 is therefore not to be seen in Fig. 28 but its relative location is indicated in Fig. 30, in which figure the parts are shown in their normal relation. The cams 398 and 399 are so formed that they will rock the frame 397 and intermediate connections actuating the totalizer engaging slide 277 twice for adding and sub-total taking.

As a preliminary to operations of the machine to clear a ticket totalizer and print its number an operative connection is established between the totalizer engaging slide 277 and cams 405 and 406 shaped to operate the totalizer engaging slide 277 after the adding period has elapsed and restore said slide as soon as the resetting movement of the differential elements and racks 185 is completed. The cams 405 and 406 cooperate with a rock frame 407 having segmental teeth 408 which are the same as the teeth on the segment 396. To establish resetting relationship between the slide 277 and the rock frame 407 the collar 393 (Fig. 30) and the pinions 391 and 395 are shifted laterally so that the pinion 395 meshes with the teeth 408. The teeth of the segment 390 are broad enough for the pinion 391 to remain in engagement therewith regardless of whether the pinion 395 is in engagement with the segment 396 or the segment 408. In order to shift the pinions 391 and 395 from one position to another the sliding collar 393 is provided with a stud 411 carrying an anti-friction roller 412 engaging a groove 413 in the periphery of a cam 414 pivoted on a stud 415 projecting from the adjacent frame of the machine. Pivoted to the cam 414 is a link 416 pivoted at its lower end to an arm 417 fast on a shaft 418. This shaft is turned to various positions by adjustment of the total taking lever 54 acting through connections explained more fully later on. It is sufficient to point out here that as shown in Fig. 29 the cam groove 413 is so formed that when the portion 421 thereof is in cooperative relationship with the roller 412 the pinion 395 will be in engagement with the teeth of the segment 396 while when the portion 422 is in cooperative relation with the roller 412 the pinion 395 will be in engagement with the teeth 408 of the totalizer clearing or resetting segment. The cam 414 also has portions 423 and 424 which hold the pinions 391 and 395 at an intermediate position, that is, a position in which the pinion 395 is in engagement with neither of the operating segments and the engaging slide 277 is not moved. In order to hold the pinions 391 and 395 in proper alignment, there is provided an aligning device 425 having teeth 426 to engage the pinion 395 when the pinions are shifted to the intermediate or non-operating position. The aligning device 425 is loosely mounted on a rod 427 and is slotted at its lower end to straddle the stud 428. The mechanism just described affords a means whereby it is not only possible to change the time of engagement and disengagement of the ticket totalizers, but it also affords a means whereby at certain positions of the total taking lever the ticket totalizer engaging mechanism will be wholly disabled. These positions are the ones to which the lever is adjusted in cash total and sub-total taking operations of the machine.

The extent of the second oscillation of the ticket differential elements 125 and 136 in ticket printing operations and the extent of their oscillations in resetting and printing totals are, as before stated, controlled by the ticket totalizer elements 244. The mechanism whereby this is effected will next be described.

Associated with each of the ticket differential elements is a plate 431 (Fig. 7) pivotally mounted concentric with the differential elements and having forwardly extending arms 432 provided with notches to engage studs 433 projecting laterally from the trips 163. Each of the plates 431 has inwardly extending teeth 434. For each set of teeth 434 there is provided a bell crank 435 (Fig. 9) pivoted to the frame at 436 and carrying a flat-sided stud 437 which, as the connected totalizer element 244 reaches the zero position in resetting, is swung into engagement with the tooth 434 which is at the time in cooperating position, thereby causing the arm 432 to operate the trip 163 in the same manner as when said trip strikes a zero stop or a depressed key. The bell crank 435 is normally held in ineffective position by the spring 355, but is swung into engagement against the tension of said spring by engagement of the transfer tooth 321 of a totalizer element with the rear end of a lever 438 (Figs. 9 and 36). There are six of these levers 438 for each of the four denominations, all of the levers for a denomination being pivoted on studs 439 attached to the vertical plates 312 (Fig. 14) and loosely connected at their forward ends

with a vertically movable link 440 (Figs. 9 and 36) similar to those employed in connection with the transfer mechanism. Each of the links 440 has a slot 441 engaging a stud 442 on a lever 443 pivoted at 444. The lever 443 also carries a stud 446 engaging a slot in a short arm 447 pivoted on a stud 448 on the machine frame. Rigid with the arm 447 is arm 449 slotted to engage a stud 450 on an arm 451 loose on a stud 452. Rigid with the arm 451 is an arm 453, pivoted at 454 to a link 455 loosely connected by a stud 456 to a link 457, which in turn is pivoted at 458 to the upper end of the bell crank 435. The links 455 and 457 form a toggle normally held in the position shown by a slot 460 in an arm 459. The levers 438 (Fig. 9) are normally lowered so that they will not be engaged by the long teeth 301 when the totalizer elements are rotated in adding. As a preliminary to turning the totalizer elements back in taking either a total or sub-total said levers must be swung up into position to cooperate with the long teeth. This is effected at the proper point in the operation by connections to the main driving mechanism whereby the arm 459 is swung clockwise (Fig. 9) on its pivot 452, causing its slot 460 to act against the stud 456 connecting the toggle links 455 and 457 so as to straighten the toggle and thereby, through the arms 453 and 451 and intermediate arms, lower the links 440 and rock the rear ends of the levers 438 upward. The arm 459 is given the movement mentioned by operation of a rock shaft 463 having a partial gear 464 meshing with a small segment 465 rigid with the arm.

Fastened to the rock shaft 463 (Fig. 28) is an arm 466 pivoted to a link 467 having an adjustable connection 468 with an arm 469 of a bell crank pivoted at 471 on the machine frame. An arm 472 of the bell crank 470 is pivotally connected with a link 473 pivoted at its lower end to an arm 474 of a bell crank 475 pivoted on the stud 389. Rigid with the bell crank 475 is an arm 481 (Figs. 17 and 37) carrying an anti-friction roller 482 projecting into a cam groove 483 in the side of a double cam disk 484 fast on the driving shaft 57. The shape of the cam groove 483 is such that after the first or adding oscillation of the ticket differential elements is completed the bell crank 475 will be rocked clockwise (Figs. 17 and 28) thereby causing the shaft 463 to be rotated anticlockwise (Fig. 9) and operating the arms 459 to adjust the toggle connections 456 to straighten the toggles and thereby lower the links 440 and rock the levers 438 up to effective position. Just at the end of the rotation of the driving shaft 57 the cam groove 483 will restore all of the parts above described to their normal positions.

It will be recalled that in describing the

ticket differential mechanism it was stated that the arm 141 for controlling the extent of movement of the units element is invariably withdrawn before the second oscillation of the elements begins. The devices for withdrawing the arm are also operated by the bell crank 475. For this purpose the arm 486 (Fig. 28) of the bell crank is connected with a link 487 connected by a pin 488 to an arm 489 loose on a shaft 500. The pin 488 extends through the arm so that its ends project from the opposite sides, as shown in Fig. 37. Pivoted on the pin 488 is a link 501 connected at 502 to an arm 503, fast to a shaft 504 extending across the lower front of the machine. The purpose of using links supported at an intermediate point by the arm 489 instead of a single link is to provide a clearance at the front of the machine for some of the grand totalizer engaging mechanism. Fast to the shaft 504 is an arm 505 connected by a link 506 to an arm 507 formed on a bail 508 loose on a shaft 509. This bail 508, as shown in Fig. 33, extends across the four ticket differential sections and near its right end has an arm 510 carrying a stud 511 projecting across an arm 512 (Figs. 7 and 33) rigid with the arm 141. The construction is such that when the bell crank 475 is rocked by the cam groove 483 to set the differential stops 435, the arm 141 will at the same time be swung back far enough to prevent it from interfering with the units trip 163.

Station printing type carriers.

The type carriers for printing the names of the various stations are as best shown in Figs. 3 and 4, mounted in a drum 520 located in the lower front (Fig. 2) of the machine. The drum has a spline and groove connection 522 with a tube 523 rotatably supported at its ends by the frames of the machine. The purpose of the spline and groove connection between the tube and drum is, of course, to provide means whereby the drum may move endwise on the tube but relative rotation of the drum and tube is prevented. The station printing type carriers 524 are mounted in six rows of forty type carriers each, the rows extending substantially half way around the periphery of the drum. In ticket issuing operations the drum is moved endwise on the tube 523 to bring the row containing the type carrier which is to print above a printing platen and is rotated by turning the tube 523 to bring said type carrier in printing position.

