

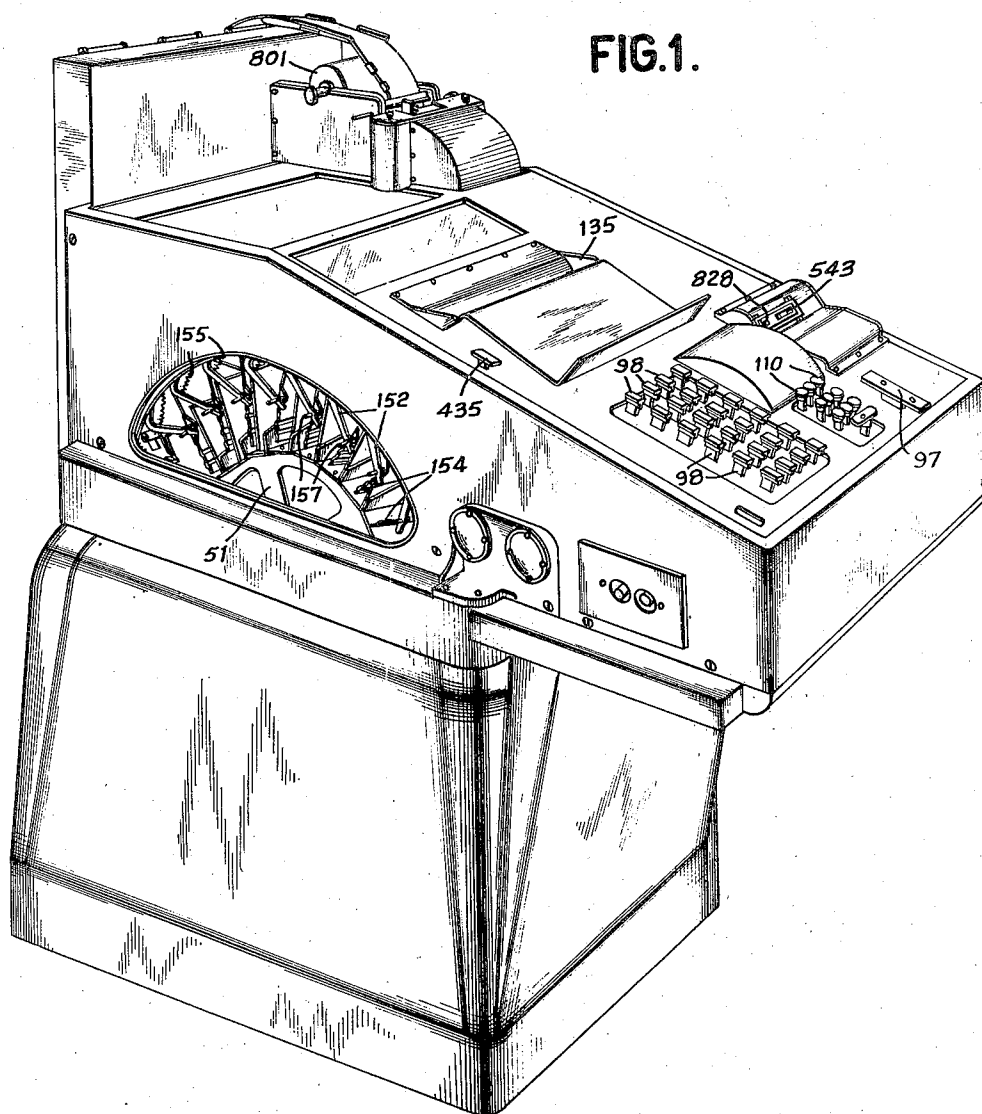
June 28, 1938.

F. L. FULLER ET AL

2,122,136

COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 1



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COMBINED PRINTING AND SORTING MACHINE

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FIG. 2.

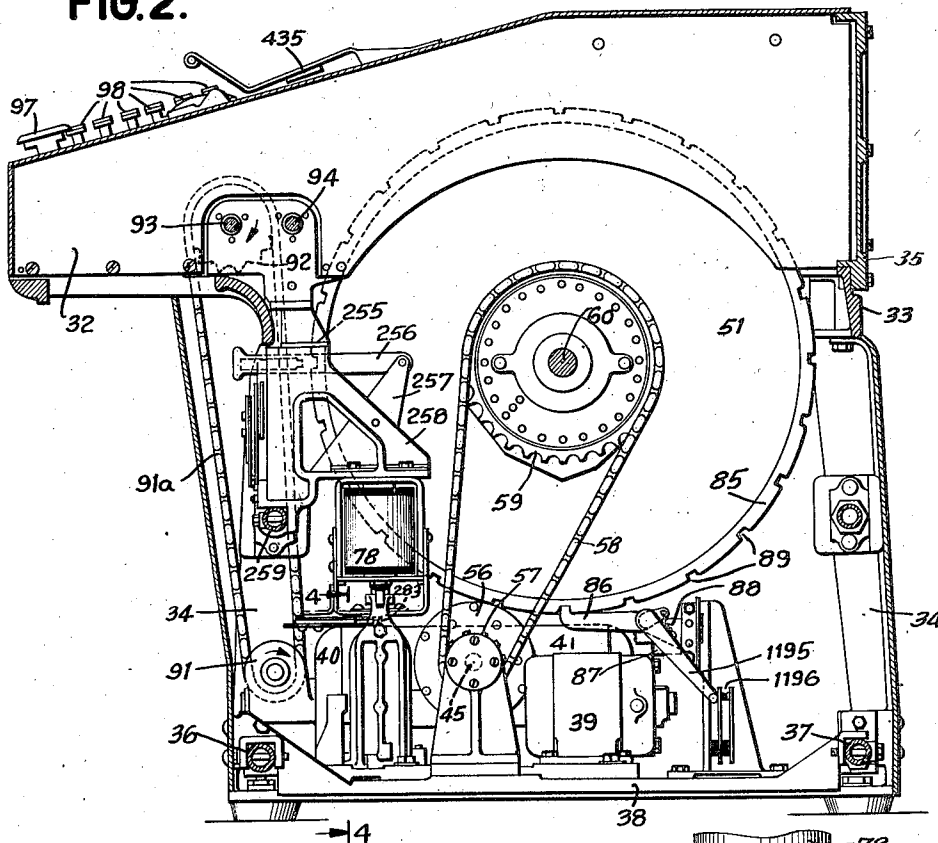


FIG. 3.

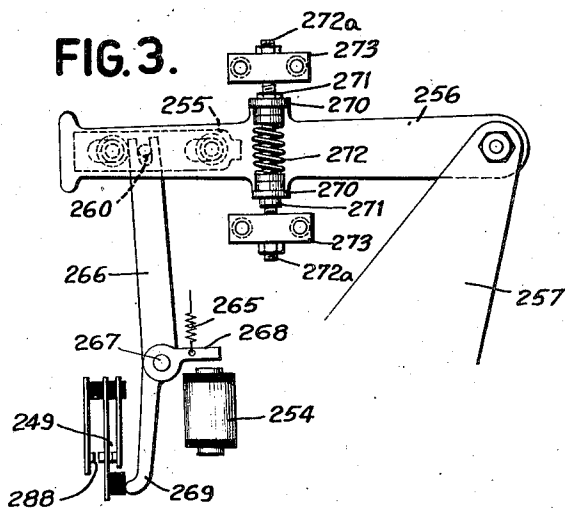
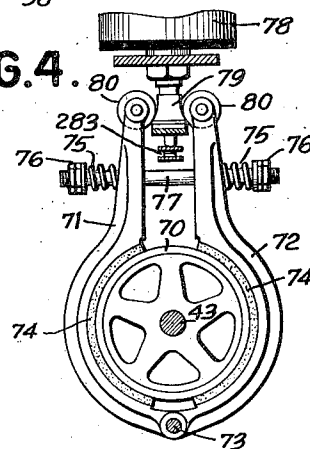


FIG. 4



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FIG. 5.

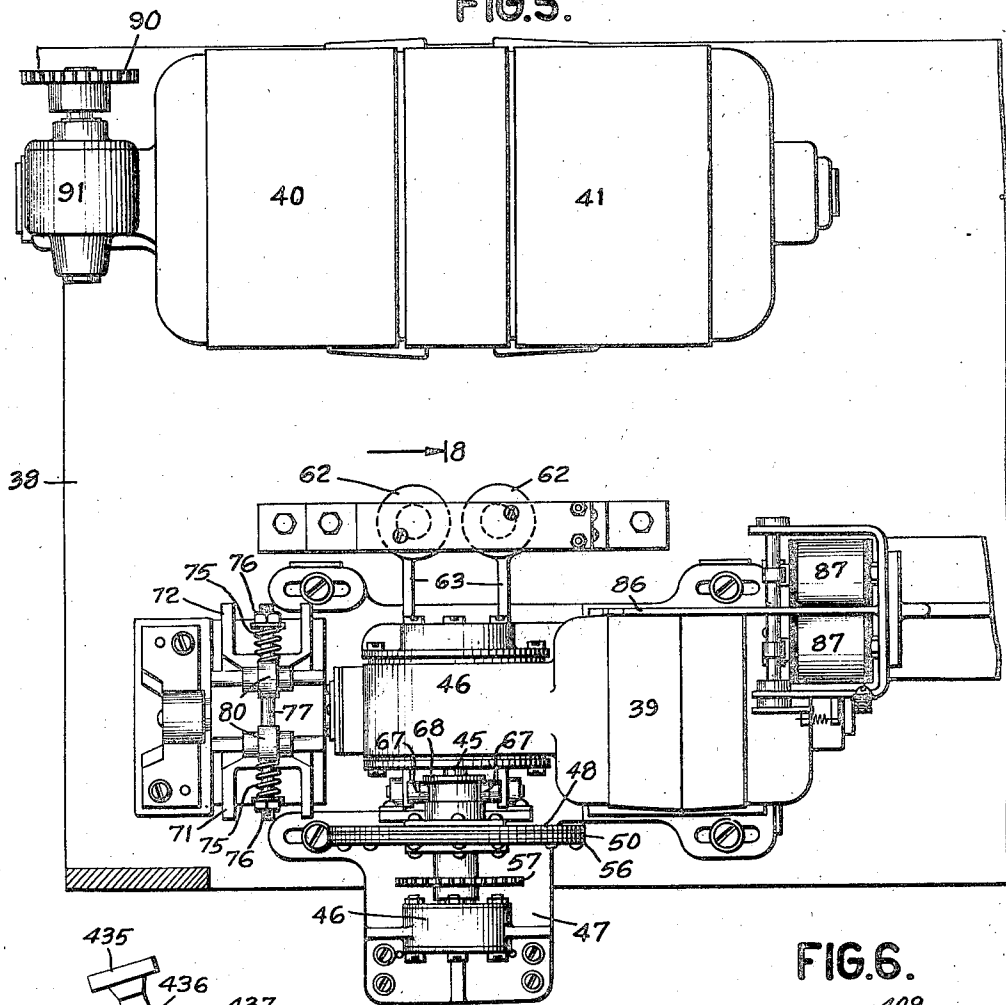


FIG. 6.

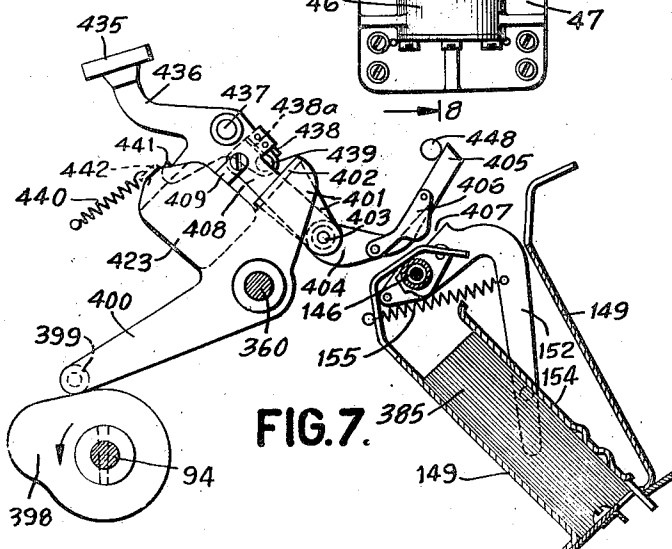
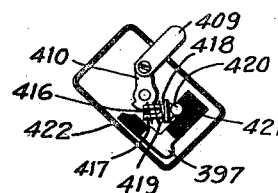


FIG. 7.

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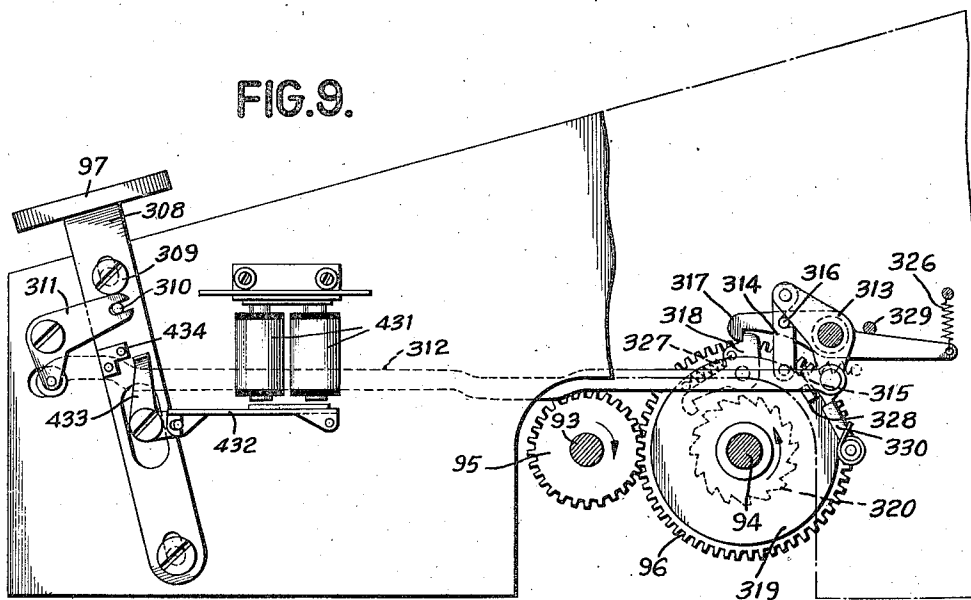
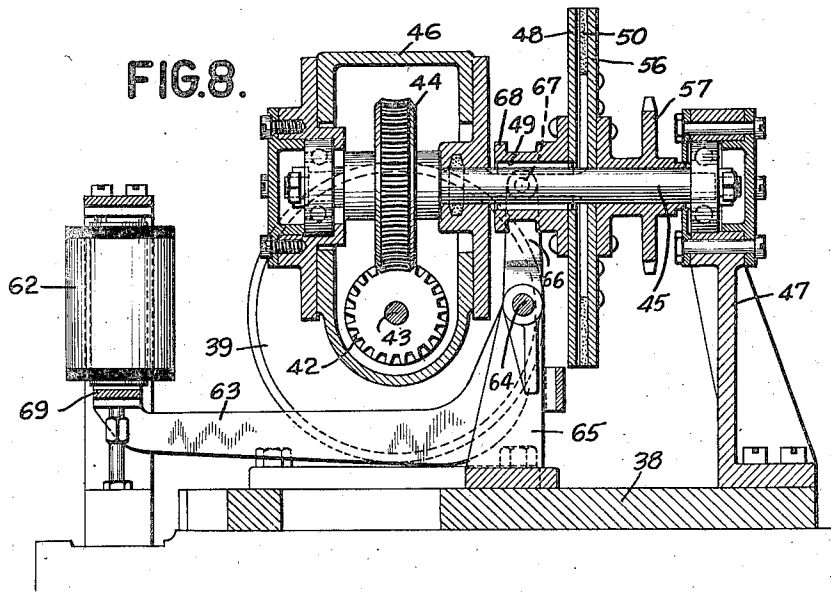
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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 4



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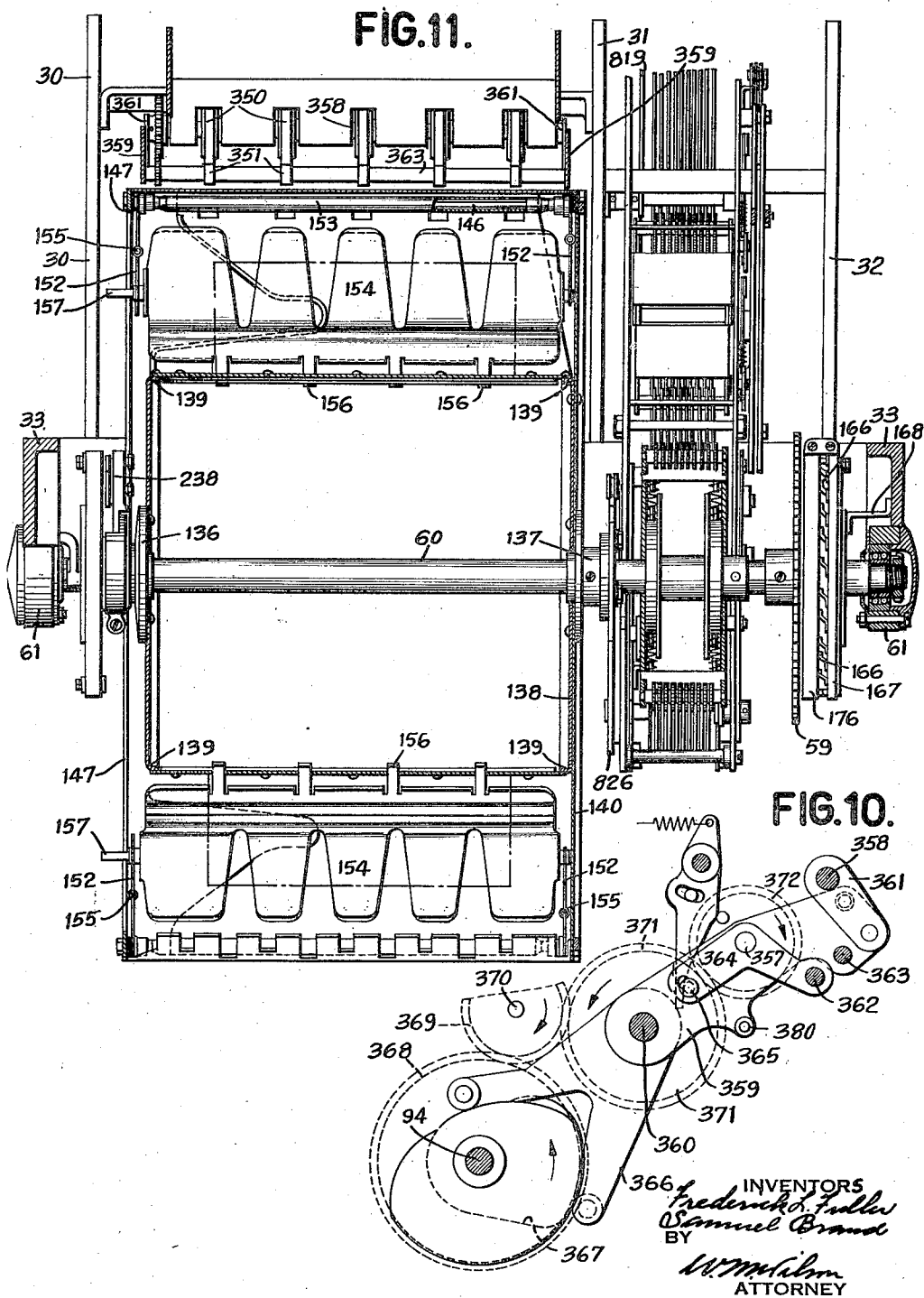
June 28, 1938.