Rotative movement is imparted to the tube and drum by movement of the handle or lever 55 (Fig. 2). Rigid with the lever is a toothed segment 526 meshing with a gear 527 fast to a short shaft 528 journaled in the adjacent machine frame. Attached to the other end of the shaft is a gear 529

meshing with a larger gear 530 journaled on a stud 531 carried by the machine frame. This gear 530 in turn meshes with a gear 532 fastened to the left end of the tube 523.

5 The lever 55 is adjustable to forty different positions and this movement, through the intermediate gearing described, permits corresponding adjustment of the type carrier drum 520.

10 The endwise movement of the drum 520 along the tube 523 is imparted by means of the handle 56 (Figs. 3 and 4). This handle is rigidly secured to the rectangular frame 237 previously mentioned. The frame is slidably mounted on the tube 523 and a rod 536. Said rod is provided with six notches 537, one for each position to which the drum may be adjusted laterally and the handle 56 has a manually operable spring latch 538 to cooperate with these notches and thereby secure exact lateral alignment of the drum as a preliminary to the operation of the machine.

25 The station name printing type carriers 524 are in the form of bars having their bases resting against the periphery of the drum. Each of the type bars has a small yoke 541 of approximately the same length as the type bar. The side portions of these 30 yokes are fastened to the type bars and extend through openings in the periphery of the drum. Compressed between the cross plates of the yokes 541 and the periphery of the drum are springs 542 serving to hold the type bars in normal position, that is, against the drum. In printing operations the positioned type carrier is projected from the periphery of the drum so that only the carrier which is to print will be in position to cooperate with the printing platen.

40 The device for projecting the type carriers is in the form of a yoke, the cross bar 543 of which extends through the drum above the printing line. The side arms 544 of the yoke are fastened to a rock shaft 545 and are far enough apart on the shaft to permit endwise movement of the drum to any of the six positions. The cross bar has a portion 546 on its lower edge to engage the yoke 541 of the type bar which is to be projected and also has slots 547 to engage the side plates 548 of the drum. The bottoms of the slots 547 are beveled to engage notches formed in the plates 548. The arrangement is such that when the bar 543 is depressed the positioned type carrier will be projected from the drum and the drum locked against both endwise and rotary movement.

60 The shaft 545 is normally rocked at each operation of the machine but this is prevented by disabling the operating connections on cash total and subtotal printing operations. In order to rock the shaft 545, an arm 5481 attached to the shaft has loosely

connected thereto a link 549 (Figs. 3 and 31). The rear end of the link 549 is pivoted on a stud 550 on an arm 551 loose on the shaft 418. The stud 550 is normally engaged by a hook 553 on a link 554 pivoted at 555 to a bell crank 556, loose on a stud 428. The other arm of the bell crank 556 carries an anti-friction roller 558 (Fig. 17) projecting into a cam groove 559 formed in the side of the disk 484 attached to the driving shaft 57. The shape of the cam groove is such that at the beginning of an operation the bell crank 556 will be rocked counter-clockwise (Fig. 31) thereby swinging the bar 543 (Fig. 3) down to project the positioned type carrier to printing position and lock the drum 520. The bell crank 556 is not returned to its original position until just at the end of the rotation of the shaft 57 so that the type carrier remains projected and the drum locked for substantially the entire rotation of the driving shaft. In cash total and sub-total taking operations the hook 553 is disengaged from the stud 550. As a result, the bar 543 will not be moved down and no type carrier 524 will be projected to print. The manner in which the hook is disengaged will be described later.

In addition to the locking notches or slots 547 in the yoke bar 543, a second aligning or locking device is provided to prevent movement of the type carrying drum 520 and the ticket totalizer frame 215 during an operation. This second mechanism comprises a locking arm 565 (Figs. 2 and 28) attached to a short shaft 566 journaled in the left hand side plate 251. This arm 565 is formed to cooperate with the teeth of the gear 222 on the shaft 217. Attached to the shaft 566 (Fig. 28) is a second arm 567 connected by a link 568 to an arm 569 rigidly connected by a short sleeve with the bell crank 556 (Fig. 30). It is apparent that when the bell crank is operated as above described, the arm 565 will be swung into engagement with the gear 222 and held in engagement until just at the end of the rotation of the driving shaft 57.

Mechanism is provided whereby if either the lever 55 or the handle 56 is at an intermediate position, operation of the machine will be prevented and an operation of either will be prevented during an operation of the machine. This mechanism for the lever 55 is shown in Fig. 43. Rigid with the lever is an arm 576 carrying a stud 577 suitably shaped to cooperate with teeth 578 in the outer edge of a plate 579. This plate is supported at its lower end by a pin 580 carried by an arm of a bell crank 585 pivoted at 581 to the frame 583. At its upper end the plate 579 is similarly supported at 582 on a bell crank 586 pivoted at 584. Pivoted at 587 and 588 to the bell cranks 130

585 and 586 respectively is a bar 589 having a shoulder 590 to cooperate with a shoulder 591 formed on a collar 592 attached to the rock shaft 58. This shaft it will be recalled 5 controls the latching mechanism and in order to release the mechanism for the machine to operate the shaft must rotate in a clockwise direction as viewed in Fig. 43. As the lever 55 is moved from one position 10 to another the stud 577 will ride over the points of the teeth 578 thereby depressing the plate 579 and swinging the arms 585 and 586 and the bar 589 upward against the tension of a spring 593 to carry the 15 shoulder 590 over the shoulder 591 and thereby prevent the releasing movement of the rock shaft 58. As the stud 577 passes into one of the notches between teeth 578, the spring 593 will withdraw the shoulder 20 590 so that the shaft 58 will be free to rock.

The devices whereby the machine is locked against operation if the handle 56 is not correctly set are shown in Figs. 3, 15 and 33. Attached to the rear of the frame 237 is a 25 cross bar 601 having a tooth 602 for each of the six lateral positions of the frame, each tooth, when the frame is in the corresponding position, resting against a roller 603 on an arm 604 rigid with a sleeve 605 30 loose on the shaft 509. Near its left hand end (Fig. 33) the sleeve 605 carries a yoke 607, carrying a stud 608. As the frame 237 is moved away from one of its six lateral positions the tooth 602 will be carried 35 out of contact with the roller 603 and a spring 609 will rotate the sleeve 605 and yoke 607 to carry the stud 608 down to the rear of a tail 610 formed on the supporting arm 84 for the temporary locking detent 82 40 of the special key bank. It is clear that this will prevent depressing any of the special keys until the frame 237 is again in one of the six positions where a tooth 602 will be effective to hold the stud 608 up out 45 of the path of the tail 610.

Printing mechanism.

The printing mechanism is located in the base of the machine and comprises mechanism 50 for printing tickets and feeding them through a slot 621 (Figs. 1^A and 1^B) and mechanism for printing a summary strip which is fed out through a slot 622.

The ticket strip passes from a supply roll 55 (not shown) up through a guide 623 (Fig. 38) and between feeding rollers 624 and 625. The left hand ends of these two rollers are equipped with intermeshed gears 626 and 627 the latter meshing with a gear 628 at 60 tached to a short shaft 629 journaled in upwardly extending portions 630 formed on the frame 631. Attached to the shaft 629 is a large gear 632 meshing with a gear 633 fastened to the driving shaft 57. The construction is such that for each rotation of 65

the driving shaft 57 the two rollers 624 and 625 will be given a complete rotation. The roller 624 has flanges 634 which cooperate with the roller 625 to feed the ticket strip the distance required for a single ticket. Positioned on the periphery of the roller 624 70 and between the flanges 634 is an electrotype which prints on the faces of the tickets the name of the railroad company and other invariable matter such as the name of the 75 station at which the machine is located.

From between the rollers 624 and 625 the ticket strip passes through a second chute or guide 635 (Fig. 39) over a stationary knife 636 and under a knife 637, rotatably 80 mounted in a stationary frame 638. Rigidly attached to the right hand end of the knife 637 is an arm 639 (Figs. 38 and 42) connected to a pitman 640 slotted to engage the shaft 629 and carrying an anti-friction 85 roller 641 projecting into a cam groove 6421 (Figs. 19 and 38) formed in the side of a disk 643 fastened to the shaft 629. The groove 6421 is so shaped as to draw the pitman 640 rearward as soon as the ticket has 90 been fed by the rollers 624 and 625, thereby severing a ticket from the ticket strip.

As the ticket strip is fed over the knife 636 its forward end is guided on to a table 641 (Fig. 39) forming a part of a carriage 95 for swinging the ticket back and forth between the position where the name of the station to which the ticket is issued is printed and the position where the amount and ticket numbers are printed. As the knife 637 is rotated and the ticket severed, the 100 knife carries the rear edge of the ticket down in front of a lug 642 formed on a table 6431 which is also a part of the ticket carriage. The tables 641 and 6431 are formed respectively on plates 644 and 645. The plate 644 105 has a tail 646 which normally rests against a shoulder 647 formed on the plate 645. The plate 645 is pivoted on a stud 648 attached to the upper end of a link 650 and extending through a slot 6402 in the plate 644 and a slot 649 in a stationary guiding plate 6401. 110 The lower end of the link 650 is connected at 651 with an arm of a bell crank 652 pivoted on a rod 653. To the other arm 654 of the bell crank a pitman 655 is connected. This pitman is slotted to engage the shaft 629 and carries a roller 656 (Fig. 44) projecting into a cam groove 657 formed in the 115 side of a disk 658 fastened to the shaft 629. The shaft 629 makes a complete rotation in a counter-clockwise direction (Fig. 44) at each operation of the machine and the cam groove 657 is so shaped that during the 120 forepart of the operation, the link 650 will be given an upward thrust, thereby swinging the carriage comprising plates 644 and 645 forward far enough to bring the ticket in position to receive an impression from 125 the station printing type carrier at the sta- 130

tion printing line 5411 (Fig. 38). The ticket carriage is then swung back part of the way toward its first position so as to bring the ticket in position to receive an impression from the amount and consecutive number type carriers at their printing line 5412. After the impression last mentioned is taken, the carriage is again swung toward the front. This movement, which is greater than the first forward movement, is to release the ticket from the carriage and engage it with rollers 661 and 662 which are then rotated to feed the ticket on out of the machine. The ticket is released from the swinging carriage by moving the tail 646 out of engagement with the shoulder 647 on the plate 645 so that movement of the plate 645 relative to the plate 644 is permitted. During this relative movement, the block 642 pushes the ticket forward into engagement with the rollers 661 and 662. The tail 646 is disengaged from the shoulder 647 by a stud 663 on the plate 644 coming in contact with a portion 664 of the stationary guiding frame. When the stud strikes the portion mentioned, the tail 646 is swung up out of engagement with the stud 647 and the plate 644 is held stationary during the final movement of the link 650 and plate 645 to engage the ticket with the rollers 661 and 662. When the bell crank 652 and link 650 are returned to the starting point the stud 648 will engage the lower end of the slot 6402 and draw the plate 644 along. A stop 665 on the guiding plate 6401 will, during the final movement of the link 650, contact the stud 663 and swing the tail 646 back into engagement with the shoulder 647.

Impressions from the station type carriers and the amount and number type carriers are taken by a platen 666 (Fig. 39) fastened to a shaft 667, journaled in side plates 668 with the ends of the shaft resting in open slots 669 in the upper ends of arms 670 fast on a shaft 653. Pivoted to an arm 6701 also fast on the shaft 653 is a pitman 671 (Figs. 39 and 41), slotted to straddle the shaft 629. The pitman carries a roller 672 projecting into a cam groove 673 in a disk 674 rigid on the shaft 629. The groove 673 is so formed as to swing the arms 670 rearward shortly after the shaft 629 has completed the first half of its rotation. By this time the ticket carriage will have carried the ticket to the printing line 5411 and back again to the printing line 5412 of the amount and number printing type carriers. The arms 670 are then swung back to their original position.

When the ticket carriage is swung forward to the printing line 5411, the platen 666 is raised to take an impression from the projected type carrier 524. When it is swung rearward into position to cooperate with the printing line 5412, the platen is

again raised to print on the ticket the amount and ticket number. These impression taking movements of the platen are imparted by a plate 678 having a slot 675 surrounding a stud 676 forming a pivotal connection between one of the plates 668 in which the platen shaft 677 is journaled and a small arm 677 which is in turn pivoted to one of the arms 670. Rigid with the plate 678 is a plate 1697 secured to a shaft 679 carrying an arm 680 having an adjustable connection 681 supporting the forward end of a pitman 682. The pitman 682 carries an anti-friction roller 683 (Fig. 40) cooperating with a cam groove 684 in a cam disk 685 fast to the shaft 629. The groove 684 is so shaped as to rock the arm 680 and plate 678 twice, the first time in a clockwise direction (Fig. 39) to raise the platen against the station printing type carrier and the second time in a counter-clockwise direction to raise the platen against the amount and number printing type carriers.

In the foregoing it was stated that when the tail 646 of the ticket carriage plate was disengaged from the shoulder 647, the plate 645 continued its movement, thereby causing the block 642 to push the ticket into engagement with the feeding rollers 661 and 662. The roller 662 is a dating and numbering cylinder such as is fully shown and described in U. S. Letters Patent 541,247, issued June 18, 1895, to W. Murphy. Such cylinders have been used in cash registers for many years and need no detailed description here. It is sufficient to state that the roller 662 contains the usual dating and numbering type carriers and knobs 6621 and 6622 respectively for setting the date wheels and turning the consecutive numbering wheels to zero. After the ticket is in engagement with the rollers 661 and 662, the rollers are rotated, thereby causing the consecutive number and date to be printed on the back of the ticket, further movement of the rollers feeding the ticket out through the slot 621 in the base of the machine. In order to feed the tickets, the rollers 661 and 662 are provided with intermeshed gears 686 and 687 respectively. Meshing with the gear 687 (Fig. 38) is a segment 688 pivoted to the printer frame at 689 and having a slot 690 to clear the rod 653. Pivotaly connected to the segment 688 at 691 is a pitman 692. This pitman carries a roller 693 (Fig. 20) cooperating with a cam groove 694 in a disk 695 fast to the shaft 629. The cam groove is shaped first to draw the segment rearward slightly so as to impart a slight reverse movement to the rollers 661 and 662 and is then given a forward thrust to rock the segment 688 and impart feeding and printing movement to the rollers. The segment 688 is then returned to its normal position.

In order to make it possible to prevent the tickets from being fed in summary strip printing operations, the feeding roller 625 is mounted on an eccentric 696 which may
 5 be turned by means of a knob 697 to move the roller 625 out of feeding relationship with the roller 624. This construction is well known in the art. The summary strip, which, it will be remembered, is printed
 10 only in taking a statement from the machine, passes from a supply roll, not shown, up through a guide 701 (Figs. 38 and 39), under guides 702 and 703, around the platen roller 666, through a guide 704 and between
 15 the platen roller 666 and a feeding roller 705. The strip then passes through a guide 706 into a delivery chute 707. It is apparent that the summary strip is raised at each time the platen 666 is given an impression taking movement and that the strip would be
 20 printed upon at every operation of the machine if it were not for the fact that in ticket printing operations, the printing falls upon the tickets which are interposed between the strip and the type carriers.

The strip is fed out of the machine by rotating the feeding roller 705. For this purpose the shaft 711, to which the feeding roller 705 is attached, is provided with
 30 ratchet 712. Loosely mounted on the shaft 711 is a plate 713 to which is pivoted a spring pressed pawl 714 cooperating with the ratchet 712. Rigid through the medium of a sleeve 7131 with the plate 713 is an
 35 arm 710 carrying a stud 715 normally cooperating with the curved edge 716 of an arm 717 pivoted as at 718 to an auxiliary frame 730. Pivoted to the side of the arm 717 is a link 719 connected at 720 to an
 40 arm 721 fast on a tube 722 on the shaft 504. Pivoted to the stationary plate 730 (Figs. 38 and 42) is a hooked arm 723, the forward end of which has a slot 724 engaging a stud 725. This stud is attached to the side of
 45 the arm 717 and projects through a slot 7181 in the frame 730 into the slot 724. In preparing the machine for summary strip printing operations, the total taking lever 54 will, through connections explained later,
 50 rock the tube or sleeve 722 counter-clockwise (Fig. 38) and thereby swing the arm 717 up out of engagement with the stud 715. This movement of the arm 717 will cause the stud 725 to swing the arm 723 down to
 55 position the nose 727 thereof in the path of the stud 715. When the platen arms 670 are swung rearward to amount and number printing position, the stud 715 will engage the nose 727 and swing the arm 710 and
 60 plate 713 counter-clockwise about the shaft 711. During this counter-clockwise movement, the pawl 714 will ride idly over ratchet 712. As the platen carrying arms 670 return to their forward position, the
 65 stud 715 will be carried along the cam edge

728 and the arm 710 and plate 713 will be rotated about the shaft 711, thereby causing the pawl 714 to turn ratchet 712 and roller 705 to feed the summary strip.

The connections for adjusting the amount and number printing type carriers are substantially the same as the ones shown and described in the two patents hereinbefore mentioned and only a brief description is
 75 thought to be necessary here.