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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 6



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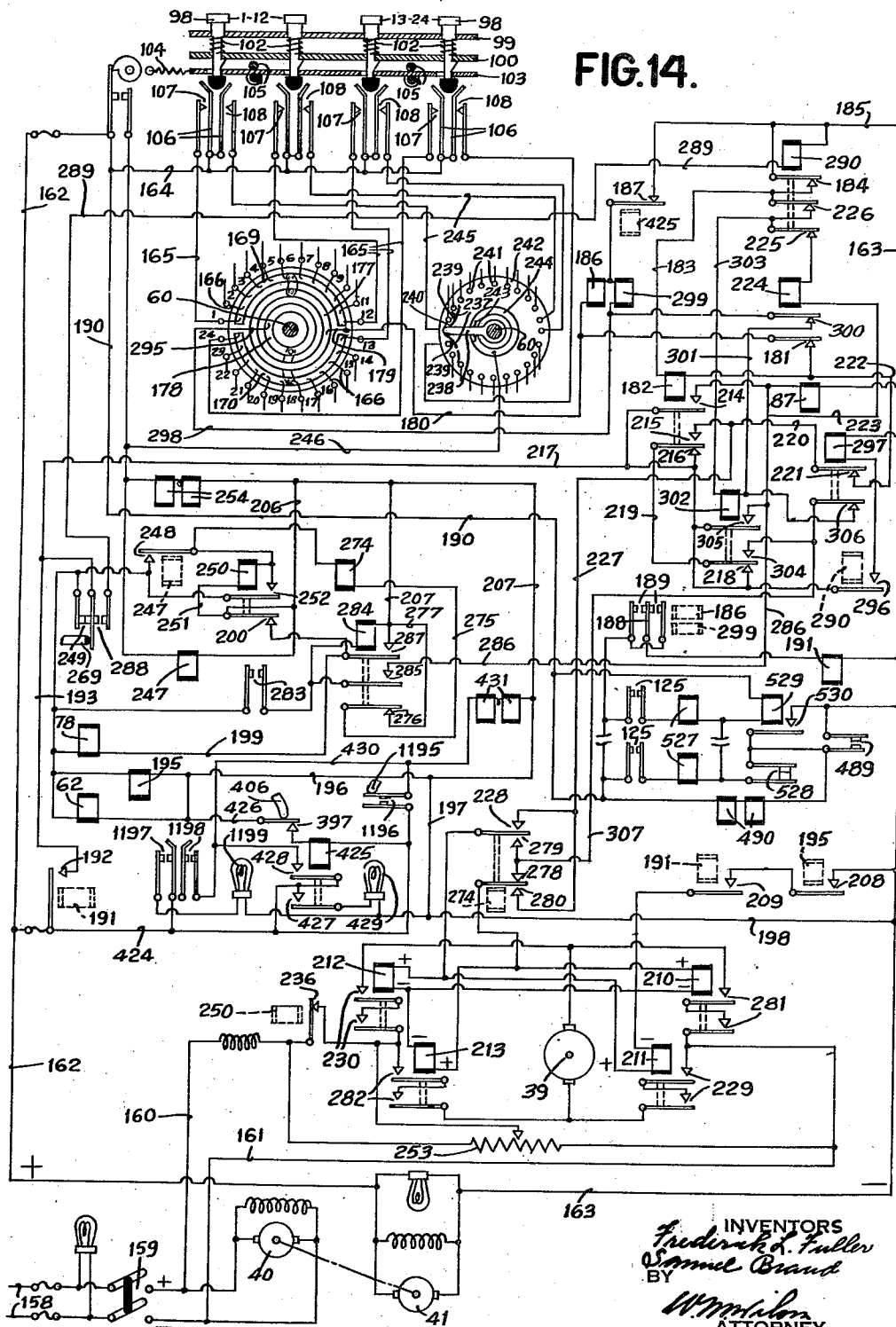
June 28, 1938.

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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 7



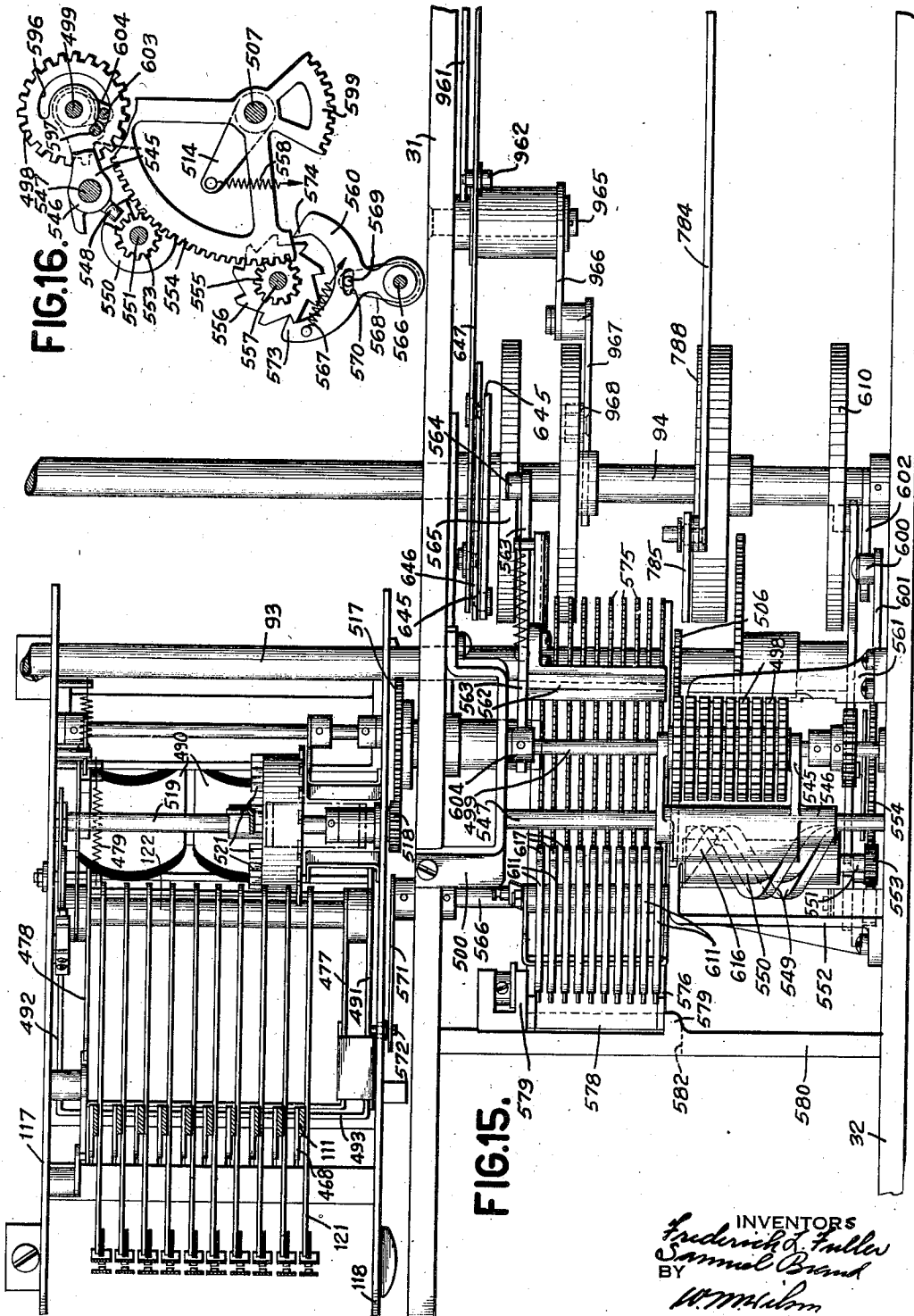
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FIG.17.

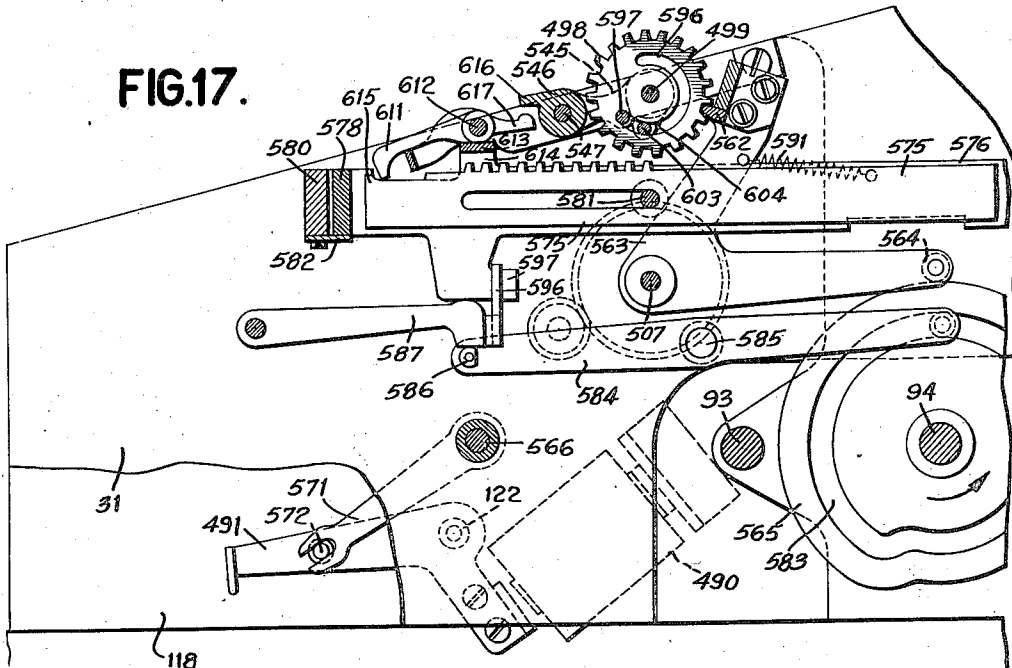
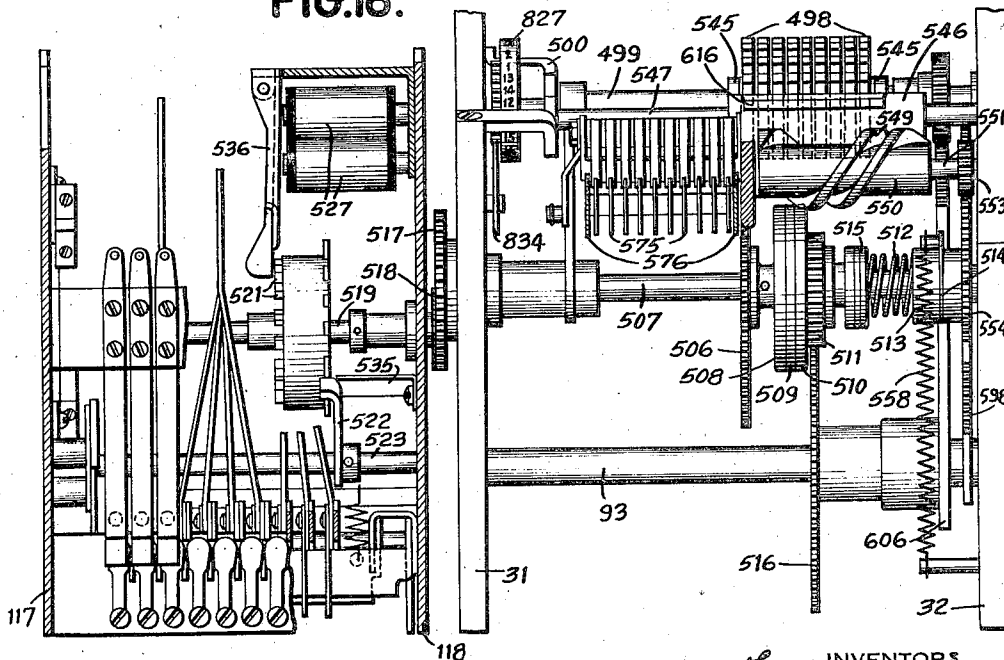


FIG.18.



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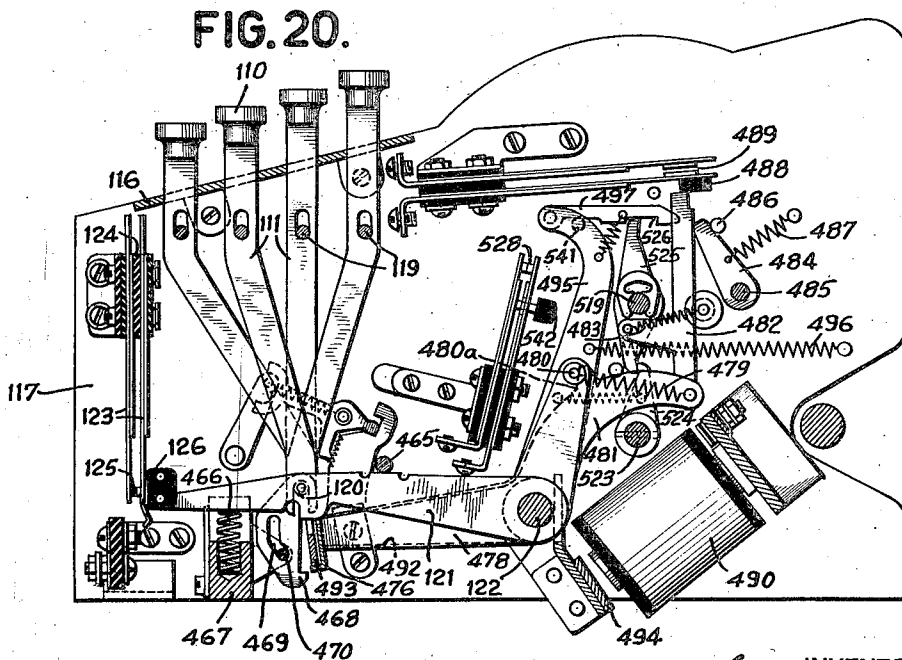
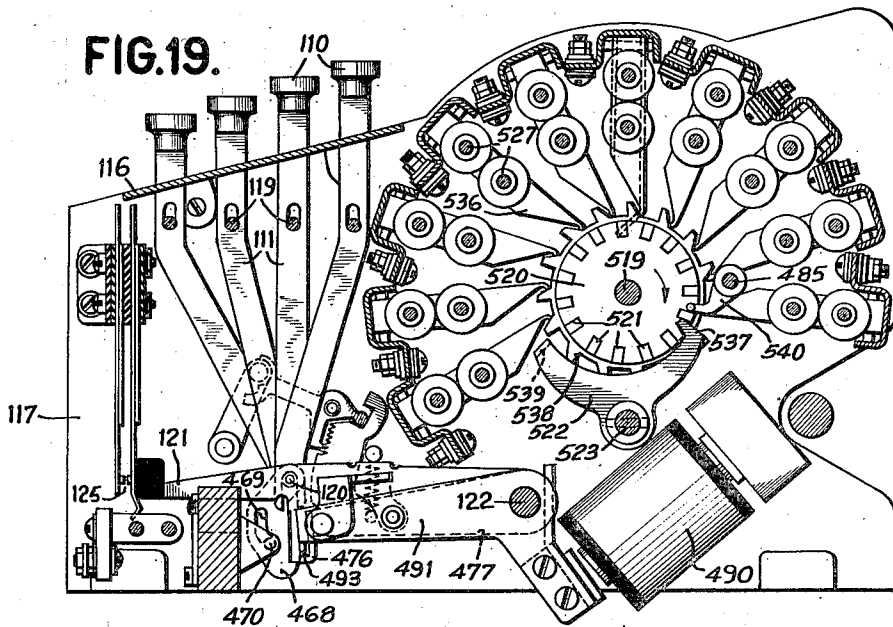
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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 10



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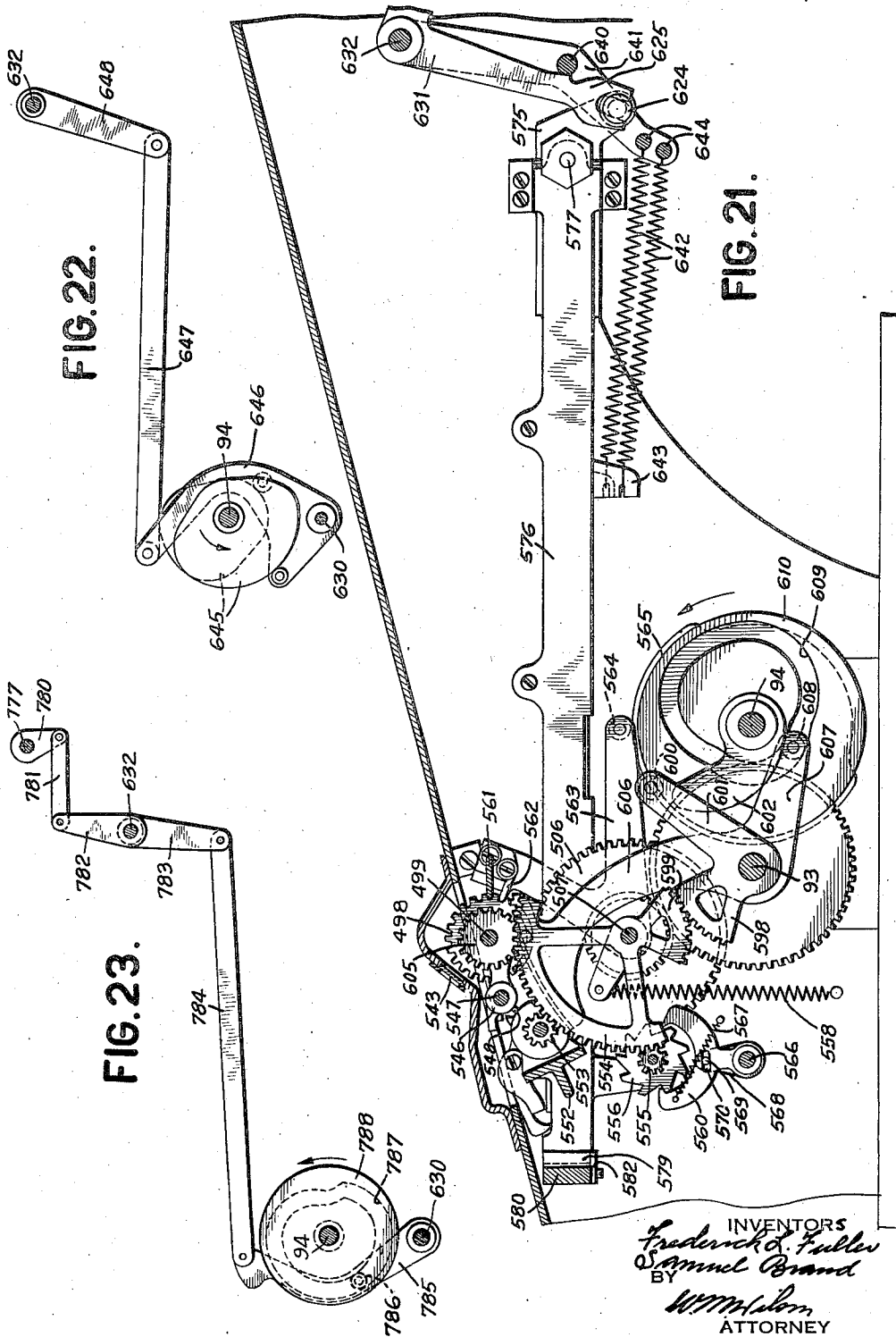
June 28, 1938.

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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 11



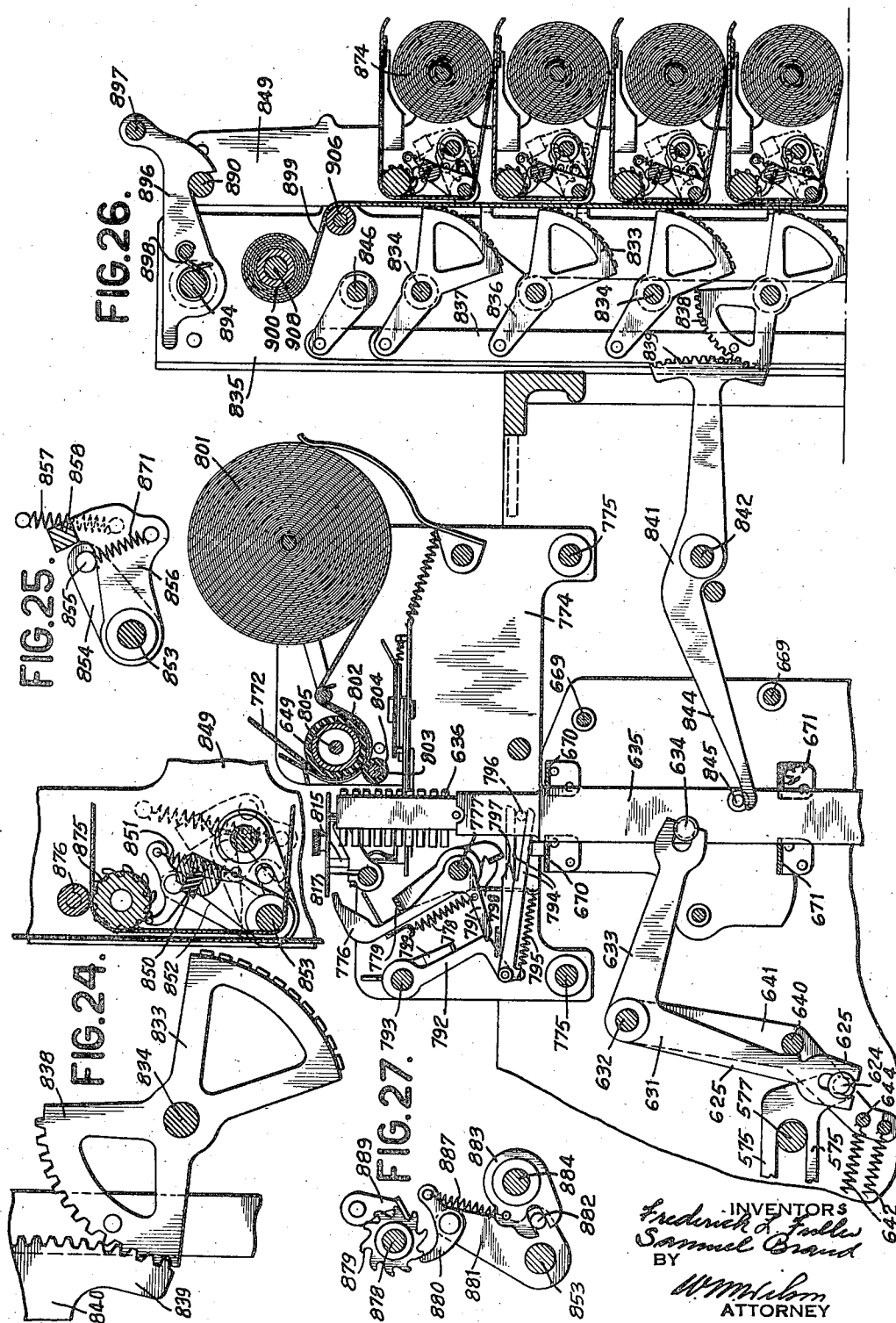
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COMBINED PRINTING AND SORTING MACHINE

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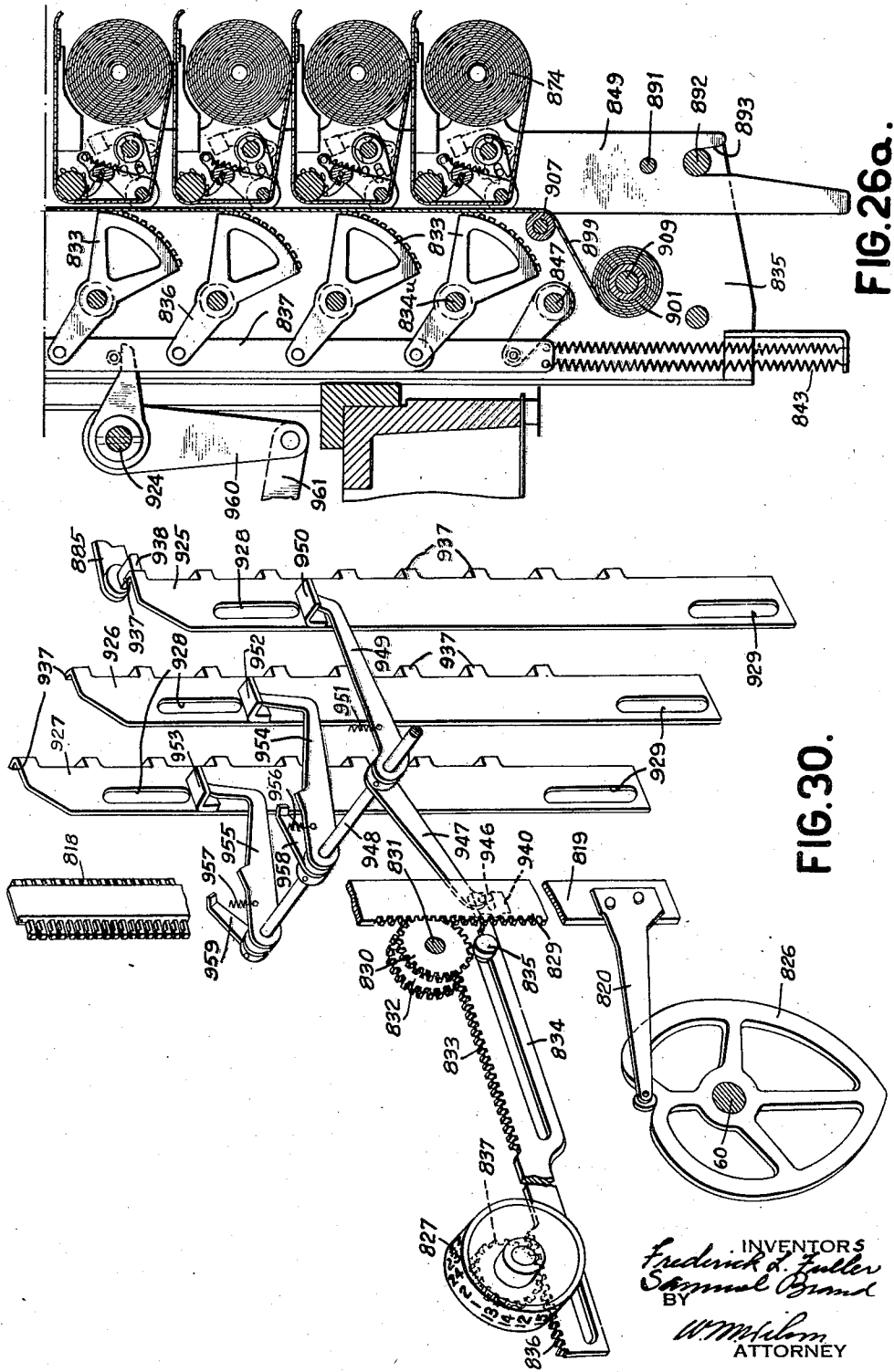
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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 13



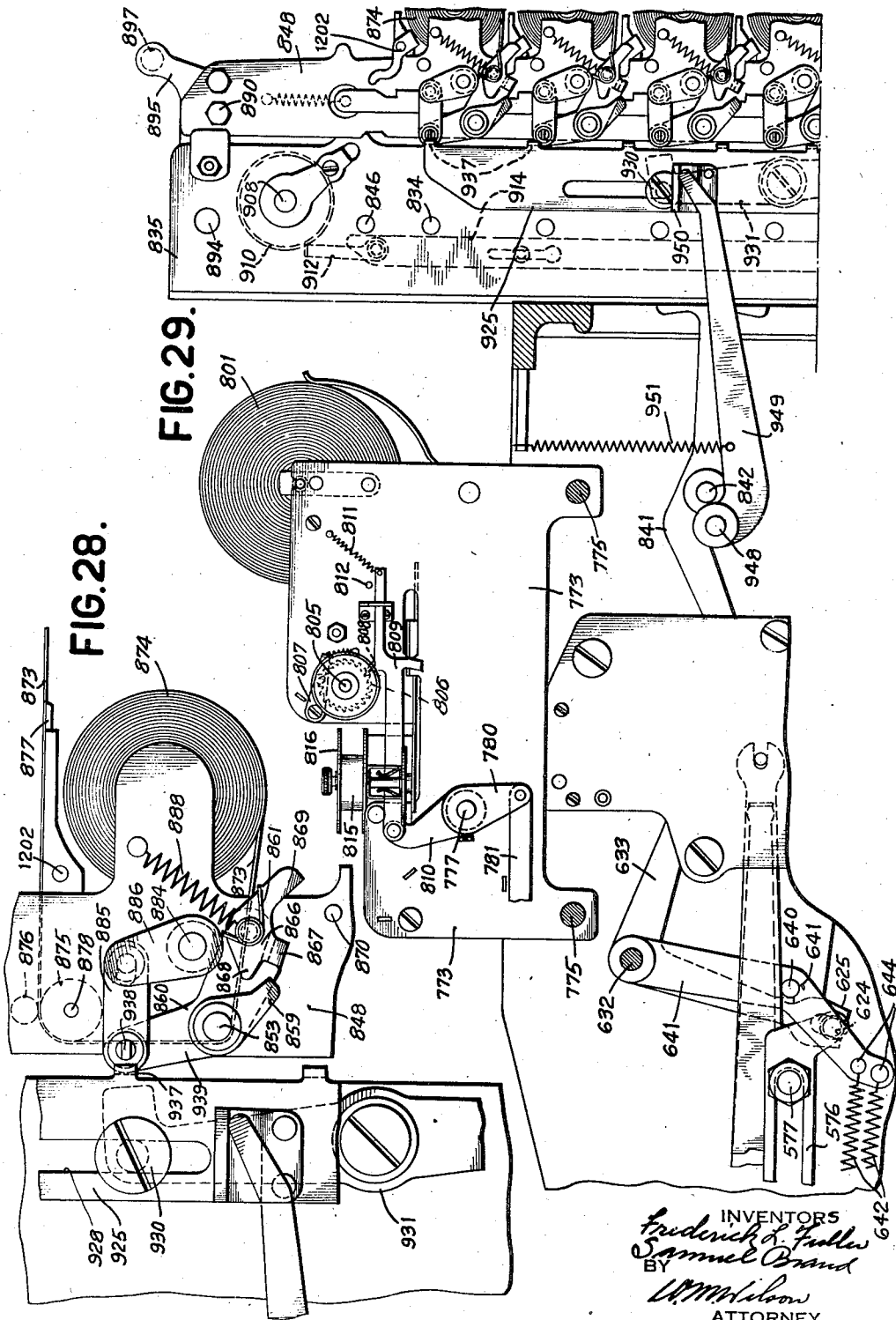
June 28, 1938.

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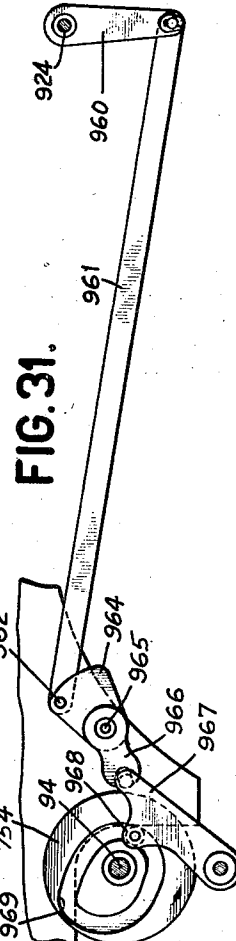
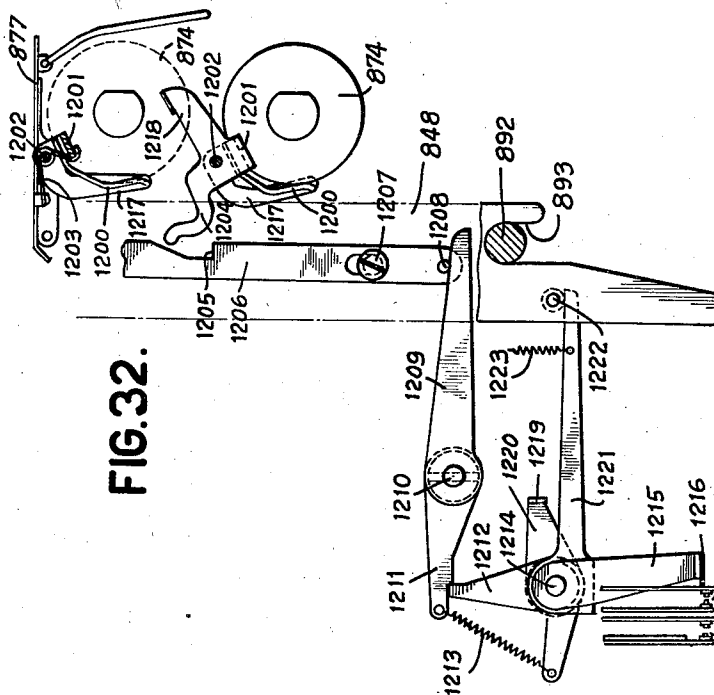
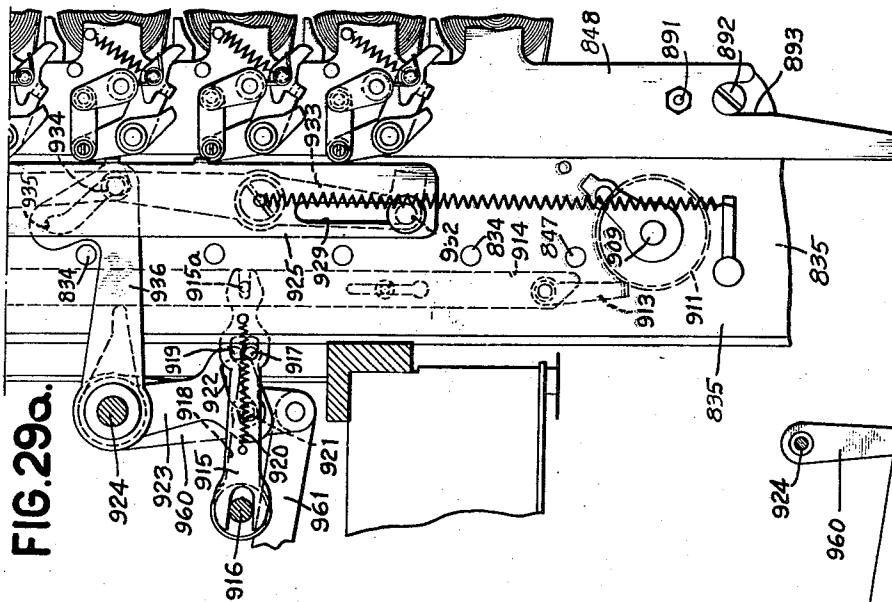
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COMBINED PRINTING AND SORTING MACHINE

Original Filed Sept. 7, 1934 15 Sheets-Sheet 15



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UNITED STATES PATENT OFFICE

2,122,136

COMBINED PRINTING AND SORTING
MACHINE

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Original application September 7, 1934, Serial
No. 743,044. Divided and this application Au-
gust 20, 1935, Serial No. 36,948

35 Claims. (Cl. 101--2)

This application is a division of the application
of F. L. Fuller and S. Brand, Serial No. 743,044,
filed September 7, 1934, for Improvements in
combined record sorting and accounting ma-
chines.

This application is restricted in its showing
to a machine which is capable of sorting a group
of promiscuously arranged checks, for example,
in accordance with their classifications with fur-
ther provisions of printing mechanisms for list-
ing the amount of the checks in the sequence
they are sorted and for listing the checks in
classified groups. The listings according to classi-
fied groups gives lists of checks according to their
segregation in groups while the listing in the
sequence the checks are sorted is provided for
rapid checking purposes. A tape carrying the
sequential listings can be compared amount for
amount with the amounts listed on the depositors'
slips and any discrepancy can easily be observed.

A machine capable of effecting such functions
has heretofore been constructed and designed
and is illustrated in the patent to F. L. Fuller,
No. 1,989,976, dated February 5, 1935. The pres-
ent machine includes several novel features which
provide improved operations and greatly increase
the efficiency of the prior arrangement.

The segregation of records has previously been
attained in the patented machine by the use of
a sorting drum which has always moved in the
same direction to select a compartment and the
selection of a compartment was effected without
any reference to the fact that the compartment
desired might have been directly adjacent the
last compartment selected and in this case instead
of effecting a short backward movement of the
drum the latter was turned forwardly and given
a long movement.

Such an arrangement greatly reduced the speed
of the operation of the machine. The individual
printers or the "compartment tape printers" were
carried by this drum and the combined weight
of these together with the sorting compartments
made the rotatable sorting drum very heavy.
While the selection of a suitable driving motor
did not give any obstacles for a suitable means to
rotate the drum, it did require a complicated
arrangement for stopping the drum at the desired
compartment position.

The main object of the present invention is to
provide a series of compartment tape printers
which are not located on the sorting drum and
which may be selected under control of the keys
which select the compartments. The selection of
a compartment tape printer is preferably provided

by a cam which rotates with the sorting drum
and the contour of the cam is so designed that a
different compartment tape printer is selected in
each position of the drum irrespective of its di-
rection of rotation.

A still further object of the present invention
is to provide a plurality of sets of amount print-
ing elements and means to cause their setting
concurrently. While the plurality of sets of
amount printing elements are set, the selection
of one for printing is effected by the selecting
means herebefore mentioned which functions to
select a desired platen for operation and a com-
partment tape feeding device.

Another object of the present invention is to
provide for each printer a type segment and to
cause all of the segments to be set to bring to
printing position a type identifying the compart-
ment selected. The selecting means also selects
the desired segment for printing.

A further object of the present invention is
to provide an improved compartment tape printer
arrangement. In the present construction there
are provided twenty-four printers arranged in
three groups of eight printers each. For each
group there is provided a frame which carries the
record strips, platens and record tape feeding
devices. Each frame is detachable from the ma-
chine and when attached therewith the record
tapes are associated with the related group of
amount printing elements. The latter are car-
ried by the machine together with the three ink-
ing ribbons, one for each group.

In connection with devices for insuring the
proper operation of the machine the present in-
vention has for its object the provision of locking
devices which effectively prevent further printing
operations when any compartment is filled to ca-
pacity and also to prevent further printing op-
erations when the tape of any compartment tape
printer is exhausted.

In the patented machine the compartment se-
lecting keys were locked when a key was operated
a limited number of times signifying the insertion
of a certain number of checks in the related
compartment. However, it was still possible to
operate the check feeding mechanism to insert
a check in the filled-up compartment. The pres-
ent arrangement effectively locks the machine
release bar which causes the operation of check
feeding mechanism and the selected printing
mechanisms. The improved locking device is
controlled by the checks already in the com-
partments instead of by a control from the keys.

Another object of the invention is to provide

a means for automatically unlocking the machine when the printer frame having the exhausted roll of tape is re-attached to the machine after a full roll of tape has replaced the exhausted roll of tape.

A still further object of the invention is to give a suitable visible signal to the operator when any compartment is filled to capacity and to give a distinctive visible signal when a roll of tape of the compartment tape printers is exhausted.

Other objects and advantages will appear from the following specification and drawings in which drawings:

Fig. 1 is a perspective view of the sorting machine provided with printing mechanisms for listing all checks in the sequence they are sorted and for listing all checks in classified groups.

Fig. 2 is a view in right elevation of the machine with part of the enclosing cabinet removed to show some of the interior.

Fig. 3 is a detail view of the locking bolt for the sorting drum.

Fig. 4 is an enlarged detail sectional view taken on the line 4—4 of Fig. 2, showing the brake for the sorting drum.