The location and relative arrangement of the amount and number printing type carriers is best shown in Figures 31 and 37. There are six of the amount type carriers 731, four controlled jointly by the four
 80 banks of amount keys and the totalizer and two controlled only by the higher order totalizer elements in total and sub-total printing. There is also provided a type carrier 732 carrying type to print characters representing the special keys. The type carriers for printing the ticket numbers are designated by the numeral 734. The amount type carriers are attached to the ends of nested sleeves 735 to which are attached at their
 90 right hand ends gears 736 normally meshing with the teeth of segments 737 (see also Fig. 32). A slight movement of the gears 736 independent of their segments is effected under certain conditions, but the purpose
 95 and manner of effecting the same is hereinafter described. These segments are fastened to nested sleeves 738 on shaft 418 to which sleeves are fastened arms 739 connected by links 740 to the rear ends of beams 741 (Fig. 6) loosely supported at their forward ends by pins 742 attached to the amount differential elements. After said elements have been positioned either under
 100 the control of the keyboard or of the totalizer, the beams 741 are engaged by rollers 744 (Fig. 6) on the invariably moved rock frames to move the beams into engagement with collars 743 on the pivot studs 101 for the differential elements and thereby rotate the type carriers to a position corresponding to the setting of the differential elements. The special type element 732 is likewise connected by a gear 1736, segment 1737 and link 740 to a beam controlled by
 105 the differential mechanism of the special bank. The ticket numbering type carriers are operated in the same manner by sleeves 7351, gears 7361, segments 745 and arms 746 linked to the ticket differential elements 125 and 136.

Cooperating with the amount type carriers 731 and special type carrier 732 is an aligning element 751 fastened to the shaft 504. The aligning device 751 has a blade
 110 752 wide enough to engage all seven of the type carriers. It will be remembered that the shaft 504 is rocked at each and every operation of the machine by the cam groove 483 in the double cam disk 484 (Figs. 17 130

and 37). The number printing type carriers are aligned by an element 753 attached to a tube 754 on the shaft 504. Fastened to the other end of the tube is an arm 755 (Figs. 31 and 37) connected to a pitman 756 slotted to straddle the hub 757 of a cam disk 758 rigid on the shaft 57. A roller 759 on the pitman 756 cooperates with a groove 760 in the disk 758. The groove is so formed that the pitman 756 is drawn rearward to rock the blade 761 of the aligning device 753 into engagement with the type carriers, this movement of the pitman occurring during the latter half of the rotation of the shaft 57 or after the type carriers 734 have been set to print the number on the ticket totalizer.

As before pointed out, in operations to print cash totals or sub-totals on the summary strip, the mechanism for projecting the station type carrier 524 which is at the time in printing position is disabled. The reason for this is that in printing amounts on the summary strip, the amounts fall in the space where the name of the station would otherwise appear. It is apparent that on the other hand the amount type carriers must be prevented from printing on the strip in all summary taking operations to list the names of the stations and the numbers taken from their respective totalizers. This is effected by turning the amount type carriers backward from zero so as to present blank portions at the printing line. The mechanism for turning the type wheels back is shown in Figures 32 and 37. Extending across the gears 736 is a stud 765 on an arm 766 journaled on the shaft 504, said arm being rigidly connected by a bar 767 to a hub 768 also loose on the shaft 504. On the under side of the hub 768 are teeth 769 meshing with the teeth of a small segment 770 loose on the shaft 545. Rigid with the segment 770 is a partial gear 771, the teeth of which are at all times in engagement with the teeth of a small segment 772 formed on a lever 773 journaled on a stud 774. The lever 773 also comprises an arm 775 carrying a stud 776 projecting into a cam groove 777 formed in a plate 778. When the total lever is adjusted to the "Reset ticket totalizer" position, see Fig. 1^B, the portion 789 of the cam groove 777 will be brought into engagement with the stud 776, thereby rocking the lever 773 counterclockwise (Fig. 32) on the stud 774. This movement will be transmitted through the partial gear 771 and segment 770 to the frame 767, swinging the frame counterclockwise to bring the stud 765 into engagement with the side 771 of notches cut in the gears 736. This will rotate the gears and consequently the connected amount type carriers 731 backward one division from their zeros to

a neutral or blank position. The connections whereby the cam plate 778 is adjusted by movement of the total lever 54 will be described later. The backward step of movement of the type carrier gears 736 does not affect the position of their segments 737. As shown in Fig. 32, when the type carriers are at zero the teeth of the segments 737 are far enough out of engagement with the teeth of the gears to permit movement of the gears relative to the segments and the segments have curved extensions 779 in contact with circular portions 780 formed on the gears. Each of the gears has a curved slot 781 to engage the extension 779, thereby preventing any interference between the gear and the segment and also serving to insure maintaining proper relationship between the gear and the segment.

Total lever and controlling mechanism.

The total lever 54 and most of the controlling mechanism associated therewith is fully shown and described in the Fuller patent previously referred to and only those features of this mechanism which directly involved in the present invention will be explained in detail here. In Figure 1^B the lever 54 is shown at the single ticket issuing position. In this position the totalizer selected by adjustment of the lever 55 and handle 56 is actuated to add one or two, depending on whether the half fare key 52 or the full fare key 51 is depressed. If the lever 54 is adjusted to the "Double" position, the machine operates twice, each of the operations being the same in every respect as the operation at the "Single" position of the lever. The mechanism for controlling the double operation will next be described.

The position of the plate 64 (Fig. 23) it will be recalled, controls the restoring of the rock shaft 58 and latch mechanism controlled thereby, the plate when in the position shown in Figure 23, restoring the shaft at the end of each rotation of the driving shaft, while if the plate is drawn forward at its lower end so as to bring the portion 81 of the slot 65 in position to receive the stud 66 when the arm 67 is operated, the shaft 58 will not be restored at the end of the first rotation of the driving shaft but will be restored near the end of the second rotation.

To permit two rotations of the driving shaft 57, the total lever 54 controls mechanism shown in Figures 23 and 24. This mechanism includes a pitman 783 pivotally connected to an arm 784 loose on the shaft 509. The pitman is provided with a slot 785 surrounding the stud 74 on which the gear 75 is mounted, the slot being provided to permit endwise movement of the pitman. The pitman carries a pin 786 engaging a slot 787 in the plate 64. A roller 788 carried

by the pitman is normally seated in an offset 789 in a cam groove 790 formed in a disk 791 loosely mounted on the stud 74. The disk 791 is normally not connected to the gear 73 but its left hand side is seated in a circular depressed portion 792 in the right hand face of the gear. A plate 793 is slidably mounted in a groove 794 formed in the left hand face of the disk 791, the plate having a slot through which the stud 74 projects. The forward end of the plate is provided with a lug 795 normally projecting towards the right between two pins 796 projecting laterally from the left hand side of the pitman 783. When the parts are in the normal position shown, one of two offsets 797 of the circular depressed portion 792 of the gear 73 will be opposite the forward end of the plate 793. This is the position of the parts when the lever 54 is at either the "Single" position or the "Ticket totalizer reset" position.

When the lever is adjusted to the "Double" position the pitman 783 is drawn forward, thereby through the studs 796 drawing the plate 793 forward into the one of the recesses 797 which is at the time in position. This latches the cam disk 791 to the gear 73 so that the two will rotate as a unit. Shortly after the gear 73 begins to turn, the cam groove 790, acting against the roller 788, will drive the pitman 783 forward, bringing the portion 81 of the slot 65 in the plate 64 under the stud 66 on the arm 67. Then when the arm 67 is operated near the end of the first rotation of the driving shaft 57, the restoring plate 64 will not be disturbed. Shortly after the second rotation of the driving shaft 57 begins, the cam groove 790 will move the pitman 783 and plate 64 rearward to their original positions, so that when the arm 67 is again operated the plate 64 will be moved downward and the rock shaft 58 will be restored.

The mechanism for first moving the pitman 783 and plate 64 forward comprises an arm 801 (Figs. 33 and 45) formed on sleeve 802, having a slot and pin connection 1802 with the shaft 509 to permit a slight movement of the sleeve independent of the shaft. The arm 801 carries a stud 803 projecting through a slot 804 in the right hand machine frame and forming a rigid connection between the arm 801 and the arm 784. The sleeve 802 has a second arm 805 (Figs. 21 and 22) carrying a stud 806 projecting into a cam slot 807 in the upper end of a lever 808 pivoted at 809 to the machine frame. At its lower end the lever 808 carries a stud 810 projecting into a cam slot 811 formed in a disk 812 (best shown in Fig. 21) rigid with the total lever 54. In Figures 21 and 22 the lever 54 is shown at the normal or "Single" ticket issuing position. If the lever 54 is raised to the next higher or

"Double" position, a cam portion 813 of the slot 811 will be brought into contact with the stud 810, thereby swinging the lever 808 counter-clockwise (Fig. 22) and causing the cam slot 807 in the lever to rock the element 802 and its arms 805 and 801 in a clockwise direction. This through the connection afforded by the stud 803 will rock the arm 784 in clockwise direction (Fig. 23) to latch the pitman 783 and gear 73 together and thereby during the first rotation of the driving shaft bring the portion 81 of the slot in the plate 64 under the stud 66. The cam slot 807 in the lever 808 is long enough and properly shaped to prevent interference with the additional movement of the element 802 as next described.