Fig. 5 is a top plan view of the driving mechanism of the machine.

Fig. 6 is a detail view of the full pocket switch.

Fig. 7 is a detail view of the full compartment signal and locking devices.

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 5.

Fig. 9 illustrates the one revolution clutch for the driving shaft and its control by a machine release bar.

Fig. 10 shows the construction of the check feeding roller frame.

Fig. 11 is a sectional view taken vertically through the sorting drum.

Fig. 12 is a detail view of the mechanism provided to feed checks in the selected pockets and shown in normal position.

Fig. 13 is a view similar to Fig. 12 but shows the mechanism in operated position.

Fig. 14 is an electrical wiring diagram of the machine.

Fig. 15 is a top plan view of the item entering mechanism and the ten-key controlling mechanism.

Fig. 16 is a detail view of the device for shifting the setup wheels when amounts are successively set thereon.

Fig. 17 is a detail view in side elevation of the item setup wheels, and the rack engaging mechanism for the item wheels.

Fig. 18 is a view in front elevation showing a part of the ten-key setup mechanism and the means for driving the master wheel for the setup wheels.

Fig. 19 is a sectional view of the ten-key mechanism and part of the electrical controlling mechanism.

Fig. 20 is another sectional view of the ten-key mechanism showing particularly the electrical coupling mechanism and electrical contact devices.

Fig. 21 is a detail view of the setup mechanism and the means for restoring the setup wheels to home or normal positions.

Fig. 22 is a detail view of the means for operating the rack adjusting means.

Fig. 23 is a detail view of the operating mechanism for the individual compartment tape printers.

Fig. 24 is an enlarged detail view of one of

the compartment tape printers showing particularly the means for setting the type elements and for operating the printing hammer.

Fig. 25 is a detail view of a part of the mechanism shown in Fig. 24.

Figs. 26 and 26a when taken together show a sectional view of the control tape printer and the compartment tape printers.

Fig. 27 is a detail view of part of the paper feeding device shown in Fig. 24.

Fig. 28 is an enlarged detail view of one of the compartment tape printers showing the hammer selecting and retracting mechanism.

Figs. 29 and 29a when taken together show the outside of the compartment tape printers and the control tape printer.

Fig. 30 is a perspective view of the compartment indicating mechanism, and compartment printer selecting and compartment indicator printing mechanisms.

Fig. 31 is a detail view of an operating cam and its connection to the compartment printers for selecting a hammer, causing paper and inking ribbon feed.

Fig. 32 is a detail view of the mechanism for locking the release bar when a compartment tape is exhausted.

Framework (Figs. 2, 5, 8, and 11)

The main framework of the machine includes three longitudinal frames 30, 31 and 32 (Fig. 11) and mounted on a sub-base 33 (Fig. 2) which in turn is supported on legs 34. The frames 30, 31 and 32 are joined by a back frame 35. The front legs 34 are joined by a rod 36 and the back legs 34 are joined in a similar manner by a rod 37. These rods support a base or platform 38 (Figs. 2, 5, and 8) which is mounted on the drum controlling mechanism.

Drive mechanism (Figs. 2, 4, 5, 8, 9, 11)

Separate electric motors are provided to drive the machine. One of these motors 39 (Fig. 2) drives the sorting drum. The other motor 40 (Fig. 5) drives the check feeding mechanism and the item printing mechanism.

The motor 40 (Fig. 5) also drives a generator 41 directly connected thereto for the purpose of supplying low voltage current to operate the several relays and other electrically operated devices with which the machine is provided and which will be described in detail later in the specification.

The motor 39 is reversible in order to drive the sorting drum from the position in which it was left at the last operation through the shorter distance to a selected position.

The sorting drum indicated generally at 51 (Fig. 1) is driven by the motor 39 through a gear 42 (Fig. 8) secured on the armature shaft 43. This gear drives a gear 44 fast on a shaft 45 suitably mounted in a gear housing 46 forming a part of the motor frame, and in a bracket 47.

The motor 39 and the bracket 47 are mounted on the base 38 (see also Fig. 5). A clutch disc 48 mounted to slide longitudinally on the shaft 45 but rotatable with shaft 45 through the medium of keys or splines 49, (Fig. 8) is adapted to be brought into contact with a clutch facing 50 mounted on a clutch disc 56 loosely mounted on the shaft 45. The clutch disc 56 is secured to a sprocket gear 57 also loosely mounted on the shaft 45, and, through a chain 58, (Fig. 2) drives a larger sprocket gear 59 secured to a drum shaft 60 mounted in suitable bearings supported

in brackets 61 (Fig. 11) extending downwardly from the sub-base 33.

The clutch disc 48 is normally out of contact with the facing 50 and is adapted to be brought into physical contact therewith by the energization of a clutch magnet 62 (Fig. 8). This magnet operates a pair of arms 63 fast on a shaft 64 journaled in a bracket 65. Also secured to the shaft 64 is a yoke 66 (Figs. 5 and 8) the ends of which yoke carry rollers 67 projecting into an annular groove in the hub 68 of the clutch disc 48.

Obviously, when the magnet 62 (Fig. 8) is energized it attracts its armature 69 which is secured to the arms 63 rocking these arms, the shaft 64 and the yoke 66 slightly clockwise (as viewed in Fig. 8), shifting the disc 48 into close contact with the facing 50 so that the rotation of shaft 45 is transmitted to the sprocket 57 to frictionally drive the sorting drum.

As will be fully explained later in connection with the description of the circuit diagram, the motor 39 may operate in either direction under the control of the selector keys in order to rotate the sorting drum the shorter distance to the selected position.

A brake mechanism is provided for the purpose of decreasing the speed of the drum as it nears the selected position. This brake mechanism includes a brake drum 70 (Fig. 4) secured on the armature shaft 43 of the drive motor 39. A pair of brake shoes 71 and 72 pivoted on a common rod 73 and embracing the drum 70 are provided with suitable linings 74. The brake shoes 71 and 72 normally press their linings against the drum 70 under the influence of springs 75 compressed between retaining nuts 76 on the ends of a rod 77 and the upward extending ends of said shoes 71 and 72. When at the proper time, as will be described later, the brake magnet 78 is energized it attracts its armature drawing a truncated cone 79 mounted on the lower end thereof, upwardly between rollers 80, there being a roller 80 mounted in the bifurcated upper end of each of the brake shoes 71 and 72, thus spreading the brake shoes and releasing the drum 70 for rotation. At approximately the time the selected pocket is at the desired position the magnet 78 is deenergized which releases the brake shoes for action of their springs 75. This immediately brings the brake lining into effective contact with the drum 70 to stop the rotation of the sorting drum.

In addition to the application of the brake to drum 70, other means is provided to act as an effective brake for the purpose of stopping the drum. This means includes momentary reversal of the current through the field windings of the motor 39. The manner in which this reversal is accomplished will be fully brought out in connection with the description of the circuit diagram.

It may also be stated that following the momentary reversal of the current through the motor a resistance is automatically placed in the motor circuit which has the effect of causing the motor to run at reduced speed until the sorting drum is accurately positioned. When this occurs, that is, when the drum 51 is brought to rest in its selected position a locking finger 86 (Fig. 2), which was withdrawn at the beginning of the operation by the energization of magnets 87, is released and its spring 88 rocks said finger into engagement with one of a plurality of spaced aligning notches 89 located about the periphery of a ring 85 secured to the drum 51.

The motor 40 (Figs. 2 and 5) as stated above, drives the generator 41 and in addition drives a sprocket gear 90 (Fig. 5) through reduction gears enclosed in a housing 91. The sprocket gear 90, by means of a chain 91a, rotates a sprocket gear 92 (Fig. 2) secured to a main drive shaft 93 mounted in the frames 30, 31 and 32. The drive shaft 93 rotates continually while the machine is in operation and drives a main cam shaft 94 by means of a gear 95 (Fig. 9) fast on the drive shaft 93 meshing with a larger gear 96 rotatably mounted on the cam shaft 94. A one revolution clutch is provided and is rendered effective, under the control of a release bar 97, to couple the cam shaft 94 to the gear 96 whereby the shaft 94 receives one complete counterclockwise (Fig. 9) rotation at each check feeding operation. This clutch and release bar will be described later.

Keyboard (Figs. 1 and 14)

A brief description will now be given of the various manipulative devices provided for controlling the machine. The sorting drum, indicated generally at 51 (Fig. 1), has twenty-four compartments into which checks may be sorted. In order to select the particular compartment into which the check is deposited and to control the rotation of the drum to bring the selected compartment into position to receive the check a plurality of selector keys 98 (Figs. 1 and 14) arranged in four banks of six keys each is provided. These keys are slidably supported in plates 99 (Fig. 14) and 100 carried between suitable frames. Springs 102 compressed between the plate 100 and the shoulders on the key stems normally hold the keys 98 in the upward position.

The key caps carry suitable indications to designate the compartments according to the classification numbers, letters, etc., of the checks or vouchers to be sorted. For illustrative purposes, however, the keys 98 have been given numbers from 1 to 24 to correspond with the numbers of the compartments on the drum 51.

Upon depression of a key 98 a projection on the stem thereof cams a detent 103 toward the right (Fig. 14) until the shoulder of said projection passes below the detent whereupon a spring 104 restores the detent to latch the key in depressed position. The detent 103 is in the form of a large single flat apertured plate and is supported between pairs of rods 105. The depressed key is held by the detent 103 until another key is depressed which shifts the detent releasing the previously depressed key. The keys 98 may not otherwise be released.

Each of the keys 98 carries at its lower end a rounded block of insulation which, upon depression of a key, is thrust between contact blades 106 to close two pair of contacts 107 and 108, there being a set of contacts 107 and 108 provided for each key 98. The contacts 107 and 108 are connected by suitable wires to the sorting drum control device which will be described later.

The sorting drum (Figs. 1, 2, 11 and 12)

It was described above how the shaft 60 (Figs. 2 and 11) is mounted in the frame 33 and how this shaft is rotated by the motor 39 by means of the chain 58. The shaft 60 supports and rotates the sorting drum in the following described manner:

Secured to the shaft 60 are two flanged hubs 136 and 137 (Fig. 11) to the flanges of which hubs are secured discs 138 having flanged rims

139. A larger disc 140 is secured to the right hand disc 138 (Fig. 11) and carries near its outer edge a series of lateral projecting rods 146 (see Fig. 12). At their opposite ends the rods 146 are secured to and spaced apart by a ring 147 (Figs. 11 and 12). To form the individual compartments into which the checks are to be sorted light metal plates are secured to the flanges 139 and extend a suitable distance around the circumference of said flanges to form the bottoms as at 148, each of the parts 148 overlapping its neighbor. The plates are then bent outwardly to form radial separators 149 for the compartments.

15 Near their outward extremity the plates are bent toward their respective rods 146, then, passing over these rods, said plates are bent slightly inward, these bent portions 150—151 forming apertures through which the checks are fed into the compartments. Ears are bent outwardly from the separator plates 149, one near the ring 147 and one near the disc 140 and holes therein receive the rods 146 to maintain the separators 149 properly spaced.

25 Near each end of the rods 146 are pivoted angular arms 152 which arms are joined by sleeves 153 surrounding the rods. Between them each pair of arms 152 pivotally carries a check retainer or clamping plate 154 each pressed against the separator 149 at its left by springs 155 attached to the arms 152. Projections 156 on the lower edges of the plates 154 extend through slots in the bottom of the compartments to limit the movement of the inner edges of said plates 154.

35 The arms 152 are adapted to be swung counterclockwise (Fig. 12) to bring the outer edges of the plates 154 against the right hand separators 149 to permit ingress of the checks. The means for rocking the arms 152 will be described later.

40 Pins 157 project from the left hand arms 152 (Figs. 1 and 11) to provide a convenient means for manually rocking the retaining plates 154 in order to remove the checks from the compartments.

45 *Compartment selection (Fig. 14)*

It was previously stated that the selection of the check compartments in the sorting drum 51 is controlled by depression of the selector key 98 (Fig. 1) corresponding to the compartment it is desired to bring into position to receive the check. The control of the sorting drum is electrical and will be described in connection with the circuit diagram shown in Fig. 14. Depression of a key 98 completes a circuit which causes the sorting drum to rotate and determines which direction said drum will rotate.

Referring now to the circuit diagram (Fig. 14) current to operate the sorting machine is supplied from lines 158 through a switch 159 which, when closed, energizes the motor 40. This motor runs continually driving the generator 41 and the drive shaft 93 (Fig. 2). Closing the switch 159 also provides current for the motor 39 by means of wires 160 and 161 but this motor does not start until a selector key 98 is depressed due to control relays now to be described. The current for operating the several relays is supplied by the direct current generator 41, the positive lead from said generator being indicated at 162 and the negative lead at 163.

As was set forth previously there are twenty-four compartments in the sorting drum 51 and an equal number of selector keys 98 are provided to select the compartments. The blades of

each inner pair of blades 106 (Fig. 14) of the switches operated by these keys are connected by a common wire 164 (Fig. 14) to the positive side 162 of the generator 41. Each of the left blades carrying one of the points of the contacts 107 is connected by a wire 165 to corresponding brushes 166. These brushes are stationary and are mounted in a suitable, insulating support 167 secured to the sub-base 33 by a pair of brackets 168 (see Fig. 11). The brushes 166 are constantly in contact with a split commutator comprising separate segments 169 and 170 (Fig. 14) mounted in an insulating disc 176 (Fig. 11) secured to the sprocket 59 which, in turn, is fast on the compartment drum shaft 60. The segment 169 is electrically connected to a ring 177 and the segment 170 is electrically connected to a ring 178 both of which rings are mounted in and rotate with the disc 176.

The commutator segments 169 and 170 have a fixed relationship with the compartment drum and rotate therewith, but rotate with respect to the brushes 166 consequently the spaces between the segments 169 and 170 may be between any adjacent pair of diametrically opposed brushes 166. For the illustrative embodiment it may be noted (see Fig. 14) that one of the spaces separating these segments lies between the brushes corresponding to the No. 1 compartment and the No. 24 compartment, while the space separating the opposite ends of the segments lies between the brushes corresponding to the No. 12 and No. 13 compartments.

Depression of a key 98, for instance the "5" key, closes contacts 107 and completes a circuit from the positive side of the generator line 162 through line 164, contacts 107, the corresponding line 165, brush 166, commutator segment 169, the common ring 177, a brush 179, a wire 180, contacts 181, through the coil of a relay 182, wire 183, contacts 184, wire 185 to the negative generator lead 163. At the same time a circuit is completed through one coil 186 of a two coil relay, contacts 187, wire 185 to line 163 energizing the relay 186 which attracts its armature 188 comprising the center blade of a three blade time delay switch. This closes one set of contacts 189 completing a circuit from the positive line 162, a wire 190, closed contacts 189, a relay 191 to the negative line 163. Energization of the relay 191 closes its contacts 192 (lower left of Fig. 14) completing a circuit from the line 162, contacts 192, wire 193, normally closed contacts 249, through the brake magnet 78 (Fig. 4) the coil of a relay 195 and the clutch magnet 62 (Fig. 8).

The circuits through the clutch magnet 62 and the relay 195 are completed by wires 196, 197 and 198 directly to the negative line side 163. The circuit for the brake magnet 78 is completed through a wire 199, contacts 200, wires 206, 207, 197 and 198 to the negative side 163.

The operation of the brake magnet 78 (Figs. 4 and 14) draws its armature including the member 79 upwardly spreading the brake shoes 71 and 72 thus releasing the brake. Energization of the relay 195 closes contacts 208 (lower right of Fig. 14), closing a circuit from the negative lead 163, contacts 208, contacts 209 closed upon energization of relay 191, to the negative side of motor control relays 210, 211, 212 and 213. The energization of the clutch magnet 62 engages the clutch 48—50 (Fig. 8) between the sorting drum motor 39 and the sprocket drive 57—53—59. The energization of the relay 182 (Fig. 14) 75

closes contacts 214 and 215, and opens contacts 216 completing a circuit from the positive generator lead 162, contacts 192, wire 217, contacts 218 normally closed, wire 219, contacts 215 now closed by relay 182, wire 220, normally closed contacts 221, wire 222, relay 182, wire 183, contacts 184, wire 185 to the negative lead 163, thus setting up a holding circuit through the relay 182. Another circuit is completed through contacts 192, wires 193 and 217, contacts 214 closed by relay 182, wire 223, relay coil 224, contacts 225, 226 and 184, wire 185 to line side 163. Energization of the relay 224 opens the contacts 181 thus opening the circuit from the commutator to the relay 182 to prevent any cross circuits when the commutator is in motion.

The closing of contacts 214 also completes a circuit through the magnet 87 which energizes this magnet to disengage the arm 86 (Fig. 2) from the notch 89 on the ring 85 thus freeing the drum 51 for rotation.

A circuit is completed at the same time through the contacts 215, a wire 227, normally closed contacts 228 to motor control relays 211 and 212, contacts 209 and 208 to the negative line 163. Energization of motor control relays 211 and 212 closes double sets of contacts 229 and 230 respectively completing a circuit through the motor 39 extending as follows: Positive side of the main supply line through line 160, normally closed contacts 236, contacts 230, armature of motor 39, contacts 229, wire 161 to the negative side of the main supply line 158 through switch 159.

The clutch is now effective and the motor is running to rotate the selector drum to bring the selected compartments to position which, it will be remembered, is the "5" compartment for this particular example. The drum will continue to rotate until it approaches within two compartments of the selected compartment as determined by the depressed selector key 98. A feeler or extended brush 237 (Fig. 14) carried on the end of an arm 238 and extending equal distances on each side thereof is in contact with a selected contact point 241. The arm 238 is fast on the shaft 60 (see Fig. 11) and carries the feeler 237, also a shorter feeler 239. A brush 240 carried by the arm 238 is adapted to successively wipe the contacts 241 mounted in an insulating disc 242 suitably secured to the base 33. There are 24 contacts 241 each electrically connected to the contact 108 associated with a corresponding selector key 98.

The arm 238 also carries a brush 243 in constant contact with a common ring 244 and electrically connected to the feeler 237 and 239 and to the brush 240.

When the "5" key was depressed the contacts 108 corresponding thereto were closed setting up a circuit from the positive lead 162, wire 164, contacts 108, wire 245 to the "5" contact 241. Now as the feelers 237 on the arm 238 which is rotating with the drum 51, contact with the "9" contact 241 the circuit is extended through the feelers 237, brush 243, ring 244, wire 246, through a relay coil 247, wires 206, 207, 197 and 198 to the negative generator lead 163. Energization of the relay 247 closes contacts 248 completing a circuit from the positive lead 162, contacts 192, normally closed contacts 249, contacts 248, through a relay coil 250, wires 251, 206, 207, 197, 198 to the negative lead 163. This energizes the relay 250 closing contacts 252 thus setting up a holding circuit through said relay 250, and opens the con-

tacts 200 to deenergize the brake magnet 78 which allows the springs 75 (Fig. 4) to apply the brake.

Energization of the magnet 250 also opens contacts 236 throwing resistance 253 in series with the motor 39 thus reducing the speed of the motor.

At the time the feeler brush 237 completed the above described circuit, a circuit was also completed through the "5" contact point 241, as set forth above, through wire 246, a pair of locking bolt magnets 254 (see also Fig. 3), wires 207, 197 and 198 to the negative lead 163.

At the time the feeler brush 237 wipes across the "5" contact however, the drum 51 is in a position between compartments and a bolt 255 (Fig. 3) which is adapted to be operated by magnet 254 strikes the inter-notch periphery of the ring 85 (Fig. 2) and is thus prevented from entering a notch 89 to arrest the movement of the drum and align said drum. The magnets 254 are energized only as long as the feeler brush 237 is in contact with the "5" contact 241.

The bolt 255 (Fig. 3) is slidably mounted on an arm 256 pivotally supported on a plate 257 which in turn is secured to a bracket 258 supported on a cross rod 259 extending between the left hand legs 34 (Fig. 2) of the machine. A pin 260 projecting from the bolt 255 is embraced by the bifurcated upper end of an arm 266 fast on a shaft 267 to which is also fast the armature 268 of the magnets 254 and an arm 269 which operates the sets of contacts 288 and 249. The arm 256 has two opposed ears 270 bent outwardly therefrom in which ears are loosely mounted studs 271 between the inner ends of which is compressed a strong spring 272.

In axial alignment with the outer ends of the studs 271 are two stop screws 272a fast in supporting blocks 273 suitably secured, the upper one to machine sub-base 33 and the lower one on the bracket 258. The bolt 255 may enter a notch 89 only when the drum has arrived at the selected position as will be described later.

When the relay 247 (Fig. 14) operated to close the contacts 248 a circuit was extended from line 162, contacts 192, contacts 249, contacts 248, a relay coil 274, wire 275, contacts 276, wires 277, 207, 197 and 198 to line 163. Energization of the relay 274 opens contacts 228 and 278 and closes contacts 279 and 280. Opening the contact 228 deenergizes motor control magnets 211 and 212 dropping contacts 229 and 230, at the same time closing of contacts 280 extends a circuit as follows: Positive lead 162, contacts 192, wires 193 and 217, contacts 218, wire, 219, contacts 215 closed by energization of magnet 182, wire 227, contacts 280, through motor control magnets 210 and 213, contacts 209 and 208 to negative lead 163. The magnets 210 and 213 now being energized, close their respective contacts 281 and 282 causing a momentary reversal of the direction of flow of the electrical current through the motor 39 for the purpose of dynamic braking.

When the brake magnet 78 is deenergized and its armature drops, it closes contacts 283 (see also Figs. 2 and 4) setting up a circuit from line 162, contacts 192, wire 193, contacts 249, contacts 283, a relay coil 284, wires 207, 197 and 198 to line 163. Energization of relay 284 closes contacts 285 setting up a holding circuit for itself extending as follows: Line 162, contacts 192, wires 193 and 217, contacts 214, wires 286, contacts 285, coil 284, wires 207, 197 and 198 to line 163.

The energization of relay coil 284 also closes contacts 287 again energizing the brake magnet 75

78 to release the brake shoes 71 and 72 (Fig. 4) and the energization of the relay coil 284 causes the opening of the contacts 276 deenergizing relay coil 274 which allows contacts 228 and 278 to close thus restoring the flow of current through the motor 39 to its former direction. The motor continues to run at reduced speed until the drum is in the selected position.

When the drum arrives in the selected position, which in the instant example is the "5" position, the brush 240 on the arm 238 contacts the "5" point contact 241 and it again completes a circuit through the relay 247 but this relay 247 does not at this time affect the circuit of relay 250 because the relay 250 was previously energized and set up a holding circuit for itself. However the magnets 254 are again energized and since a notch 89 is now opposite the bolt 255 (Fig. 2) the magnets 254 rock the armature 268, shaft 267 and arm 266 to slide the bolt 255 into the notch 89. As the drum 51 at this time still has some momentum the bolt 255 and consequently the arm 256 will be carried therewith in the direction of rotation of the drum 51 compressing the spring 272 (Fig. 3) which absorbs the shock and centers the drum accurately in the selected position by retracting the drum to a predetermined position.

The magnets 254 are energized as long as a key 98 is depressed and the drum is standing in the position corresponding to the depressed key. However as soon as another key 98 is depressed the circuit is opened and the magnets 254 are deenergized and a spring 265 withdraws the bolt 255 to permit rotation of the drum to the new position.

Again referring to Fig. 3, the movement of the armature 268 also rocks the arm 269 which opens the contacts 249 and closes contacts 288 (Fig. 14) setting up a circuit extending from line 162, contacts 192, contacts 288, wire 289, relay coil 290, wire 185 to the negative line 163. Energization of relay 290 closes contacts 296 and opens the contacts 184, 226 and 225. Closing contacts 296 sets up a circuit through a coil 297 from the line 162, contacts 192, wire 217, contacts 296, coil 297 to line 163. The coil 297 thus is energized to open the contacts 221 and opens the holding circuit through the relay 182.

The opening of contacts 184, 226, and 225 opens the circuits and allows the relays 182, 224 to assume the normal original position and also prevents back circuits through coils 182, 224 and 186.

Opening the contacts 249 opens the circuit through the brake magnet 78 allowing the brake again to become effective. Also opening the contacts 249 deenergizes magnet 195 which allows the contacts 208 to open thus deenergizing the motor control magnets which in turn drop their armatures to open the motor circuit thus stopping the motor 39. Further opening the contacts 249 deenergizes the clutch magnet 62 to render the clutch 48—50 (Fig. 8) ineffective.

When the magnet 182 is deenergized dropping its armature and opening the contacts 214 the magnet 87 is deenergized (see also Fig. 2) allowing the spring 88 to engage the nose of arm 86 in a notch 89 to align the drum in the selected position.

With the drum 51, split commutator and the rotor arm 238 standing at the "5" position let it be assumed, as a further example, that the "23" key is depressed.

Depression of the "23" key completes a circuit to the "23" brush 166 which, it will be observed by reference to Fig. 14 is in contact with the seg-

ment 170. This sets up a circuit through the "23" brush 166, segment 170, common ring 178, brush 295, a wire 298, a relay coil 299 serving the same purpose as the previously described magnet 186 and has a common outlet through contacts 187 and wire 185 to the line 163. At the same time a circuit is completed from wire 298, through contacts 300, wire 301, magnet 302, wire 303, contacts 226 and 184, wire 185 to the negative lead 163. Energization of the magnet 302 opens contacts 218 and closes contacts 304 and 305, completing a circuit from the positive lead 162, contacts 192 closed upon energization of magnet 299, wires 193 and 217, contacts 216, wire 219, contacts 304, contacts 306, magnet 302, wire 303, contacts 226 and 184, wire 185 to line 163 thus setting up a holding circuit for magnet 302.

Another circuit is completed through contacts 305, wire 223, magnet 224, contacts 225, 226 and 184 to the line 163. The relay magnet 224 opens its contacts 300 thus opening the circuit from the commutator segment 170 to the relay 302 to prevent cross circuits.

The closing of contacts 305 also energizes magnet 87 to remove the arm 86 from engagement with the ring 85 freeing the drum for rotation.

At the same time a circuit is completed through contacts 304, a wire 307, contacts 278 through the motor control magnets 210 and 213, contacts 209 now closed, contacts 208 also closed at this time, to the line 163. The magnets 210 and 213 close their respective contacts 281 and 282 energizing the motor to run in reverse direction. This rotates the drum by the shorter direction directly to the "23" pocket where it is brought to rest in the manner described above.

During the course of this rotation the space between the segments 169 and 170 passes the "23" brush 166 at which time the magnet 299 will be deenergized dropping the armature 188. At this time the armature is shifted to close the left hand (Fig. 14) contacts 189 in order to maintain the relay 191 energized and hold the circuits through contacts 192. This is only for a very brief time after which the segment 169 comes into contact with the live brush energizing magnet 186 which immediately picks up the armature 188 closing the right hand pair of contacts 189 holding the magnet 191 energized. The magnet 186 is energized as long as a key 98 is depressed. However, the motor 39 does not operate because a circuit is also maintained through the magnets 254 to hold the bolt 255 (Fig. 3) in engagement with the drum thus holding the contacts 249 open and the contacts 288 closed. This maintains the magnet 290 (Fig. 14) energized holding the control circuits open.

As soon as another key 98 is depressed the circuit through the magnets 254 is opened which allows the bolt 255 to come out, and closes contacts 249 opening contacts 288. This deenergizes magnet 290 and the machine operates through the above described selecting cycle.

Release bar (Fig. 9)

Immediately after depressing the selector key 98 the sorting drum rotates to the selected position. After this operation, the operator depresses the release bar 97 rendering a one-revolution clutch (Fig. 9) effective to impart one complete counterclockwise rotation to the cam shaft 94 in the following described manner:

It was set forth above that closure of the switch 159 (Fig. 14) energizes the motor 40 (Figs. 2 and 5) which runs continuously as long as the ma-

chine is in operation and which drives the generator 41 to supply low voltage current to operate the machine. The motor 40 drives the shaft 93 (Figs. 2, 9 and 12) continually but this shaft rotates idly until operation of the clutch mechanism illustrated in Fig. 9 is effected by depression of the release bar 97.

The bar 97 is mounted on a stem 308 which is slidably supported by a pair of headed screws 309 projecting from the frame 31. The stem 308 carries a stud 310 which is embraced by the bifurcated end of one arm of a bell crank 311 having its other arm connected by a link 312 to a lever 313 pivotally supported on the frame 31. Depression of the release bar 97 rocks the bell crank 311 clockwise drawing the link 312 leftward (Fig. 9) thus rocking the lever 313 also clockwise.

This raises a link 314 depending from one arm of the lever 313. The link 314 has a shouldered notch in one edge thereof normally held by a spring 315 in cooperative relation with a stud 316 projecting from a retaining pawl 317 pivoted concentrically with the lever 313.

The pawl 317 cooperates with the tail of a drive pawl 318, pivotally carried on a disc 319 secured to the cam shaft 94, to hold said pawl 318 out of engagement with a drive ratchet 320 secured to the gear 96 and constantly rotated thereby in a counterclockwise direction (Fig. 9).

The clockwise movement of the lever 313, imparted thereto by depression of the release bar 97, as above stated, raises the link 314 which, due to the stud 316, rocks the retaining pawl 317 clockwise against the tension of its spring 326, freeing the drive pawl 318 to the action of its spring 327 which immediately rocks the pawl 318 into engagement with the ratchet 320. The disc 319 is now rotated counterclockwise one complete rotation. Shortly after the disc commences its rotation a block 328 secured to the side thereof strikes the lower end of the link 314 and rocks the link clockwise to free the pawl 317 to its spring 326 which rocks said pawl counterclockwise against a stop stud 329. Near the end of the rotation of the disc 319 and of the shaft 94 to which it is fast, the tail of the drive pawl 318 strikes the pawl 317, rocking the drive pawl 318 out of engagement with the ratchet 320 to stop rotation of the shaft 94. A spring pressed pawl 330 cooperates with a notch in the periphery of the disc 319 to prevent retrograde movement of the shaft 94.

Check feed (Figs. 1, 10, 11, 12, 13)

After the drum 51 has been positioned according to the selector key 98 depressed, the check is inserted into an aperture 135 (Figs. 1 and 12) and is fed into the selected compartment. The checks are fed into the compartments by means of a plurality of pairs of feed rollers 350 and pairs of smaller rollers 351 (Figs. 12 and 13). These feed rollers normally occupy the position with relation to the sorting drum, in which they appear in Fig. 12, but upon operation of the check feed mechanism to feed a check into a selected compartment, the rollers are rocked to the positions disclosed in Fig. 13. The rollers 350 are secured to the shafts 357 and 358 (Fig. 13), the shaft 357 being carried between a pair of frames 359 (see also Figs. 9 and 10) secured to a shaft 360 journaled in the frames 30 and 31. The shaft 358 is carried between upwardly extending brackets 361 one secured to each of the frames 359. The rollers 351 are carried on shafts 362 and 363 the latter shaft being supported be-

tween the frames 359 and the shaft 362 being supported between adjustable brackets 364 pivoted on the shaft 357 and adjustably secured to the frames 359 by screws 365 (see Fig. 10).

Also secured on the shaft 360 is a cam arm 366 carrying rollers cooperating with a pair of cams 367 secured on the shaft 94 (Figs. 10 and 12) which, it will be remembered receives one complete counterclockwise rotation at each operation of the machine. At the proper time the cams 367 rock the shaft 360 and the frames 359 clockwise to bring the rollers 351 into close proximity to the selected compartment and at the same time a gear 368 (Fig. 12) fast on the shaft 94 rotates the rollers 350 and 351 in the directions indicated by the arrows through the following described train of gears:

The gear 368 drives an intermediate gear 369 mounted on a stud 370 in the frame 30. The gear 369 meshes with a gear 371 loose on the shaft 360, which gear 371 meshes with a gear 372 (Fig. 10) fast on the shaft 357 back of the frame 359. A gear 373 (Fig. 13) fast to the shaft 357 on the opposite side of the frame 359 from gear 372 meshes with a gear 374 fast on the shaft 358. The counterclockwise rotation of the gear 368 through the train of gears just described rotates the gear 372, the shaft 357 and the rollers 350 fast thereon in a clockwise direction, and the gear 374, shaft 358 and the feed rollers 350 on this shaft counterclockwise. The gear 374 (Fig. 13) meshes with an intermediate gear 375 which in turn meshes with a gear 376 secured on the shaft 363, and the gear 376 meshes with a gear 377 fast on the shaft 362. This causes the feed rollers 351 on the shaft 363 to rotate counterclockwise and the rollers 351 on shaft 362 to rotate in a clockwise direction.

The rollers 350 are notched substantially as shown by numeral 378 (Fig. 13) so that when the check is dropped into the aperture on chute 135 (Fig. 12) the lower edge thereof rests on the shoulders of the notch 378 substantially between the sets of rollers 350. The rotation of rollers 350 and 351 in the direction of the arrows feeds the checks into the selected compartment.

When the selected compartment comes into position an arm 379 integral with the arm 152 comes to rest adjacent a roller 380 (Figs. 10, 12 and 13) on the frame 359. When this frame is rocked by the cams 367, the roller 380 rocks the arms 379 and 152 counterclockwise carrying the retainer plate 154 from the position in which it appears in Fig. 12 to the position in which it is shown in Fig. 13 so that the incoming check may be fed onto the stack 385 in the proper order.

As the checks or other record materials are fed into the compartment they are held close against the retainer plate 154 by a series of fingers 386 (Figs. 12 and 13) pivotally carried on a rod 387 carried between a pair of arms 388. The arms 388 are secured to a shaft 389 pivotally supported on brackets 390 (only one of which is shown) secured to the sub-base 33. Springs 391 normally urge the arms 388 clockwise pressing rollers 392 one carried by each arm 388, against cams 393 fast on the shaft 94.

When the shaft 94, and consequently the cams 393 are rotated counterclockwise the cams 393 permit the springs 391 to rock the arms 388 quickly clockwise from the Fig. 12 position to the position in which they appear in Fig. 13. As the fingers 386 are carried into the compartment they are guided by tails 394 thereon cooperating with grooves in a rod 395 under the influence of springs

396. After the card is fed in between the tops of the fingers 386 and the retainer plate 154 the cams 393 restore the arms 388 to their original position withdrawing the fingers 386 from the compartment. The cams 367 now rock the frames 359 counterclockwise carrying the feed rollers outwardly to their normal positions and this allows the springs 155 to carry the retainer plate 154 against the stack 385 to hold the checks in position.

Full compartment signal (Figs. 6, 7, 14)

Means is provided to prevent further compartment selecting operations when a compartment is full of checks. This means includes contacts 397 (Figs. 6 and 7) adapted to be operated by a cam 398 fast on the shaft 94 and under the control of the arms 152 carrying the retainer plate 154. Cooperating with the cam 398 (Fig. 7) is a roller 399 on the free end of an arm 400 of a lever pivoted on the shaft 360. The other arm 401 of the lever, which arm 401 is bent back on itself as at 402 in order to clear other mechanism, pivotally carries at 403 a curved lever 404 having one of its arms 405 provided with a block 406 in the plane of a projecting surface 407 on the arm 152.

The other arm 408 of the lever 404 is connected to a link 409 which at its opposite end is connected to a lever 410. A pin 416 on the lever 410 projects into a bifurcated floating member 418 and a spring 419 compressed between the pin 416 and a shoulder on the member 418 presses a roller 420 against a curved insulating retainer 421. This switch is mounted in a casing 422 secured to an arm 423 of the lever 400—401.

When the link 409 is moved toward the left (Fig. 6) it rocks the lever 410 counterclockwise and the pin 416 rocks the member 418 clockwise about the roller 420 as a pivot until just as the pin 416 passes the center line through the pivot point of the lever 410 and the center of roller 420, whereupon the roller shifts quickly into contact with the contacts 397 of which there are two. One of the contacts 397 does not appear in Fig. 6 since it lies directly behind but insulated from the one shown. The link 409 is operated in the following described manner:

When the cams 367 (Fig. 10) operate to rock the frames 359 counterclockwise withdrawing the feed rollers 350 and 351 from the position in which they appear in Fig. 13 to their normal position (Fig. 12) and the roller 380 frees the arm 152 to the action of its spring 155 so that the latter immediately rocks said arm clockwise until it is arrested by the plate 154 striking the stack of checks 385. Shortly thereafter the cam 398 (Fig. 6) rocks the lever 400—401 clockwise carrying the lever 404 therewith, the lever 404 maintaining the same relation to the arm 401 and with the switch box 422 shown in Fig. 6.

On its clockwise travel the block 406 will strike the face 407, if a sufficient number of checks have previously been sorted into the particular compartment selected, and rock the lever 404 slightly counterclockwise about its pivot 403 on the arm 401. As the number of checks in the compartment increases the lever 404 will be rocked farther and farther in a counterclockwise direction until eventually the capacity of the compartment is reached at which point the movement of the lever 404 is sufficient to rock the lever 410 (Fig. 6) past center, whereupon the spring 419 acts to snap the roller 420 toward the left to bridge the contacts 397.

Referring now to the circuit diagram (Fig. 14) closing the contacts 397 completes a circuit from the line 162, a wire 424, magnet 425, contacts 397, wires 426, 196, 197 and 198 to line 163. Energization of the magnet 425 closes its contacts 427 and 428 and opens the previously described contacts 187 (top of Fig. 14 just under figure number).

Closing contacts 427 lights a signal light 429 to indicate to the operator the nature of the trouble. Closing contacts 428 sets up a circuit from line 162, wire 424, contacts 428, wire 430, coils 431, wires 207, 197 and 198 to line 163.

Referring now to Fig. 9, energization of the magnets 431 attracts the armature 432 rocking counterclockwise a pawl 433 to position the end of said pawl in the downward path of a block 434 secured to the release bar stem 308 to thus prevent depression of the release bar 97 until the checks have been cleared from the compartment.

The opening of contacts 187 deenergizes the energized magnet 186 or 299 opening contacts 189 to deenergize magnet 191 which opens its contacts 192 and 299 preventing a selecting operation of the sorting drum until the checks are removed from the full compartment.

Before the operator can proceed with an item entering operation, however, it is necessary to depress a key 435 (Figs. 1 and 7). When the cam 398 operated the lever 400—401 an ear 438 on the arm 408 of lever 404 was carried to the position indicated by dotted lines 438a to the right of a stud 439 on the key lever 436. The counterclockwise movement of the lever 404 carried the ear 438 counterclockwise almost into contact with the stud 439. Now when the cam 398 releases the lever 400—401 and the spring 440 rocks said lever counterclockwise, the ear 438 rocks the key lever 436 clockwise positioning a hook 441 in the path of an ear 442 bent at right angles to the arm 423, latching the lever 400—401 against restoring movement thus preventing operation of the link 409 to open the contacts 397.

After the operator has cleared the checks from the full compartment he depresses the key 435 rocking the lever 436 counterclockwise to free the lever 400—401 to its spring 440 which restores said lever to its normal position. As the lever 400—401 rocks counterclockwise the arm 405 of lever 404 strikes a stud 448 causing this lever to rock clockwise about its pivot 403 thus drawing the link 409 toward the right to open the contacts 397.

Referring now to Fig. 14 when the contacts 397 are opened the magnet 425 is deenergized opening contacts 427 and 428 and closing contacts 187. The machine may now be operated in a normal manner.

Lock for release key (Figs. 2, 9, 14)

Means is provided to lock the release bar 97 while the sorting drum is rotating. This lock is controlled by the locking finger 86 (Fig. 2) which is operated by the magnet 87 (see also Fig. 14).