When the pitman 783 (Fig. 23) is reciprocated by the cam 790 as above described to move the plate 64, the arm 784 and the element 802 (Figs. 18 and 33) rigid therewith are of course given a rocking movement. This, however, does not disturb the shaft 509 in operations with the lever 54 at the "Double" position because of the slot and pin connection 1802. The shaft must, however, be rocked on cash total and sub-total taking operations, that is, when the lever 54 is swung either to the top or bottom positions. (See Fig. 1^B.) The reason for this is that shaft 509 has attached thereto mechanism which is called into play on these operations. This mechanism comprises a rod 817 (Figs. 6 and 33) supported at its ends by two arms 818 fastened to the shaft 509, zero stop pawls 821 which are to be swung forward into engagement with the latch trips 163 of ticket differential elements so as to stop said elements at zero, and an arm 822 (Figs. 6 and 22) operating a link 823 and other mechanism associated with the cash totalizer engaging pitman 1824 in the manner described in the Fuller patent. The pin fastening the arm 822 to the shaft 809 forms part of the slot and pin connection 1802 between sleeve 802 and shaft 509 so as to prevent any interference between the sleeve and the shaft when the element 802 is rocked independently of the shaft. The construction of the slot and pin connection is shown in Fig. 45 in which the arm 822 has been omitted for the sake of clearness. The rod 817 when the shaft 509 is rocked will first be swung to the rear of tails 824 (Fig. 6) of the arms 84 so as to prevent depressing amount keys and will then engage tails 90 on the zero stop pawls so as to swing the noses 107 of the pawls out of the path of the trips 106 of the amount differential elements. The zero stops 821 for the tickets differential elements are fast on the shaft 509 (Fig. 33) and are provided so as to hold the elements at zero in order to print properly on cash printing operations. If there were no such stops it is apparent, of course,

that the three higher order elements would travel up the full distance so as to print nines while the units element would be stopped at one by the controlling arm 141 and as a result when the type carriers were set they would print opposite the total of the cash the numerals 9991 instead of four ciphers 825 shown in Fig. 25.

In order to cause the shaft 509 to rock in cash sub-total and total taking operations means is provided for latching the shaft and sleeve 802 together so that when the sleeve is rocked by operation of the pitman 783 the movement will be imparted to the shaft. This means comprises a link 827 (Figs. 18 and 21) slotted at its forward end to engage the shaft 509 and pivoted at its rear end to a lever 828 pivoted on a stud 829 attached to the adjacent machine frame and carrying a roller 830 projecting into a slot 831 in the disk 812 forming a part of the lever 54. Near its forward end the link 827 (Figs. 18 and 21) is provided with a slot 832 receiving a stud 833 fast on an arm 834 secured to the shaft 509. Rigid with the arm 834 is a small arm 837 carrying a stud 838 on which is loosely mounted a plate 839 having a slot 840 receiving a stud 841 on the link 827. When the lever 54 is swung to either the top or bottom position, one or the other of the portions 842 of the slot 831 (Fig. 21) will be carried into engagement with the stud 830, thereby rocking the lever 828 on its pivot 829 and drawing the link 827 toward the rear of the machine. As the link moves rearward, the stud 841 (Fig. 18) will rock the element 839 to move a stud 844 thereon between two ears 845 formed on the sleeve 802. The slot 832 will at the same time act against the stud 833 to rock the arm 834 of the shaft 509 to an extent corresponding to the movement given the sleeve 802 by the cam slot 807 in the arm 808. Then when the element 802 is rocked by the pitman 783, the shaft 509 and all the parts attached thereto will move as a unit. As shown in Figs. 18 and 21, the slots 832 and 840 are long enough and are suitably shaped to prevent any interference during this unitary movement of the shaft 509 and the element 802.

When the lever 54 is swung to either the top or bottom position, the rock shaft 58 is released and the machine permitted to operate just as though one of the special keys had been depressed. This is effected in substantially the same way as described in the Fuller patent by depressing the plate 69 (Fig. 15). For operating this plate by movement of the lever 54 there is provided a link 845 pivoted at its forward end to an arm 846 (Fig. 15) journaled on the shaft 509. Rigid with the arm 846 is a second arm 847 carrying a stud 848 engaging a shoulder 849 on an arm 850 extending downward from the plate 69. At its rear end the

link 845 (Fig. 21) is pivotally connected to a lever 852 pivoted at 853 and carrying a stud 854 projecting into a slot 855 in the disk 812. The slot 855 is so formed that when the lever is swung to either the top or bottom position, the lever 852 will be swung counter clockwise thereby thrusting the link 845 forward (Fig. 15) and swinging the stud 848 downward to lower the plate 69 and permit the rock shaft 58 to release the driving mechanism and close the motor circuit. The operation of the links 845 and 827 are so timed with reference one to the other that the shaft 509 will have been latched to the element 802 before the detent 69 is lowered to release the machine.

Pivoted at 856 (Fig. 21) to the side of the disk 812 is a link 857. At its lower end the link is provided with a notch 858 to engage a stud 859 (Fig. 32) carried by an arm 860 fast to the shaft 418. This shaft has fastened thereto the cam plate 778 previously mentioned, a cam plate 871 (Fig. 31) and the arm 417 (Fig. 28) operating through the link 416 to move the cam 414 for shifting the pinions 391 and 395 laterally to control the engagement and disengagement of the ticket totalizers. The cam plate 778 (Fig. 32) in addition to the slot 777 previously described for turning the amount type carriers backward a step from zero, has a second slot 861 receiving a long stud 862 on an arm 863 attached to the sleeve 722 (Fig. 37). This sleeve, it will be recalled, carries the arm 721 for operating the arms 717 and 723 (Fig. 38) controlling the feeding of the summary strip. The slot 861 is so shaped that when the lever 54 is lowered to the "Reset ticket totalizer" position, the portion 864 of the slot will be in engagement with the stud 862, thereby raising the rear end of the lever 863 and rocking the sleeve 722 in the proper direction to render the strip feeding mechanism effective. The cam plate 871 (Fig. 31) is near the left hand side of the machine and controls the operation of the bar 543 for projecting the station type carriers to printing position and locking the station type carrier drum against movement. Formed in the cam plate 871 is a cam slot 872 engaging a stud 873 attached to the side of a bell crank 874 pivoted on a stud 875 attached to the machine frame. The rear arm 876 of the bell crank has a stud 877 extending through a slot 878 in the link 554. The slot 872 is so formed that when the lever 54 is swung to either the top or the bottom position, the bell crank 874 will be rocked counter clockwise (Fig. 31) thereby raising the forward end of the link 554 to disengage its hook 553 from the stud 550. The stud 877 will support the link 554 in this disconnected position, so that when the link is reciprocated by the bell crank 556 and cam 559, the arm 548 and con-

sequently the shaft 545 will not be disturbed. In order to prevent the shaft 545 from being accidentally displaced while the link 554 is disconnected, the forwardly extending arm of the bell crank 874 is provided with a stud 881 (Fig. 31) which will engage a notch 882 formed in the upper edge of link 549. This will lock the link 549, arm 548 and shaft 545 against movement until the bell crank 874 is returned to its original position.

In addition to the other slots described the disk 812 has a slot 894 (Fig. 21) operating a bell crank 895 for preventing releasing movement of the rock shaft 58 when the total lever is in intermediate positions, a slot 896 controlling the connection between the oscillatory disk 898 (Fig. 22) and the cash totalizer engaging link 899, a slot 900 controlling the mechanism whereby the positioning of the actuators in resetting operations of the cash totalizer is controlled by the totalizer elements, and a slot 901 controlling the movement of the totalizer engaging pitman 1824. These four slots and the mechanisms associated therewith are all fully shown and described in the Fuller patent. The description need not be repeated here, as the mechanism is not directly involved in this invention.