It was explained above how depressing a selector key 98 effected energization of magnet 182 which closes contacts 214 energizing the magnet 87 through the circuit extending from line 162, contacts 192 now closed, lines 193 and 217, contacts 214, magnet 87 to line 163. Energization of magnet 87 rocks the finger 86 counterclockwise and also rocks an arm 1195 rigidly connected to finger 86 counterclockwise closing

contacts 1196. Upon closing of contacts 1196 a circuit is set up from the line 162 (see Fig. 14) over wire 424, contacts 1196, release bar magnet 431, wires 197 and 198 to line 163 thus energizing the release bar magnets.

Referring now to Fig. 11 it will be remembered that energization of magnets 431 through armature 432 rocks bell crank 433 counterclockwise to interpose the end of said bell crank in the path of the block 434 thus preventing depression of the release bar until the drum is stopped in the selected position.

At this time, however, as was fully explained above, the relay 182 (Fig. 14) is deenergized dropping its armature and opening contacts 214 which opens the circuit through magnet 87. The spring 88 (Fig. 2) now reengages the finger 86 with a notch 89, at the same time rocking the arm 1195 clockwise allowing contacts 1196 to open. This opens the circuit through magnets 431 which upon deenergization drop armature 432 (Fig. 9) rocking the bell crank 433 clockwise to free the release bar for operation.

Amount set up mechanism (Figs. 15, 16, 17, 18, 19, 20, 21)

To enter an item corresponding to the check to be sorted the operator sets up the amount to be entered on the ten-key amount setup mechanism which includes the keys 110 (Figs. 1, 19 and 20). Depression of any of these keys operates mechanism now to be described in identically the same manner and effects a differential rotation of a master wheel to set amounts corresponding in digital value to the particular keys depressed on corresponding set up wheels, which amounts are later transferred to a rack system to set up printing elements. Since the operation of each of the keys is exactly the same, a description will be given of the operation of the set up mechanism upon depression of only one of the said keys, for example, the "6" key.

The various mechanisms are carried by a suitable base (not shown) and parallel side frames 117 and 118 (Fig. 15) which primarily carry the ten-key controlling mechanism. The item setup mechanism and item entering mechanism are carried by the frame plates 31 and 32, (Fig. 15).

The bifurcated lower ends of the key stems 111 (Figs. 19 and 20) of the keys 110 each embrace a stud 120 on a pivoted arm 121, there being an arm 121 associated with each key 110. The arms 121 are urged upwardly against a stop rod 465 by individual springs 466 set in a cross bar 467 which bar is also slotted to guide the arms 121. Pivoted on the stud 120 is a latch 468 having a cam slot 469 therein embracing a rod 470 supported on projections of the cross bar 467.

The first downward movement of the depressed key cams the latch 468 counterclockwise to engage the shoulder end thereon beneath an angular bail 476 underlying all the arms 121 and carried by arms 477 and 478 (see also Fig. 15) pivoted on the shaft 122. The arm 478 (Fig. 20) extends upwardly and a spring 479 stretched between a stud 480 on said arm and an arm 481 pivoted on the shaft 122 normally holds a shoulder 480a of the arm 481 against the stud 480. When the arm 121 moves downwardly under the influence of the depressed key it rocks the bail 476 and arms 477 and 478 counterclockwise, and, through the spring 479, rocks the arm 481 in the same direction, thrusting upwardly a link 482 held by a spring 483 against an arm 484 secured to a shaft 485 which arm 484 is held against a

stop stud 486 by a spring 487. The upper end of the link 482 abuts against an insulating block 488 supported on the lower one of a pair of switch blades carrying contacts 489 (see also Fig. 14 right side of the sheet near the center) closing said contacts. Closing contacts 489 energizes a ball magnet 490 (Figs. 17, 19 and 20) which operates another ball including arms 491 and 492 (Fig. 15) pivoted on the shaft 122 and connected at their left hand ends (Figs. 19 and 20) by a bail 493. Between them the arms 491 and 492 also carry an armature 494 adapted to be operated by the magnets 490.

Examination of Figs. 19 and 20 discloses that the bail 493 rests first above and in contact with the angular or flanged part of the bail 476. When a key 110 is depressed and arm 121 rocked the bail 476 moves downwardly away from the bail 493, but energization of magnets 490 rocks the bail 493 downwardly into contact with the now lowered bail 476 to prevent restoration of the latter until magnets 490 are deenergized.

The arm 492 (Fig. 20) is integral with an upwardly extending arm 495 and a spring 496 holds this arm and the bail 493 in retracted position until the magnets 490 are energized whereupon the bail 493 and the arm 495 are rocked counterclockwise. At this movement a link 497 pivotally connected to the free end of the arm 495 is drawn toward the left for the purpose of operating an escapement device which permits an amount corresponding in value to the particular key 110 depressed to be set on one of a group of setup wheels 498 (Figs. 15, 17 and 18).

These wheels are mounted on a shaft 499 supported in the frame 32 and in a bracket 500 secured to the frame 31 (Fig. 15), and are slidable as a group longitudinally on the shaft 499 toward the left from the position in which they appear in Fig. 15 by means to be described later. In this position (Figs. 15 and 18) the wheel 498 on the extreme left is in mesh with a master setup wheel 506 secured to a shaft 507 mounted in the frames 31 and 32. Hubbed to the gear 506 is a friction disk 508 which cooperates through the medium of a facing 509 of leather, or other suitable material, with a disc 510 fast to a constantly rotating gear 511. A spring 512 compressed between a hub 513 of an arm 514 on the shaft 507 and a disc 515 provides a constant pressure between the discs 508 and 510 whereby the gear 511 drives the gear 506 when the latter is freed by the above mentioned escapement device.

The gear 511 meshes with a gear 516 secured to the shaft 93 which, it will be remembered rotates constantly when the machine is in operation, (see Fig. 2).

Fast on the left hand end of the shaft 507 (Fig. 18) is a gear 517 meshing with a gear 518 on a shaft 519 (see also Fig. 15) on which is also mounted a pin drum 520. The drum 520 has slidably mounted therein a plurality of pins 521 (Figs. 15, 18 and 19) adapted, when thrust toward the right (Fig. 18) to cooperate with an escapement pawl 522 fast on a shaft 523. The upper end of an arm 524 also fast on the shaft 523 (Fig. 20) rests in the path of the lower end of a lever 525, the upper end of which lever 525 rests normally in the left hand end of a recess 526 in the lower side of the link 497.

Depression of a key 110, for instance, the "6" key, first closes the corresponding contacts 125 and then, as the depressed key nears the limit of its downward travel, the link 482 closes the contacts 489 completing a circuit from the line 75

162 (Fig. 14), wire 190, contacts 125 corresponding to the particular key depressed, a pin magnet 527, contacts 528, contacts 489 to line 163. A circuit is also completed from wire 190 through a magnet 529, contacts 528, contacts 489 to line 163. The magnet 529 closes contacts 530 setting up a holding circuit through contacts 528, contacts 530 to line 163. At the same time a circuit is established through the ball magnets 490, contacts 489 or 530 to line 163.

Energization of the pin magnet 527 (Fig. 18), in this example the "6" magnet, attracted its armature 536 which acts to thrust the particular pin 521 then in line with said armature toward the right (Fig. 18) into the plane of a nose 537 on the escapement pawl 522. The pin drum 520 is normally prevented from rotating due to the pin 521 previously setup resting against the nose 537 on the escapement pawl 522.

The pin 521 last set up remains effective to hold the drum 520 against rotation until another key is depressed operating the pawl 522. The pin primarily set up is restored just after it passes the nose 537 by a cam face on the end of a bracket 535 (Fig. 18) projecting from the frame 118.

As the ball 493 (Fig. 20) and the arm 495 near the end of their counterclockwise excursion the link 497 rides onto a stud 541 which rocks said link upwardly clear of the lever 525 which is then permitted to be restored to its normal position as the tooth 539 (Fig. 19) wipes the ear 538 rocking the pawl 522, shaft 523 and arm 524 (Fig. 20) counterclockwise. The link 497 is restored to its normal position when the arm 495 moves clockwise to its normal position.

Just as the arm 495 reaches the limit of its counterclockwise movement it strikes an insulating block 542 opening the contacts 528. This deenergizes the ball magnet 490, the holding relay 529 and the pin magnet 527 allowing the arms 121 and the balls 476 and 493 to restore to normal positions, allowing the circuits to return to normal for the next succeeding operation.

Obviously the operation of the above described mechanism upon depression of a key 110 effects a partial rotation of the shaft 519 corresponding in degree of rotation to the value of the particular key depressed plus one. Thus if the "0" key is depressed the shaft 519 is rotated one step, the "1" key causes a two step rotation, etc.

When the ball magnet 490 is energized it rocks the balls 476 and 493 counterclockwise as set forth above and near the end of this stroke the link 497 (Fig. 20) rocks the lever 525 counterclockwise, said lever at the same time rocking the arm 524, shaft 523 and the escapement pawl 522 clockwise removing the nose 537 from the path of the pin 521 then pressing against said nose thus freeing the pin drum 520 and the shaft 519 for rotation.

The armatures 536 of the several digital pin magnets 527 are spaced differentially away from the nose 537 of the escapement pawl 522 in a counterclockwise direction so that when the pawl 522 is rocked to free the drum 520 said drum and the shaft 519 will rotate a distance a number of steps proportional to the particular key 110 depressed, which in this case is the "6" key when it is again arrested by the projected pin 521 striking the pawl 522. This pawl was returned to its former position (Fig. 19) by one of a series of teeth 538 on the drum 520 wiping an ear 539 on the opposite end of the pawl 522 thus rocking said pawl counterclockwise.

As the projected pin 521 approaches the nose 537 of the escapement pawl 522 it strikes an arm 540 (Fig. 19) fast on the previously described shaft 485 rocking this shaft and the arm 484 (Fig. 20) counterclockwise. It will be remembered that the spring 483 normally presses the link 482 against the arm 484. The counterclockwise movement of the arm 484 rocks the link 482 also counterclockwise carrying the upper end of said link clear of the block 488 whereupon the contacts 489 immediately open. The several circuits described just above, however, are maintained through the contacts 528 (Fig. 14).

The differential rotation of the shaft 519 is effected by the continuously rotating gear 511 through the friction drive 508—510 as set forth above thus imparting through the master gear 506 (Figs. 18 and 21) and consequently to the particular setup gear 498 in mesh with the master gear a rotation sufficient to set the gear 498 to a position corresponding to the value of the depressed key 110. Thus, if the "6" key 110 was depressed the wheel 498 then in mesh with the master gear 506 will be rotated seven steps to bring the "6" position on the wheel 498 under a sight opening 543 (Figs. 1 and 21) where it is visible to the operator.

Setup wheels (Figs. 15, 16, 17, 18, 21)

In setting up a number comprising a plurality of denominational orders on the setup wheels 498 the operator sets up the highest denominational order first, and then sets up the remaining denominational orders in succession from the highest to the lowest order. Assuming then that the "6" key 110 was depressed to set up the highest denominational order of a number, the setup wheels 498 (Figs. 15 and 18) are all the way to the right with the left hand one of the wheels 498 in mesh with the master gear 506.

As each number is set up the group of wheels 498 are shifted in two movements, one space to the left to bring the left hand wheel in line with the right hand one of a series of racks 575 and to bring the second wheel 498 into mesh with the master gear in readiness to set the next denominational order digit thereon. The mechanism for shifting the wheels 498 will now be described.

As mentioned above the set up wheels 498 are slidably mounted on the shaft 499. The group of wheels 498 is embraced by a pair of arms 545 (see Fig. 15) projecting from a sleeve 546 slidably mounted on a shaft 547 supported in the bracket 508 and in the frame 32.

A roller 548 (Fig. 16) carried on the sleeve 546 projects into a spiral cam groove 549 formed about a cylindrical member 550 secured on a shaft 551 rotatably supported in the frame 32 and in a bracket 552 secured to said frame.

In order to rotate the cam 550 a gear 553 secured on the shaft 551 near the frame 32 (Figs. 15 and 16) meshes with a segmental gear 554 pivoted on the shaft 507. Also meshing with the segment 554 is a gear 555 secured to an escapement ratchet 556 mounted to rotate on a stud 557 projecting from the frame 32. A spring 558 having one of its ends secured to the arm 514 mounted on the shaft 507 and secured to the segment 554 normally urges the segment 554 counterclockwise and the gear 555 and ratchet 556 clockwise (Fig. 16) but these parts are prevented from rotating due to the cooperation of an escapement pawl 560 loosely mounted on a shaft 566 supported between the frames 31 and 32. The pawl 560 is normally urged clockwise to 75

the position in which it appears in Fig. 16 by a spring 567. Secured to the shaft 566 adjacent the pawl 560 is an arm 568 carrying a stud 569 projecting into a slot 570 in the pawl 560.

The bifurcated end of an arm 571 secured on the shaft 566 between the frames 31 and 118 (Figs. 15 and 17) embraces a stud 572 projecting from the ball arm 491 through a clearance opening in the frame 118.

It will be recalled that the ball arm 491 is rocked counterclockwise (see Fig. 20) upon energization of the ball magnets 490. This movement is transmitted through the stud 572 (Fig. 17) arm 571 and shaft 566 to rock the arm 568 (Figs. 15 and 21) counterclockwise. Near the extreme of this movement of the arm 568, the stud 569 strikes the left hand end of the slot 570 and rocks the pawl 560 slightly counterclockwise to disengage a hook 573 from the ratchet 556, and, at the same time, moving a nose 574 into the path of the next ratchet tooth.

As soon as the nose 573 is clear of the ratchet the spring 558 acting through the segment 554 rotates the gear 555 and the ratchet 556 one half tooth space. This movement is transmitted by the segment 554 to the gear 553 and the cam 550 (see Fig. 15) rotating the cam sufficiently to displace the sleeve 546 and the group of wheels 498 one half step toward the left. This movement is not sufficient to carry the particular wheel 498 then in mesh with the master wheel 506 out of engagement therewith.

At this point in the operation the master wheel 506 receives its increment of rotation under the control of the depressed key 110, which in the present example is the "6" key, and the pin drum 520, as set forth above, to correspondingly rotate the particular setup wheel 498 in mesh therewith seven spaces to the "6" position after which the magnets 490 are deenergized by opening of the contacts 528 and the ball arm 491 is restored clockwise to normal.

This rocks the arm 571 (Fig. 17) shaft 566 and arm 568 (Figs. 16 and 21) clockwise to free the escapement pawl 560 to the spring 567, which immediately rocks the pawl in the same direction disengaging the nose 574 from the ratchet 566, and engaging the hook 573 therewith. At this time, and under the influence of spring 558 the segment 554, receives its second movement advancing the ratchet 556 one half step to complete a full step of movement. Likewise, the frame 545 and spiral cam 550 receives their second clockwise rotation (Fig. 16) to shift the setup wheel the second half step toward the left. This carries the highest denominational order setup wheel out of mesh with the master wheel 506, and positions that wheel just above and in a vertical plane with, but not in mesh with the right hand, or lowest denominational order rack of the series of racks 575 (Figs. 15, 17 and 18).

The same operation is repeated as each key 110 representing a denominational order of a number being set up is depressed. The setup wheels 498 being shifted one full step toward the left and the next succeeding wheel being differentially set according to the particular key 110 depressed.

Setup wheel aligner (Figs. 15, 16, 17)

In their normal right hand position (Fig. 15) the setup wheels 498, with the exception of the highest order wheel, that is, the left hand wheel, are in engagement with a fixed aligner 561, secured to, and projecting inwardly from the frame

32. This lock is not effective for the highest order wheel 498 as it is in mesh with the master gear 506 ready for a rotation.

As the wheels are shifted toward the left (Fig. 15) they are moved successively out of engagement with aligner 561 and into engagement with the master gear 506 to receive their adjustment then out of engagement with the master gear 506 and into engagement with an aligner 562 carried by one arm of a bell crank 563 (Fig. 17) pivoted on the shaft 507. The other arm of the bell crank 563 carries a roller 564 cooperating by means of a spring 591 with the cam profile of a box cam 565 fast on the cam shaft 94.

At the proper time, after the amount is set on the wheels 498 and after the racks 575 are lifted into mesh with the wheels 498, the cam 565 operates to permit the spring 591 to rock the bell crank 563 clockwise to remove the aligner 562 from engagement with the setup wheel 498. The racks 575 then move toward the right until the end of a concentric slot 596 in the wheel 498 strikes a stop rod 597 (Fig. 16) carried between the arms 545 and extending through the slots 596 in all of the wheels 498. Thus, the racks 575 receive their differential movement under control of the previously adjusted setup wheels 498.

After the racks 575 are set they are disengaged from the wheels 498, and at the same time the aligner 562 is brought into engagement with the said wheels.

Rack engaging mechanism (Figs. 15, 17)

After the complete number or amount has been set on the wheels 498 the operator depresses the release bar 97, which, as above described, operates the one revolution clutch (Fig. 9), to impart one complete counterclockwise rotation to the cam shaft 94.

Mechanism is operated by the cam shaft to raise the racks 575 into mesh with the setup wheels, and then restore said wheels to zero or normal thereby differentially setting the racks 575 a distance corresponding to the setting of the individual wheels 498. The movement of the racks 575 is utilized to set printing elements, as will be fully described later.

The racks 575 are slidably mounted in a frame including plates 576 (Figs. 17 and 21) having their right hand ends pivoted on a stud 577, the racks being slotted at the right to embrace the stud 577. The left hand ends of the plates 576 are joined by a bar 578 (Figs. 15, 17 and 21). This end of the rack frame is adapted to be raised and lowered to bring the racks 575 into and out of mesh with the setup wheels 498. The frame is guided in its movement by projections 579 (Fig. 15) on a cross bar 580, supported between frames 31 and 32. The racks 575 are slotted near the left hand ends and are slidably mounted on a rod 581 (Fig. 17), extending between the side plates 576 of the rack frame. In its normal position the bar 578 rests on a plate 582 secured to the bottom of the bar 580, and extending beneath the bar 578 (see Fig. 17).

The mechanism for raising the racks into mesh with the setup wheels includes a groove 583 in the box cam 565 (Figs. 15 and 17), fastened on the cam shaft 94. This cam is adapted to rock a lever 584 pivoted on a stud 585 projecting from the frame 31. A flattened stud 586 on the left hand end of the lever 584 rests beneath an arm 587. Formed on the end of the arm 587

is a slotted ear 596 surrounding an angular projection 597 on the plate 576.

Referring to Fig. 17, it is obvious that rotation of the cam 565 through the groove 593 will rock the lever 584 first clockwise and then counterclockwise to normal. On its clockwise movement the lever 584 by means of stud 586 rocks the arm 587 counterclockwise to raise the rack frame, thus carrying the racks 575 into mesh with the setup wheel 498.

Setup wheel restoring (Figs. 15, 16, 21)

As soon as the aligner 562 is re-engaged with the setup wheels 498, these wheels are shifted toward the right (Fig. 15) to their normal position by one continuous movement. This is accomplished by rotating the cam 550 and consequently by the cam groove 549 moving the frame 545 backwardly the same distance it was moved to shift the wheels 498 step by step as the numbers are set up. As the escapement pawl 560 (Figs. 16 and 21) is operated to permit the spring 558 to rotate the segment 554 in the setting up of numbers, another segment 598 (Fig. 21) pivoted on the shaft 93, and meshing with a segment 599 integral with the segment 554 is correspondingly rocked to carry a roller 600 on an arm 601 integral with the segment 598, into the path of a profile cam 602 fastened on the shaft 94.

Near the end of the rotation of the shaft, the cam 602 rocks the arm 601 and the segment 598 counterclockwise to normal, rocking the segment 554 clockwise to its normal position. This movement of the segment 554 rotates the gear 553 and the cam 550 counterclockwise sliding the sleeve 546 and its group of setup wheels 498 toward the right to the position in which they appear in Fig. 15.

At this clockwise rotation of the segment 554 the gear 555 and the ratchet 556 are also rotated counterclockwise. This rotation, however, is idle since the escapement pawl 560 vibrates idly, the slot 570 being of sufficient length to permit the pawl to vibrate without displacing the stud 569.

Means is also provided to positively rotate the setup wheels 498 backwardly to zero. This means includes a restoring rod 603 (Fig. 16), carried between a pair of arms 604 secured on the shaft 499. The rod 603 extends through all of the slots 596 in the wheels 498, and is of sufficient length to permit the longitudinal movement of the group of wheels 498 as they escape to the left (Fig. 15) when being set up. A gear 605 (Fig. 21) secured to the shaft 499 meshes with a segment carried on an arm 606 pivoted on the shaft 93 and forming one arm of a lever. The other arm 607 of the lever carries a roller 608 projected into a cam groove 609 in a cam 610 secured to the cam shaft 94.

The cam 610 operates to rock the lever 606-607 clockwise, which rotates the gear 605, shaft 499, and the restoring rod 603 counterclockwise to restore the wheels 498 to normal. On normal operation the wheels 498 are restored as the racks 575 advance toward the right, the restoring rod 603 following this movement, to insure that all of the setup wheels 498 are positively restored.

Locking devices for actuating racks (Figs. 15, 17, 18)

A number to be set on the setup wheels 498 may vary in the number of denominational orders from one to nine, the numbers being limited

in denominational order to the numbers of the setup wheels 498 provided in the machine.

In the illustrated embodiment, nine of these wheels are provided, however, when a number is set on these wheels utilizing less than the nine wheels, certain of the racks 575 will not cooperate with the wheels 498, in which case it is necessary to provide means to prevent such racks as do not mesh with the setup wheels 498 from movement toward the right. This means includes a series of pawls 611 (Figs. 15 and 17) there being a pawl 611 cooperating with each rack 575. The pawls 611 are pivoted on a rod 612, mounted in a bracket 613 carried on ears 614 bent inwardly from the upper edge of the side plates 576 of the rack frame. Referring to Fig. 17, it can be seen that the pawls 611 rest in the paths of projections 615 on the left hand ends of the racks 575. As the group of setup wheels 498 escape toward the left (Fig. 18) a projection 616 on the sleeve 546 positions itself over tails 617 projecting from pawls 611. When the rack frame 576 is brought upwardly to mesh the racks 575 with the setup wheels 498, the tails 617 of the pawls 611 move upward therewith, and the projection 616 rocks the pawls clockwise about pivot 612 to remove the pawls from cooperative relationship with the projections 615 on the racks 575.

Obviously only those pawls 611 will be rocked which lie beneath the projection 616. Thus, if a number comprising four denominational orders is set on the wheels 498, the left hand four of these wheels (Fig. 15) will engage the right hand four of the rack 575. Likewise the projection 616 will move left over the four pawls 611 to the right.

Now when the rack frame 576 is rocked upwardly (Fig. 17) the four pawls to the right will be rocked out of engagement with their respective racks, whereas the remaining pawls 611 cooperating with higher denominational order racks 575 will remain in their position wherein they are effective to restrain the racks 575 from moving toward the right (see Fig. 17) to set the printing type elements to be described later.

Rack operating mechanism (Figs. 21, 22, 26, 26a, 29, 29a)

Referring to Fig. 21 each of the racks 575 carries a stud 624 at its right hand end which stud is embraced by the bifurcated end of an arm 625 of a bell crank 631 pivoted on a shaft 632. The other arm 633 (Fig. 26) of the bell crank 631 is also bifurcated and straddles a stud 634 carried by a vertically disposed slide 635. There is a bell crank 631 and vertical slide 635 for each denominational order rack 575. At its upper end the vertical slide 635 carries type elements 636 slidably mounted therein. The purpose of the bell crank 631 is to transmit the movement of the rack 575 to the vertical slide 635, for the purpose of positioning the type element 636 differentially to print the amount set up by the keys 110.

The arms 625 of the bell crank are normally pressed against a ball 640 carried between a pair of arms 641 (Figs. 21, 29 and 29a) secured to the shaft 632 by a spring 642 stretched between a projection 643 on the lower side of the rack 575 and one of the rods 644 carried between the arms 641.

After the racks 575 have been rocked into engagement with the previously set setup wheels 498, the ball 640 (Fig. 21) receives an invariable

excursion, first counterclockwise and then clockwise to normal. On its counterclockwise travel, the rod 644 acting through the spring 642 draws the racks 575 which were engaged with the setup wheels toward the right therewith, each rack 575 being differentially stopped by its corresponding setup wheel 498, engaging the stop rod 597 (Fig. 16). The bail 644 continues its invariable excursion after the racks 575 are arrested merely stretching the springs 642.

After the racks 575 are disengaged from the setup wheel 498, as described above, the bail 640 receives its clockwise or restoring movement to shift the racks 575 leftward to their normal position.

The means for operating the bail 640 is illustrated in Fig. 22, and includes a pair of complementary cams 645 fast on the shaft 94 co-operating with rollers carried on a curved arm 646 pivotally supported on a rod 630. A link 647 connects the curved arm 646 with an arm 648 secured to the shaft 632. At each adding cycle the cams 645 (Fig. 22) rock the arm 646 first clockwise and through the link 647 rock the arm 648, shaft 632, and the bail 640 counterclockwise. The cams 645 then reverse this movement rocking the arm 646 counterclockwise and through the link 647 rock the arm 648, the shaft 632 and the bail 640 clockwise to restore the racks 575 to their normal position.

It was stated above that each of the slides 635 is shifted vertically a distance commensurate with the movement of the rack 575 under the control of the related setup wheel 498. This movement positions the corresponding type element 636 (Fig. 26) opposite a platen 649. Mechanism is then operated to force the type element 636 against the record material in order to take the impression therefrom. This printing mechanism will now be described.

Control printer (Figs. 23, 26, 29)

Means is provided to take an impression from the type element 636 when the slides 635 are in their adjusted positions. The printing mechanism for accomplishing this impression is known herein as "Control Printer." This printing mechanism is supported by a frame 773 (Fig. 29) and a frame 774 (Fig. 26) mounted on rods 775, projecting between the frames 31 and 32. At the proper time, after the slides 635 are adjusted, hammers 776 pivoted on a shaft 777 extending between the frames 773 and 774 are released and springs 778, there being a spring for each hammer 776, throw the hammers against the selected type element 636 pressing each element against the record material 772 to make the impression thereon. The springs 778 normally urge the hammers 776 clockwise but a bail 779 secured to the shaft 777 normally restrains the hammers in their retracted positions. The operating mechanism for the bail 779 includes an arm 780 (Figs. 23 and 29), fast on the shaft 777 and connected by a link 781 to an arm 782 (Fig. 23) on the shaft 632. Another arm 783 is mounted on the shaft 632 and is hubbed to the arm 782 the arm 783 being connected by a link 784 to a cam arm 785 loosely pivoted on the rod 630.

A stud 786 on the arm 785 projects into a cam groove 787 in the side of a cam 788 fast on the shaft 94. At the proper time, the cam groove 787 rocks the cam arm 785 clockwise thrusting the link 784 toward the right (Fig. 23) rocking the arms 783 and 782 counterclockwise. This movement through the link 781 rocks the arm

780 and the shaft 777 clockwise to rock the bail 779 (Fig. 26) also clockwise to free the hammers 776. At this time the springs 778 endeavor to rock the hammers 776 clockwise but tails 791 on said hammers come into contact with shoulders on individual tripping arms 792 pivoted on a shaft 793 extended between the frame 773 (Fig. 29) and 774 (Fig. 26) to prevent operation of the hammers unless the slides 635 are adjusted.

Each of the tripping arms 792 has pivotally connected thereto a bar 794 urged by a spring 795 against the underside of a stud 796 in the corresponding slide 635. The stud 796 normally holds a shoulder 797 on the bar 794 below the path of movement of a bail 798, integral with bail 779, and adapted to be operated therewith.

When the slide 635 is adjusted upwardly the stud 796 moving upwardly therewith permits the spring 795 to rock the bar 794 counterclockwise bringing the shoulder 797 into the path of the tripping bail 798. Now when the bail 798 rocks clockwise, it picks up the bars 794 thrusting them toward the left, to rock the tripping arms 792 clockwise, thus freeing the tails 791 of the hammers to their springs 778 whereupon these springs throw the hammers clockwise to take the impression.

Immediately after the impression is taken, the cam 788 acts to rock the shaft 777 and the bail 779 counterclockwise, restoring the hammers 776 to their normal retracted positions. As the tail 791 passes the shoulder of the tripping arm 792, the springs 795 draw these arms into position in the path of tail 791.

The stud 796 on the slide 635 holds the bars 794 two spaces below their respective tripping positions, so that when the bars move upwardly to position the zero type elements in printing position, these bars will still be ineffective to trip the hammers. The purpose of this arrangement is to prevent the printing of zeros to the left of the highest denominational order wherein is set a significant digit. Each of the tripping arms 792 is provided with a cross-over 799 to the next lower bar 792, so that if the zero is set on a slide 635, to the right of the highest order significant digit, the cross-over 799 of the next higher denominational order tripping arm will rock the tripping arm 792 of the denominational order having the zero set thereon to permit the hammer 796 associated therewith to print the zero.

The record material upon which the impressions are made by the control printer is unwound from a roll 801 (Figs. 1, 26 and 29) and passes between the platen 649 and a guide plate 802. A tension roll 803 mounted on a shaft 804 is spring-pressed against the platen 649 in order that the rotation of said platen may feed the control tape.

The platen 649 is mounted on a shaft 805 supported in the printer frames 773 and 774. Secured to the shaft 805 outside the frame 773 (Fig. 29) is a ratchet 806 with which yieldingly cooperates an aligner 807 pivotally mounted on the frame 773. A projection 808 on a reciprocating feed slide 809 having its left hand end (Fig. 29) operatively connected to an arm 810 fast on the shaft 777 also cooperates with the ratchet 806.

In its normal position the projection 808 is held in engagement with the ratchet 806 by a spring 811 attached to the right hand end of the slide 809. At the proper time during an operation the slide 809 is shifted toward the right removing the projection 808 from engagement with

the ratchet, which is held against retrograde movement by the aligner 307. As soon as the projection 308 clears the ratchet tooth the spring 311 draws the slide 309 upwardly against a stud 312.

After the impression is made the shaft 777 rocks counterclockwise for the purpose of restoring or retracting the discharged hammers 776 as described above. This movement of the shaft 777 through the arm 810 (Fig. 32) draws the slide 309 toward the left. Near the end of its leftward travel the projection 308 engages the next higher ratchet tooth and advances the platen one step to feed the control tape or web one space in readiness to receive the next impression.

An ink ribbon 815 (Figs. 26 and 29) adapted to be wound and unwound from spools 816 and 817 and which is adapted to be interposed between the types 636 and the control tape provides a convenient medium for rendering the impressions legible. Conventional means is provided to feed and reverse the direction of feed of the ribbon.

25 *Compartment indicators (Figs. 18, 26, 30)*

Means is provided to select and print on the control tape a character indicating the particular compartment into which a check is sorted. This mechanism also sets a visible indicator which the operator may read before he depresses the motor release bar 97 to release the machine for a check entering and item entering operation thus being able to check the selected compartment and an individual printer before releasing the machine for operation.

This mechanism is illustrated in Fig. 30 and includes type elements 818 slidably mounted in a vertical slide 819. This slide is guided by the combs 670 and 671 (Fig. 26) which also guide the slides 635. An arm 820 secured to the lower end of the slide 819 carries a roller cooperating with a heart-shaped cam 826 fast on the sorting drum shaft 60 (see Fig. 11).

When the sorting drum is rotated to the selected position the cam 826 is rotated therewith shifting the slide 819 upwardly if necessary to bring the proper one of the type elements 818 to the printing position. The sorting drum remains in the last selected position and is rotated, as previously set forth, in either direction to bring the next selected compartment to position, consequently the slide 819 may be moved upwardly or drop by gravity to correspondingly position the type.

There is also provided an indicator wheel 827 (Figs. 18 and 30) rotatably mounted on a stud projecting from the frame 31. Characters indicating the compartments are engraved or otherwise suitably marked on the periphery of the wheel 827 which is visible through a sight opening 828 adjacent to the opening 543 (Fig. 1). Teeth 829 formed in the left hand edge of the slide 819 mesh with a gear 830 mounted on a stud 831 and connected by a hub to a gear 832 which meshes with a rack 833 on the right hand end of a horizontal slide 834 mounted on studs 835 (Fig. 30) only one of which is shown. A rack 836 (Fig. 30) on the left hand end of the slide 834 meshes with a gear 837 fast to the indicator wheel 827.

The vertical adjustment of the slide 819 is transmitted through the gears 830 and 832 to the horizontal slide 834 correspondingly adjusting the latter, which, in turn, rotates the indicator 827

to position the identifying character corresponding to the selected compartment under the sight opening 828. Thus both the amount set up on the wheels 498 (Fig. 18) and the identification of the selected compartment may be observed and checked before the release bar 97 (Fig. 1) is depressed to enter the check in the compartment and the amount printed by the printing elements 636.

10 *Compartment printers (Figs. 24, 25, 26, 26a, 27, 28, 29, 29a)*

As each check is entered into a selected compartment the amount of the check, in addition to being printed on the control tape as set forth above, is also printed on one of twenty-four compartment tapes located at the rear of the machine. These twenty-four individual printers correspond to the twenty-four compartments in the sorting drum. Each time a selector key 98 (Fig. 1) is depressed to select a compartment the corresponding compartment printer is selected.

These compartment printers are arranged in three vertical rows across the back of the machine and each of the printers is provided with a group of type segments 833 (Figs. 24, 26 and 26a) comprising a plurality of denominational orders. These segments are mounted on a series of shafts 834 mounted in a plurality of vertical frames 835 secured to the rear of the machine. The segments 833 of each denominational order in each vertical group are provided with arms 836 each of which arms is operatively connected to a common link 837 so that when one of said segments 833 is selectively adjusted all segments of that particular order and in the particular vertical group are correspondingly adjusted.

The segments 833 of one group are provided with segmental gears 838 which mesh with segments 839 on the ends of arms 840 of levers 841 pivoted on a shaft 842. These segment gears 838 are connected to the links 837. Springs 843 (Fig. 26a) urge the links 837 downwardly tending to rock the segments 833 counterclockwise and the lever 841 clockwise pressing the other arms 844 of the levers 841 upwardly against studs 845 projecting from the vertical slides 635.

When these slides are adjusted upwardly by the mechanism and for the purpose set forth above, the levers 841 follow under the tension of the springs 843 thus correspondingly adjusting the type segments 833 for the right hand group of printers looking at the front of the machine and which are illustrated in Figs. 26 and 26a.

It may be noted here that the springs 843 (Fig. 26a) and the springs 642 (Fig. 21) previously described operate at different times and are tensioned at different times in order to distribute the work done by the machine and also to distribute the action by the springs. Suppose, for instance, that one denominational order is to be set to "5" under the control of its setup wheel 498 (Fig. 21). As the bail 640 moves counterclockwise the particular rack 575 moves therewith without placing additional tension on the spring 642 associated therewith until said rack is stopped in the "5" position by the stop rod 597 (Fig. 16). Until this occurs the springs 843 (Fig. 26a) which were previously tensioned exert their tension downwardly on the links 837 thus assisting to adjust these links and through the levers 840 assist in adjusting the vertical slides 635. After the rack 575 is stopped the bail 640 continues its invariable excursion tensioning the spring 642.

At the restoring movement, the springs 842 now being under greater tension than they were previously, assist in restoring the bail 640 until said bail picks up the rack. From there on to the home position the bail 640 positively restores the slide 575, vertical slide 635 and the links 837 together with all of the type segments 833 of that particular denominational order, tensioning the springs 843 as the links 837 involved are raised.

In order to adjust the type segments 833 of the remaining two vertical groups of printers one segment of each denominational order for each group is secured to one of the shafts 834. For example the units segment 833 in the lowermost group is fast on the shaft 834u (Fig. 26a) upon which it is mounted. Likewise the units segments 833 for the two other groups mounted on this particular shaft are also fast on said shaft 834u. Now movement of the units link 837 in the vertical group shown in Figs. 26 and 26a by the springs 843 and under control of the units slide 635 sets all of the units segments 833 for this vertical group of printers. This movement is transmitted by the lower shaft 834u to the units segments 833 for the lowermost printers of the two other vertical groups, and, these latter segments being operatively connected to units link 837, set all of the units segments 833 in their respective vertical groups.

It can thus be seen that all of the 24 units type segments 833 are simultaneously and correspondingly adjusted under the control of the previously described setup mechanism.

This applies also to all of the denominational order segments 833, however, since there are ten denominational order segments 833 in each of the 24 groups and eight shafts 834, it is necessary to provide two additional or auxiliary shafts 846 (Fig. 26) and 847 (Fig. 26a) to transmit the movement of these two denominational orders to the two other vertical groups of segments.

The printing mechanisms are all alike and the eight printers of each group are mounted in a removable common frame comprising side plates 848 (Figs. 29 and 29a) and 849 (Figs. 26 and 26a). Referring to Fig. 24, a platen 850 is mounted in a channel bar 851 supported by a pair of arms 852 (only one of which is shown) secured to a shaft 853. This shaft is journaled in the plates 848 and 849, and has secured to one end thereof an arm 854 (Fig. 25). A stud 855 carried by the arm 854 extends across the plane of an arm 856 loosely mounted on the shaft 853, the arm 856 having a strong spring 857 attached thereto which normally holds the arm 856 against a stop block 858 secured to the plate 849.

An arm 859 (Fig. 28) is fast on the other end of the shaft 853 adjacent a lever 860 rotatably mounted on the shaft 853. One arm of the lever 860 pivotally carries a tripping pawl 866 having an ear 867 adapted to be held normally against a shoulder on the lever 860 by a spring 861.

At the proper time during the operation of the machine the lever 860 is rocked clockwise, and, after having travelled a short distance, a projection 868 on the tripping pawl 866 engages the arm 859 and rocks the arm, the shaft 853, arm 854 (Fig. 25), and through the stud 855, the arm 856 clockwise against the tension of the spring 857, until a tail 869 on the tripping pawl 866 (Fig. 28) strikes a stud 870 projecting from the frame 848. When this occurs the lever 860 continues its travel rocking the pawl 866 counterclockwise past the arm 859.

As soon as the arm 859 is free of the pro-

jection 868 the spring 857 (Fig. 25) throws the arms 856, 854, shaft 853 and the platen 850 (Fig. 24) sharply counterclockwise. The arm 856 strikes and is arrested by the stop block 858 but the momentum of the hammer carries the platen against the types on the segments 833 to take the impressions therefrom. A spring 871 (Fig. 25) restores and holds the stud 855 against the arm 856 in which position the platen is clear of the type segments.

On the return stroke of the lever 860 the projection 868 on the pawl 866 (Fig. 28) wipes by the end of the arm 859 whereupon the spring 861 restores it to normal position.

The impressions are taken on a tape or web 873 (Fig. 28) which is unwound from a supply roll 874 supported between the plates 848 and 849. The tape passes around the shaft 853 and then between a feed roller 875 and a tension roller 876. After leaving these rollers the tape passes rearwardly over a plate 877 the rear edge of which is serrated, so that the tape may be torn off to accompany the group of checks taken from the corresponding compartment.

The feed roller 875 is mounted on a shaft 878 journaled in the plates 848 and 849, and has secured thereto a ratchet 879 (Fig. 27) which co-operates with a feed pawl 880 pivotally carried by an arm 881 pivoted on the shaft 853. A stud 882 on the arm 881 is embraced by a bifurcated arm 883 fast on a shaft 884 mounted in the plates 848 and 849. A link 885 (Fig. 28) connects an arm 886 fast on the shaft 884, to the other arm 889 of the lever 860.