Mechanism is provided for preventing operation of the full fare key 51 and the half fare key 52 when the total lever 54 is at the "Reset ticket totalizer" position and for preventing operation of the releasing key 53 except when the lever 54 is at the "Reset ticket totalizer" position. This mechanism is shown in Fig. 18. It comprises a plate 902 slidably mounted on studs 903 fastened to the special key bank frame. In the inner edge of the plate 902 is a notch 9031 engaging a stud 904 projecting from the link 905 pivoted to the key frame at 906. At its lower end the link has a slot 907 surrounding a stud 908 fastened to the side of the disk 812. In the outer edge of the plate 902 are cuts 909, 910 and 911 cooperating respectively with the pins 156 in the keys 51, 52 and 53. The cuts 909 and 910 are so positioned and are of sufficient width to permit depression of the keys 51 and 52 when the lever 54 is at either the "Single" or the "Double" position. The cut 911 is just wide enough and is so positioned that it is only brought into position under the pin in the key 53 when the lever 54 is set at the "Reset ticket totalizer" position. It is, of course, apparent that none of the three keys can be operated when the lever 54 is swung to its extreme upper or lower position, the machine then being released directly by movement of the lever operating the special key detent as hereinbefore described.

Operation.

In operating the machine to issue tickets the total lever 54 is adjusted to either the "Single" or the "Double" position depending upon whether one or two tickets are wanted. At the "Single" position, the driving mechanism has a single cycle of operation and issues one ticket while at the "Double" position of the lever the driving mechanism has two cycles of movement during each of which a ticket is printed and delivered through the slot 621 at the front of the machine. The handle 56 is then moved laterally to shift the station type carrying drum 520 to position the desired row of station type above the platen and connect the group of totalizers containing the desired ticket totalizer 244 with the totalizer engaging mechanism. The lever 55 is then adjusted with reference to the scales on the front of the machine until the point on the lever is opposite the horizontal line containing the name of the destination station. This movement of the lever rotates the station type carrying drum 520 to bring the proper type carrier 524 in position to print and also shifts the ticket totalizer frame 215 laterally to bring the corresponding ticket totalizer to adding position. The amount keys 50 are then operated to set up the price of a single ticket. The order in which the total lever 54, the lever 55 and handle 56 and the amount keys 50 are operated is not essential as in ticket printing operations they can be adjusted in whatever sequence is convenient. In fact, as before stated, the lever 55 and handle 56 may be simultaneously operated to select the station type carrier and ticket totalizer.

After the various conditions have been set up by operation of the other manipulative devices either the full fare key 51 or the half fare key 52 is depressed. This releases the lock for the driving mechanism and also closes the motor circuit in case the machine is electrically driven. The stepped arm 141 (Fig. 7) is also set to control the extent of movement of the units differential element 125 to add "1" or "2" depending respectively upon whether the half fare or the full fare key was depressed.

In each ticket issuing cycle of movement of the driving mechanism the ticket differential elements 125 and 136 are oscillated twice due to the shape of their operating cams 133 and 134. The first oscillation operates the connected ticket totalizer 244 to add and effect transfers while the second oscillation first turns the ticket totalizer back to zero to control the setting of the number printing type carriers to print the new numbers on the ticket being issued and then returns the amount to the totalizer. In

other words the second movement of the ticket differential elements effects what is usually known in the art as a subtotal printing operation of the ticket totalizer.

5 The amount set up on the amount keys is entered in the cash totalizer 121 (Fig. 6) in the usual way and the totalizer is not operated to print totals or sub-totals except when taking a final statement from the machine. In case of a double ticket printing operation the cash totalizer 121 is of course operated twice, each time adding the price of a ticket.

15 The tickets are drawn from a strip by feed rolls 624 and 625 which normally grip the paper, the former roll carrying an electrotype for printing the name of the railroad the name of the issuing station and other invariable matter on the face of the ticket. From the feeding rolls mentioned the strip passes through a chute 635 (Fig. 39) over a stationary knife 636 and under a movable knife 637 into a carriage composed of formed plates 644 and 645. These plates are capable of a relative movement but this movement is normally prevented by a tail 646 on the plate 644 engaging a shoulder 647 on the plate 645. After the ticket is deposited in the carriage, the carriage is swung to bring the ticket under the printing line 5411 (Fig. 38) to have printed thereon the name of the destination station and is then swung back to the printing line 5412 where the number and price are printed. The ticket carriage is then again swung forward past the printing line 5411 far enough for a stud 663 on the plate 644 to strike the portion 664 of a fixed frame 6401. This will disengage the tail 646 from the shoulder 647 and permit the plate 645 to move relative to the plate 644 and cause a block 642 on the frame to push the ticket out of the carriage and forward into engagement with the rollers 661 and 662. These rollers are then rotated to feed the ticket out of the slot 621 in the front of the machine and as they are rotated the roller 662 prints the date and consecutive number on the back of the ticket.

50 In taking a statement from the machine, the name of each of 240 destination stations and the number taken from the corresponding station totalizers are printed on the summary strip. As an incident to printing the numbers from the various totalizers during a statement taking operation the totalizers are set to zero. After all the station totalizers have been cleared and their numbers printed the cash totalizer is operated to print either the sub-total or total at the bottom of the strip. In preparing the machine for printing the summary strip the eccentric 696 (Fig. 38) is rotated by means of the knob 697 to move the feeding roller 625 away from the roller

624 so that the ticket strip will not be fed. The lever 54 is then adjusted to the "Reset ticket totalizers" position. This movement of the lever among other things will move the arm 717 up and the hooked arm 723 (Fig. 38) down so as to operate the arm 710 for turning the summary strip feeding roller 705. Then at each operation of the machine the arm 710 will be oscillated so that the spring pressed pawl 714 pivoted on an arm 712 rigid with the arm 710 will actuate the feeding roller, this roller cooperating with the platen 666 to draw the strip from the usual supply roll.

After the ticket feed has been disabled and the mechanism for feeding the summary strip rendered effective the motor key 53 is depressed to unlock the driving mechanism and close the motor circuit. This causes the ticket totalizer which is at the time in effective position to be cleared and the number printed on the summary strip. It is apparent that by proper adjustment of handle 55 and lever 56 the two hundred and forty ticket totalizers may be operated successively until they are all cleared and their numbers printed the motor key 53 being depressed after each selecting adjustment of the lever 55 and handle 56.

When it is desired to print a sub-total from the cash totalizer the lever 54 is swung to the top or "Read" position and when the totalizer is to be cleared and the amount printed it is swung to the lowest or "Reset" position. As a preliminary to this the ticket feed must of course be disabled if this has not already been done, but positioning the lever to either the "Read" or "Reset" position will render the summary strip feeding mechanism effective. In cash totalizer reading and resetting operations none of the special keys can be operated, all of the work of releasing the machine and closing the motor circuit being performed by the lever.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to the one form herein shown but that it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What is claimed is:—

1. In a machine of the class described, the combination of a main driving shaft, type carriers, a totalizer, manipulative devices, and mechanism for first operating the totalizer to add under the control of the manipulative devices and then adjusting the type carriers under the control of the totalizer by a single rotation of the main driving device.

2. In a machine of the class described, the combination of a main driving device,

a totalizer, type carriers, manipulative devices, and means for operating the totalizer first to add under the control of the manipulative devices and then to control the setting of the type carriers by a single rotation of the main driving device.

3. In a machine of the class described, the combination of a main driving device, a totalizer, printing means, and means for operating the totalizer independent of the printing means to add to the previous total and then adjusting the printing means to print the new total with one operation of the driving device.

4. In a machine of the class described, the combination of a totalizer, total printing mechanism, manipulative means for controlling the entry of items into the totalizer, an operating shaft, and means for effecting entry of items and total printing during a single rotation of the operating shaft.

5. In a machine of the class described, the combination of a main operating device, a totalizer, manipulative devices, mechanism for entering items on the totalizer and controlled by the manipulative devices, mechanism controlled by the totalizer for printing the total of items previously entered, and connections for operating both said printing mechanism and the item entering mechanism by a single cycle operation of the main operating device.

6. In a machine of the class described, the combination of a driving mechanism, a totalizer, manipulative devices, a total printing mechanism, and connections for operating the totalizer first to add under the control of the manipulative devices and then to control the printing mechanism during a single cycle of operation of the driving mechanism.

7. In a machine of the class described, the combination of a totalizer, a main driving mechanism, a total printing device, means for entering an item on the totalizer independent of said printing device and printing the total carried by the totalizer at a single operation of the driving mechanism, and manipulative devices controlling said means.

8. In a machine of the class described, the combination of a totalizer, a main driving mechanism, a total printing device, means for operating the totalizer to add to the previous total independent of said printing device and then printing the new total during the same operation of the main driving mechanism, and manipulative devices controlling said means.

9. In a machine of the class described, the combination of a driving mechanism, a totalizer, manipulative devices, printing means, an oscillating member controlled by the manipulative devices for operating the totalizer to add, connections between said member and said printing means, and actuating means interposed between said totalizer and

said member for actuating said member to set up the printing means through said connections, both said connections and actuating means being operable during the same cycle of operation of the driving mechanism which operates said member to operate the totalizer to add.

10. In a machine of the class described, the combination of a driving mechanism, a totalizer, manipulative devices, printing means, an actuator operated by the driving mechanism and controlled by said devices for operating said totalizer independent of said printing means, connections intermediate the totalizer and the actuator and connections intermediate the actuator and the printing means, both of said connections being controlled by the totalizer to operate the printing means during the same operation of the driving mechanism that operates said actuator.

11. In a machine of the class described, the combination of a driving mechanism, a totalizer, a plurality of keys, a printing device, an actuator operated by the driving mechanism and controlled by the keys for operating the totalizer to add to the previous total independent of the printing device, connections intermediate the totalizer and the actuator, and connections intermediate the actuator and the printing device, both of said connections being controlled by the totalizer to set up the printing device to print the new total during the same operation of the driving mechanism that operates said totalizer to add.

12. In a machine of the class described, the combination of a driving mechanism, a totalizer, a plurality of keys, a printing device, and an actuator adapted to be operated twice during one operation of the driving mechanism first under the control of the keys to operate the totalizer to add to the previous total independent of the printing device and second under the control of the totalizer to set up the new total on said printing device.

13. In a machine of the class described, the combination of a totalizer, item entering mechanism, sub-total printing mechanism, a drive shaft, means carried by the drive shaft for first operating the item entering means to actuate the totalizer independent of the sub-total printing mechanism and then operating the sub-total printing mechanism under the control of the totalizer during one operation of said shaft.

14. In a machine of the class described, the combination of a plurality of groups of totalizers, manipulative devices, and means common to all of said totalizers and controlled by said devices for operating any desired totalizer to add to its previous total and then automatically printing the new total under the control of said totalizer and

during the same operation of the machine.

15. In a machine of the class described, the combination of a plurality of totalizers, means common to all of said totalizers for both entering an item on any desired totalizer and printing sub-totals under control of said totalizer at a single operation, and manipulative devices controlling said means.

16. In a machine of the class described, the combination of a plurality of groups of totalizers, means common to all of said totalizers for entering an item on any desired totalizer in any group and printing a sub-total from said totalizer by a single operation, and manipulative devices controlling said means.

17. In a machine of the class described, the combination of driving mechanism, a plurality of groups of totalizers, manipulative devices, and means common to all of said totalizers and controlled by said devices for adding to the previous total on any totalizer in any group and then printing the new total during the same operation of the driving mechanism.

18. In a machine of the class described, the combination of driving mechanism, a plurality of groups of totalizers, manipulative devices, and means common to all of said totalizers and controlled by said devices for entering an item on any desired totalizer in any group and printing a sub-total from said totalizer during the same operation of the driving mechanism.

19. In a machine of the class described, the combination of driving mechanism, a plurality of totalizers, means common to all of said totalizers for adding to the previous total on any totalizer and then printing the new total during one operation of the driving mechanism.

20. In a machine of the class described, the combination of driving mechanism, a plurality of totalizers, means common to all of said totalizers for adding to the previous total of any desired totalizer and printing the new total during the same operation of the driving mechanism, and manipulative devices controlling said means.

21. In a machine of the class described, the combination of a plurality of totalizers, a main driving mechanism, means common to all of said totalizers for entering an item on any desired totalizer and printing the total shown by said totalizer during an operation of the driving mechanism, and manipulative devices controlling said means.

22. In a machine of the class described, the combination of a totalizer, mechanism for entering items on the totalizer, sub-total taking mechanism, a rotatable driving shaft, and connections for operating both the item entering mechanism and the sub-total taking mechanism at each rotation of the driving shaft.

23. In a machine of the class described, the combination of a plurality of groups of totalizers, printing means, manipulative controlled means common to all of said totalizers for entering an item on any desired totalizer in any group independent of the printing means and printing the amount carried by said totalizer during a complete actuation of the means.

24. In a machine of the class described, the combination of a driving mechanism, manipulative means, a totalizer, and an actuator for the latter positively controlled differentially by both the manipulative means and the totalizer at the same cycle of operation of the driving mechanism.

25. In a machine of the class described, the combination of a main operating mechanism, an accounting element, a differentially operable actuator, manipulative devices, and means for operating the actuator twice at each cycle of operation of the operating mechanism, first to an extent controlled by the manipulative devices and then differentially to an extent controlled by the accounting element.

26. In a machine of the class described, the combination of a main driving mechanism, an accounting element, a differentially operable actuator, manipulative devices, and means for positively operating the actuator twice at each cycle of operation of the main driving mechanism, first to an extent controlled positively by the manipulative devices and then to an extent controlled positively by the accounting element.

27. In a machine of the class described, the combination of a main operating device, a totalizer element, an actuator for said element, manipulative devices, and connections for operating the actuator differentially first to extents controlled by the manipulative devices and then to extents controlled by the totalizer element during the same cycle of operation of the main operating device.

28. In a machine of the class described, the combination of a main operating device, a totalizer element, an actuator for said element, manipulative devices, and connections for positively operating the actuator first to extents controlled positively by the manipulative devices and then to extents controlled positively by the totalizer element during the same cycle of operation of the main operating device.

29. In a machine of the class described, the combination of a main operating device, a totalizer element, an oscillatory actuator, manipulative devices, and means for differentially oscillating the actuator twice at each cycle of operation of the operating device, the extent of one oscillation being controlled by the manipulative devices and the extent of the other by the totalizer element.

30. In a machine of the class described, the combination of a main operating device, a totalizer element, an oscillatory actuator, manipulative devices, and means for differentially oscillating the actuator twice at each cycle of operation of the operating device, the extent of one oscillation being positively controlled by the manipulative devices and the extent of the other positively controlled by the totalizer element.

31. In a machine of the class described, the combination of actuators, totalizers, devices for engaging the totalizers with the actuators, a plurality of oscillatory segments, independent means for oscillating the segments at different times with reference to movement of the actuators, a geared element shiftable to connect either segment with the engaging mechanism or to a neutral position to disconnect said mechanism from either segment, a cam for shifting said element, and manipulative devices controlling the cam.

32. In a machine of the class described, the combination of actuators, totalizers, devices for engaging the totalizers with the actuators, a plurality of oscillatory segments, independent means for oscillating the segments at different times with reference to movement of the actuators, a geared element shiftable to connect either segment with the engaging mechanism or to a neutral position to disconnect said mechanism from either segment, a cam for shifting said element, and a manually operable lever for operating the cam.

33. In a machine of the class described, the combination of a differentially movable member, means for controlling the extent of forward differential movement of said member comprising a differentially movable arm and positive driving means for said member, and manipulative means for controlling the movement of said arm.

34. In a machine of the class described, the combination of a differentially movable member, a driving member therefor, a latch for coupling the movable member and the driving member, a set of keys, and a stepped member controlled by said keys as a preliminary to an operation of the driving member for tripping the latch at different points in the movement of the driving member.

35. In a machine of the class described, the combination of a differentially movable member, a driving member therefor, a latch for coupling the movable member and the driving member, a plurality of keys, and a member differentially operated by said keys and carrying stops arranged to trip the latch at different points in the movement of the driving member.

36. In a machine of the class described, the combination of a differentially movable

member, an invariably moved driving member therefor, means normally connecting the driving member and the differentially movable member, a plurality of keys, and a member differentially driven by said keys for disabling the connecting means at different points in the movement of the driving member.

37. In a machine of the class described, the combination of two independent sets of type carriers, an invariably moved platen common to the two sets of type carriers, means for preventing either set of type carriers from cooperating with the platen, and manipulative means controlling said means.

38. In a machine of the class described, the combination of a set of amount type carriers, a set of station printing type carriers, an invariably moved platen common to the two sets of type carriers, means whereby either set of type carriers may be rendered effective to print at an operation of the platen and the other set ineffective, and manipulative means controlling said means.

39. In a machine of the class described, the combination of a plurality of sets of type carriers, means for successively taking impressions on a ticket from said type carriers, a carriage for moving the ticket from one set of type carriers to another and consisting of relatively movable parts, devices for ejecting tickets out of the machine, and means for causing relative movement of the parts of the ticket carriage to move the ticket into position to be seized by the ejecting devices.

40. In a machine of the class described, the combination of a plurality of sets of type carriers, means for successively taking impressions on a ticket from said type carriers, a carriage for moving the ticket from one set of type carriers to another and consisting of relatively movable parts, devices for feeding tickets out of the machine, and means for positively causing relative movement of the parts of the ticket carriage to engage the ticket with the feeding devices.

41. In a machine of the class described, the combination of a plurality of sets of type carriers, means for successively taking impressions on a ticket from said type carriers, a carriage for moving a ticket from one set of type carriers to another, and consisting of relatively movable parts, a pair of invariably rotated rollers for feeding tickets out of the machine, and means for causing relative movement of the parts of the carriage whereby to insert the ticket between the feeding rollers.

42. In a machine of the class described, the combination of a plurality of sets of type carriers, the sets having different printing lines, a carriage for moving a ticket from one printing line to another and consisting of relatively movable parts, and

means for causing relative movement of the parts of the ticket carriage to eject the ticket from the carriage.

43. In a machine of the class described, the combination of a plurality of series of station printing devices, a movable support for said devices, a platen, means for moving said support directly from any position to any other position whereby to position any desired station printing device in any series opposite the platen, a plurality of totalizers supported independently of said devices, and totalizer selecting devices controlled by the aforesaid means.

44. In a machine of the class described, the combination of a plurality of totalizers, a plurality of series of station printing devices, a movable support for said station devices, a platen, two manipulative devices operable singly or simultaneously to bring any device in any series in position to cooperate with the platen, and totalizer selecting devices independent of said station printing devices also controlled by said manipulative devices.

45. In a machine of the class described, the combination of a plurality of series of totalizers, a plurality of series of station printing devices mounted independently of said totalizers, a movable support for said devices, a platen, two manipulative devices operable singly or simultaneously to bring any desired station printing device into position to cooperate with the platen, and totalizer selecting devices controlled jointly by said manipulative devices.

46. In a machine of the class described, the combination of a plurality of series of station printing devices, a movable support for said devices, a platen, two manipulative devices operable singly or simultaneously to position any desired station printing device opposite the platen, a totalizer for each station printing device mounted independently thereof, and connections whereby positioning a station printing device opposite the platen selects the corresponding totalizer for operation.

47. In a machine of the class described, the combination of a plurality of series of station printing devices, a movable support for said devices, a platen, two manipulative devices operable singly or simultaneously to position any desired station printing device opposite the platen, a totalizer for each station printing device, said totalizers being arranged in a plurality of series, item entering mechanism, and connections whereby positioning a station printing device opposite the platen selects the corresponding totalizer for operation by the item entering mechanism.

48. In a machine of the class described, the combination of a plurality of series of

station printing devices, a movable support for said devices, a platen for taking impressions on tickets from said devices, means for moving said support directly from any position to any other position whereby to set any desired station printing device in any series opposite the platen, and differentially adjustable means cooperating with said platen for printing on the tickets the amount of the fare to the various stations.

49. In a machine of the class described, the combination of a plurality of series of station printing devices, a movable support for said devices, a platen for taking impressions on tickets from said devices, a manipulative device for determining the series and a manipulative device for determining the device in the series to print against said platen, said manipulative devices being operable singly or in combination, and fare recording mechanism mounted independently of said station printing devices cooperating with said platen for printing on the tickets the amount of the fare to the various stations.

50. In a machine of the class described, the combination of a plurality of groups of totalizers, manipulative devices, a printing device common to all of the groups of totalizers, and means controlled by said manipulative devices for operating any desired totalizer to add to its previous total and then automatically print the new total from said printing device under the control of said totalizer and during the same operation of the machine.

51. In a machine of the class described, the combination of a plurality of groups of totalizers, manipulative devices, a printing device common to all of the groups of totalizers, and means controlled by said manipulative devices for operating any desired totalizer to add to its previous total and then setting the printing devices to print the new total under the control of said totalizer and during the same operation of the machine.

52. In a machine of the class described, the combination of a plurality of groups of totalizers, a main driving mechanism, a total printing device common to all of the groups of totalizers, means for entering an item on any desired totalizer and adjusting the total printing device to print the new total under the control of said totalizers during the operation of said mechanism, and manipulative devices controlling said means.

53. In a machine of the class described, the combination of a plurality of totalizers, a main driving mechanism, a total printing device common to all of said totalizers, means for entering an item on any desired totalizer and adjusting the total printing device to print the new total under the con-

trol of said totalizer during one operation of the driving mechanism, and manipulative devices controlling said means.

54. In a machine of the class described, 5
the combination of a driving mechanism, a 6
totalizer, total printing mechanism, item
entering mechanism, and connections be-
tween said driving mechanism and said item
entering and total printing mechanisms in-
volving independent elements, for operat-
ing the item entering mechanism and the 10
total printing mechanism during a single
operation of the machine.

55. In a machine of the class described, 15
the combination of a differentially movable
member and a driving means therefor al-
ways movable variable extents.

56. In a machine of the class described, 20
the combination of a differentially movable
member, a driving member therefor mov-
able variable extents at each operation of
the machine.

57. In a machine of the class described, 25
the combination of a driving member for a
differentially movable member, and cam
members for operating said driving mem-
ber different extents.

58. In a machine of the class described, 30
the combination of a differentially movable
member, driving means therefor for oper-
ating the same different extents at each
operation of the machine, manipulative
means for controlling said member as said
driving means is given one extent of move-
ment, and a totalizer for controlling said 35
member as said driving means is given an-
other extent of movement.

59. In a machine of the class described, 40
the combination of a differentially movable
member, driving means movable to differ-
ent extents, and manipulative means for
controlling the movement of said member
during one extent of movement of said driv-
ing means.

60. In a machine of the class described, 45
the combination of a differentially movable
member, a totalizer and manipulative means
for controlling the movement of said mem-
ber, and means for driving said member a
greater distance when under control of the
totalizer than when under control of the
manipulative means.

61. In a machine of the class described, 55
the combination of a differentially movable
member, a totalizer, and means for opera-
tively connecting the totalizer and differ-
entially movable member twice during a
single cycle of operation of the machine.

62. In a machine of the class described, 60
the combination of a differentially movable
member, a totalizer, means for operatively
connecting the totalizer and differentially
movable member first to control the move-
ment of the totalizer in accordance with
the movement of the differentially movable 65

member and then to control the differen-
tially movable member in accordance with
the movement of the totalizer during a nor-
mal single operation of the machine.

63. In a machine of the class described, 70
the combination of a totalizer, a differen-
tially movable member, and rotatable cam
means for operatively connecting said total-
izer and differentially movable member
twice during a single rotation of said cam 75
means.

64. In a machine of the class described, 80
the combination of a rotation shaft, a dif-
ferentially movable member, a totalizer, and
means driven from said shaft for actuating
said differentially movable member and for
connecting the same to the totalizer twice
during each rotation of said shaft.

65. In a machine of the class described, 85
the combination with a plurality of groups
of totalizers, of a set of actuators common
thereto, each actuator consisting of a single
adding portion and a single transfer portion
movable relative to the adding portion,
means for positively latching the portions 90
together to effect transfers by movement of
the adding portion, and means whereby said
latching means may be controlled positively
by any totalizer in any group.

66. In a machine of the class described, 95
the combination with a plurality of groups
of totalizers, of a set of actuators common
thereto, each actuator consisting of a single
adding portion and a single transfer por-
tion movable relative to the adding portion,
means for positively latching the two por-
tions together to effect transfers by move-
ment of the adding portion, and means
whereby said latching means may be con-
trolled by any totalizer in any group. 105

67. In a machine of the class described, 110
the combination with a plurality of groups
of totalizers arranged in a plane, of a set
of main actuators and a set of auxiliary ac-
tuators, means for positively connecting the
main and auxiliary actuators, and devices
whereby said means may be controlled by
any totalizer in any group.

68. In a machine of the class described, 115
the combination with a plurality of groups
of totalizers, of actuating racks therefor,
each rack consisting of two sections having
a certain extent of movement relative to each
other, means for causing a relative move-
ment between the actuating rack and the
totalizer, and a single set of devices con-
trolled by any totalizer in any group for
positively connecting the two sections of the
racks to increase the effective length of the
racks to effect transfers. 125

69. In a machine of the class described, 130
the combination with a plurality of groups
of totalizers, of a single set of totalizer ac-
tuating racks common thereto, a second sin-
gle set of racks mounted in alignment with

each of the first mentioned racks and movable therewith, means for differentially actuating the racks, latches normally connecting the racks, means for disabling said
5 latches and for stopping the racks of one set before the racks of the other set reach the end of their stroke, and connections whereby any totalizer in any group may control said means.

10 70. In a machine of the class described, the combination with a plurality of groups of totalizers, of a single set of totalizer ac-

tuating racks each consisting of two sections, positive means connecting the two sections, means for differentially actuating the racks, 15 positive means for disconnecting the two sections and stopping one of them before the other reaches the limit of its stroke, and means whereby any totalizer in any group may disable the means for disconnecting the 20 two sections and stop one of them.

In testimony whereof I affix my signature.

FREDERICK L. FULLER.