Now when the lever 860 is rocked clockwise to retract and then to trip the hammer, through the connection 885 it rocks the arm 886, shaft 884 and arm 883 (Fig. 27) also clockwise. This movement rocks the arm 881 counterclockwise. This movement rocks the arm 881 counterclockwise to advance the feed roll 875 (Fig. 28) one step. A spring 887 (Fig. 27) maintains the feed pawl 880 in cooperative relationship with the ratchet 879.

The restoring movement of the lever 860 (Fig. 28) under the influence of a spring 888, reverses the movement of the arm 881 to retract the pawl 880. A retaining pawl 889 (Fig. 27) under spring tension cooperates with the ratchet 879 to prevent retrograde movement thereof.

It was stated above that there are three printer frames each comprising plates 848 and 849. Each of these frames is joined near its upper end by a rod 890 (Fig. 26) and near its lower end by a rod 891 (Fig. 26a) and each of these frames is removably supported in the machine in the following described manner.

A rod 892 (Fig. 26a) joins the lower ends of the frames 835 and open slots 893 in the frames 848 and 849 are adapted to be seated over the rod 892 thus supporting the printing frame. Pivotally mounted on a rod 894 (Fig. 26) joining the upper ends of the frames 835 is a latch comprising a pair of arms 895 (Fig. 29) and 896 (Fig. 26) joined by a rod 897 and urged clockwise into engagement with the rod 890 by a spring 898.

When it is desired to remove one of the printer frames the operator first rocks the latch 895-896 free of the rod 890 and by grasping the latter may rock the entire printer frame clockwise about the rod 892 (Fig. 26a) whereupon the frame may be lifted from the machine.

An ink ribbon 899 (Figs. 26 and 26a) is provided for each group of eight compartment printers. This ribbon is adapted to be wound and unwound on spools 900 and 901 (Figs. 26 and 26a re-

spectively). The ribbon 899 passes around guide rollers 906 and 907 and thence between the groups of type segments 833 of the corresponding printing mechanisms.

5 The spools 900 and 901 are mounted on shafts 908 and 909 supported in the frames 835, each of said shafts having three ribbon spools mounted thereon, one for each group of printers. As the shafts 908 and 909 are rotated all three ribbons are fed simultaneously past their respective groups of type segments.

10 In order to rotate the shafts 908 and 909 and their corresponding ribbon spools the shafts are provided with ratchet feed pawls 910 and 911 respectively with which ratchet feed pawls 912 and 913 (Figs. 29 and 29a) carried at opposite ends of a vertical feed bar 914 cooperate. The bifurcated end of a slide 915 (Fig. 29a) embraces a stud 915a projecting from a bar 914 and the opposite end of said slide is bifurcated to straddle a shaft 916. A stud 917 on an arm 918 pivoted on the shaft 916 projects into an opening 919 in the slide 915 the left hand wall of said opening being pressed against the stud 917 by a spring 920. A stud 921 carried by the arm 918 projects into a cam slot 922 in a cam arm 923 fast on a shaft 924.

20 During an operation of the machine the cam arm 923 receives an oscillatory movement first clockwise and then counterclockwise to normal. At this movement the cam slot 922 rocks the arm 918, and through the stud 917, the slide 915 counterclockwise first raising the ribbon feed link 914 and then lowering said link to normal position. At the upward movement of the bar 914 the feed pawl 912 rotates the ratchet 910, the shaft 908 and the ribbon spools 911 to unwind the three ink ribbons 899 from the spools 901 and wind said ribbons on the spools 900. When the ribbons are unwound from the spools 901 the pawl 912 is unable to operate the ratchet 910 thus restraining the bar 914 against upward movement. When this condition obtains the stud 917, upon counterclockwise movement of the arm 918 shifts the slide 915 leftward against the tension of the spring 920, which spring restores the slide 915 as soon as the stud 917 has passed the hump in the left wall of the opening 919. Now when the cam arm 923 rocks counterclockwise to normal rocking the arm 918 clockwise, the slide 915 is rocked clockwise to lower the bar 914. At this movement of the bar 914 the pawl 913 cooperates with the ratchet 911 to wind the ink ribbons on the lower spools.

Compartment printer selection (Figs. 28, 30, 31)

55 Only one of the twenty-four compartment printers is operated during an operation of the machine. The particular printer to be operated is selected under the control of the compartment selecting and compartment totalizer selecting mechanism. This mechanism includes three selector bars 925, 926 and 927 (Fig. 30) slidable vertically alongside each bank of printers. Each of the selector bars has two elongated slots 928 and 929 therein (see also Figs. 29 and 29a), the slot 928 surrounding a stud 930 carried on the upper end of a lever 931 pivotally supported on the frame 835. The slot 925 (Fig. 29a) embraces a stud 932 on the lower end of a lever 933 also pivotally supported on the frame 835. A stud 934 carried by the upper arm of the lever 933 projects through a cam slot 935 in a cam arm 936 fast on the shaft 924 and also extends through a hole in the lower end of the lever 931.

75 In order to effect a selection of one of the

compartment printers it is necessary that the selector bars 925, 926 and 927 be shifted vertically to bring the proper one of a series of ears 937 (Figs. 28 and 30) bent at right angles to the bars into cooperative relation with a flattened stud 938 connecting the link 885 to the arms 939 of the lever 860 (Fig. 28) of the selected printer. The arrangement of the selector bars 925, 926 and 927 is such that bar 925 completes its selecting movement before bar 926 commences its movement. Bar 926 then completes its selecting movement and following this the bar 927 is adjusted.

15 The bars 925, 926 and 927 are adjusted under the control of the selector keys 98 (Fig. 1) which it will be recalled control the selection of the sorting compartments.

Referring to Fig. 30 it will be remembered that the heart-shaped cam 826 is secured to the shaft 60 and rotates therewith to a position corresponding to the selected compartment, adjusting the slide 819 correspondingly to set an indicator 827 and type elements 818 to indicate and print character designating the particular compartment selected. The cam 826 does not make a complete rotation at each selecting operation but is adjusted from the last selected position to the newly selected position. This movement is transmitted through the slide 819 to correspondingly adjust the bars 925, 926 and 927 by the following described mechanism.

35 Secured to the side of the slide 819 is a slotted plate or block 940 embracing a stud 946 projecting from the free end of an arm 947 fast on a shaft 948 suitably supported in the machine. Also secured to the shaft 948 is a finger 949 (see also Fig. 29) upon the upwardly turned tip of which rests an angular bracket 950 secured to the side of the selector bar 925. A spring 951 urges the finger 949, shaft 948 and arm 947 counterclockwise pressing the slide 819 downwardly to maintain the roller on the arm 820 in contact with the cam 826.

45 The bars 926 and 927 are provided with brackets 952 and 953 respectively which rest on the ends of fingers 954 and 955 free on the shaft 948 and which fingers are held in this uppermost position by springs 956 and 957. An arm 958 fast on the shaft 948 adjacent to the finger 954 carries at its free end an ear bent at right angles to the arm 958, said ear projecting across the plane of the fingers 954. Likewise an arm 959 also fast on the shaft 948 has an ear at its free end extending across the plane of the fingers 955.

55 Reference to Fig. 30 discloses that the arm 958 is spaced radially from the finger 954 a given distance and that the arm 959 is spaced radially a greater distance from its associated finger 955.

60 When the sorting drum is rotated in either direction from the position in which the shaft 60 and cam 826 are shown in Fig. 30, the slide 819 travels upwardly rocking the arm 947, shaft 948 and the finger 949 clockwise to lower the bar 925. Assuming that the cam 826 turns 180°, the slide 819 will be raised to its extreme uppermost position rocking the arm 947, shaft 948, finger 949 and the arms 958 and 959 clockwise to their extreme positions. As the finger 949 rotates clockwise it lowers the bar 925 until said bar comes to rest on its guide studs 930 and 932 (Figs. 29 and 29a respectively). At this time the arm 958 contacts with the fingers 954 rocking this finger clockwise and lowering the bar 926 until the latter rests on its guide studs. At this time in the movement of the shaft 948 the arm 959 picks up the 75

finger 955 and rocks it clockwise to position the proper one of the ears 937 on the bar 927 opposite the stud 938 (Fig. 28) of the printer to be operated.

Obviously if the sorting drum is rotated to any point or position intermediate to the position in which the cam 926 appears in Fig. 30, and the position just described, that is 180° in either direction from the position illustrated in Fig. 30, the shaft 948 will receive a corresponding movement and will position an ear 934 on any one of the bars 925, 926 or 927 but on one of said bars only, opposite the stud 938 associated with the printer which corresponds to the selected compartment.

After the selector bars 925, 926 and 927 have been adjusted, as set forth above, all three bars are simultaneously moved toward the right (Figs. 29, 29a and 30) for the purpose of operating the selected printer. This movement is effected by rocking the cam arm 936 (Fig. 29a) clockwise at which movement the cam slot 935 in said arm acting on the stud 934 rocks the lever 931 clockwise and the lever 933 for each bank of printers counterclockwise. Thus the selected bars are shifted in a parallel movement toward the printers and the particular ear 937 which was positioned opposite a stud 938 moves this stud toward the right (Fig. 28), rocking the lever 960 clockwise to effect the printing and paper feeding operations in the manner previously described.

As soon as the printing has occurred the cam arm 936 is restored counterclockwise to normal retracting the selector bars 925, 926 and 927 permitting the spring 888 (Fig. 28) to restore the hammers actuating mechanism to normal.

The mechanism for operating the cam arm 936 (Fig. 29a) is best shown in Figs. 29a and 31. An arm 960 secured to the shaft 924, to which the cam arm 936 is secured, is pivotally connected to a link 961 carrying a stud 962 at its opposite end (Fig. 31) projecting into an arm 964 pivoted on a stud 965. Another arm 966 also pivoted on the stud 965 and secured to the arm 964 has an open slot in its free end embracing a stud carried by an arm 967 pivotally mounted on the stud 930. An anti-friction roller 968 carried by the arm 967 projects into a cam groove 969 in the cam 754 fast on the cam shaft 94.

After the proper compartment, and compartment printer have been selected under the control of the selector keys 98 (Fig. 1) and the amount to be entered has been set on the setup wheels 498 (Fig. 18) under the control of the amount keys 110 (Fig. 1) the release bar 97 is depressed, whereupon the cam shaft 94, as fully described above, is caused to make one complete counterclockwise rotation (Fig. 9) during which rotation the cam 970 (Fig. 31) rocks the arm 967 first clockwise and then counterclockwise to normal.

This rocks the arms 966—964 first counterclockwise to draw the link 961 toward the left and then clockwise to return the link toward the right to normal position. The movement of the link 961 (referring now to Fig. 29a) effects the oscillation of arm 960, shaft 924, the ribbon feed cam arm 923 and the printer operating cam arm 936 to operate the selected printer hammer, feed the selected record material and to feed the ribbon.

The cam 970 (Fig. 31) during the latter part of its rotation reverses the movements of the parts just described to restore said parts to their normal positions.

Exhausted compartment tape signal (Figs. 14, 32)

It is desirable to lock up the machine and to signal the operator when any one of the rolls 874 of compartment tape (see Figs. 26, 26a, 28, 29 and 29a) is exhausted.

This is accomplished by closing contacts 1197 and 1198 (Figs. 14 and 32). Closing of contacts 1197 lights a lamp 1199 by closing a circuit from line 162, wire 424, contacts 1197, lamp 1199, wire 198 to line 163. The lamp will remain lighted until the exhausted roll 874 is replaced by a fresh roll.

Closing of contacts 1198 sets up a circuit from line 163, wire 424, contacts 1198, wire 430, release bar magnets 431, wires 197 and 198 to line 163. This energizes the magnets 431 to lock the release bar against operation as described above.

The mechanism for closing the contacts 1197 and 1198 when any one of the 24 rolls 874 is exhausted will now be described. Referring to Fig. 32 associated with each of the 24 rolls 874 is a follower finger 1200 integral with a yoke 1201 pivoted on a rod 1202 supported by the plate 877. A spring 1203 coiled about the rod 1202, having one end hooked over the yoke 1201 and the other end anchored in a projection of the plate 877 urges the finger 1200 into contact with the circumference of the paper roll 874. An arm 1204 integral with the yoke 1201 is adapted to cooperate with a shoulder 1205 in the edge of a vertically disposed slide 1206 slidably mounted on studs 1207 projecting from the printer frame 848.

As the paper is unwound from the roll 874 the finger 1200 follows in a counterclockwise direction under the influence of spring 1203 bringing the arm 1204 gradually closer to the shoulder 1205, and finally when the paper is nearly exhausted the arm 1204 lowers the slide 1206. As the slide 1206 moves downwardly a stud 1208 on the lower end thereof strikes and rocks clockwise an arm 1209 fast on a shaft 1210.

Also fast on the shaft 1210 is an arm 1211 which is rocked with the shaft to release an arm 1212 to the action of its spring 1213, the arm 1212 being secured to a shaft 1214 to which is also secured an arm 1215. At its lower end the arm 1215 carries a block 1216 of insulating material.

Each of the three banks of printers is provided with a slide 1206 and an arm 1209 fast on shaft 1210 is provided to cooperate with said slides, consequently when any one of the 24 paper rolls 874 is exhausted and its associated arm 1240 lowers slide 1206 the shaft 1210 is rocked to release arm 1212 whereupon spring 1213 immediately rocks the arms 1212 and 1215 clockwise closing contacts 1197 and 1198.

An arm 1217 integral with the yoke 1201 embraces the end of the roll 874 to hold said roll in place. An arm 1218 integral with the arm 1204 and the yoke 1201 forms a convenient medium for manually rocking the assembly 1200—1217—1204 clockwise to permit restoration of the slide 1206 and to permit insertion of a new roll of paper. In order to replace the exhausted paper roll it is necessary to release the printer frame 848—849 containing the exhausted roll and swing said frame outwardly. This outward or clockwise movement of the frame about the rod 892 effects restoration of the arm 1212. When this arm was tripped and rocked clockwise to close the contacts its movement was limited by an ear 1219 on an arm 1220 fast on the shaft 1214 striking a finger 1221 free on the shaft 1214 and urged counterclockwise against a stud 1222 in the frame 848 by a spring 1223.

Now when the frame 848—849 is rocked clockwise to insert a new roll of paper the stud 1222 travels in an arcuate path, the finger 1221 following under the influence of its spring 1223. The spring 1223 being stronger than spring 1213 rocks the finger 1221, arm 1220, shaft 1214, arms 1212 and 1215 counterclockwise past normal position. A new roll of paper is inserted in place of the exhausted one which permits the slide 1206 to shift upwardly whereupon arm 1209 and 1211 rock counterclockwise under the influence of spring 1213 until arm 1211 rests on the end of the now restored arm 1212.

The frame 848—849 is now rocked counterclockwise and latched in its operative position, the stud 1222 rocking the finger 1221 clockwise allowing the spring 1213 to rock the arm 1212 clockwise against the shoulder on arm 1211.

It is to be understood that there are three of the arms 1209 fast on shaft 1210, one associated with each of the three printer banks any one of which may be operated by exhaustion of any roll 874 in its associated bank to trip arm 1212. Likewise three fingers 1221 and three arms 1220 are provided, one for each bank of printers. When the arm 1212 is tripped and rocked clockwise all three of the arms 1220 come into proximity to these fingers 1221 so that any finger operated will restore arm 1212 and arm 1215.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a machine of the class described, the combination with a plurality of sets of denominationally ordered printing segments, there being several rows, and each row comprising several sets of printing segments, of means for connecting the printing segments of the same denominational order in each row, and cross-over connections comprising shafts on which said printing segments are mounted, each connecting a printing segment of the same denominational order in each of the several rows.

2. In a machine of the class described, in combination, a plurality of sets of individual record strip printing devices, and sets of type therefor, a plurality of record strip printing device selecting bars, each bar carrying differentially spaced projecting elements whereby only one element at a time is cooperatively associated with an element of one of said record strip printing devices, means for causing a selected projecting element of a bar to be operatively associated with a related element of the selected record strip printing device, and means for moving the selected element of the bar to effect by the element of the selected record strip printing device an impression from the set of type of the selected record strip printing device.

3. In a combined printing and sorting machine, the combination with a carrier provided with a plurality of sorting compartments, means for supporting a plurality of record strip printing devices, each provided with a series of type, means for simultaneously setting all of said series of type to represent an item on a record to be sorted, means for selecting a sorting compartment in

accordance with the classification of the record to be sorted, and means controlled by said carrier for selecting the series of type related to the selected compartment to print on the correlated record strip the value of the item.

4. In a combined printing and sorting machine, in combination, a movable carrier provided with a series of record sorting compartments, a plurality of record strip printing devices, one for each sorting compartment and mounted separately from the carrier, and means for causing the printing of an amount represented by a record to be sorted on a printing medium of the record strip printing device corresponding to the sorting compartment receiving the record, the last named means adapted to be adjusted under control of said carrier for selecting a record strip printing device in accordance with the position of said carrier.

5. In a combined printing and sorting machine, in combination, a series of sorting compartments, a plurality of rows of record strip printing devices, means for printing an amount on a strip of the record strip printing device corresponding to the sorting compartment selected, a plurality of keys, one for each sorting compartment, and means whereby each key selects a corresponding sorting compartment, a row of the record strip printing devices and the record strip printing device in the selected row which is related to the sorting compartment selected.

6. In a combined printing and record sorting machine, a movable carrier carrying a plurality of record sorting compartments, a plurality of rows of record strip printing devices, a plurality of keys, one for each sorting compartment, means whereby each key causes a predetermined movement of said carrier to select a record sorting compartment, and means on said carrier adapted to select a desired row of record strip printing devices and a selected record strip printing device in the selected row.

7. In a machine for printing amounts in classified groups, a plurality of rows of record strip printing devices, a plurality of keys, one for each record strip printing device, and means whereby the operation of each key selects a row of record strip printing devices and the particular record strip device corresponding to the key operated.

8. In a machine for printing items in classified groups comprising a plurality of record strip printing devices, a corresponding number of groups of item printing elements, means for simultaneously setting all of said groups of printing elements, a plurality of keys, one for each group of item printing elements, and means including electrical controlling means controlled by said keys whereby each key causes the printing from a related group of item printing elements.

9. In a machine of the class described, in combination, a plurality of record strip printing platens movable with respect to a record strip, a corresponding number of groups of commensurately set item printing elements, operating means for effecting the movement of said platens to first contact with the record strip and then impress the record strip against the printing elements to print from the related group of item printing elements, a plurality of keys, one for each printing platen and related group of item printing elements, and means whereby each key causes said operating means to effect the movement of the related platen to print from the associated group of printing elements.

10. In a combined record sorting and printing

machine, in combination, a plurality of record sorting compartments, a corresponding number of record strip printing devices, means for feeding a record to a selected compartment and for printing the item corresponding to the record on a paper strip of the related record strip printing device, means for selecting a sorting compartment and related record strip printing device, and means controlled by the records in the sorting compartments and operable when any sorting compartment is filled to capacity for preventing the subsequent operation of said selecting means.

11. In a machine of the class described, in combination, a plurality of rows of record strip printing devices, each row including a plurality of rolls of record strips, a single machine controlling means, and means whereby the roll of any row of record strip printing devices commonly controls the operation of the single machine controlling means.

12. In a machine of the class described, in combination, a plurality of rows of record strip rolls, each row of record strip rolls being carried by a frame detachable from the machine, machine controlling devices, means whereby the exhaustion of a record strip determined by the decrease in size of the related roll causes the operation of the machine controlling devices from a normal position, and means whereby the replacement of the exhausted record strip roll by a roll of a normal size and the re-attachment of its frame causes the restoration of the machine controlling device to normal position.

13. In a machine for sorting records and printing items in groups, record sorting compartments, means for printing items represented by the records sorted in classified groups, manually operable means for controlling the operation of the printing means, and means controlled by records deposited in said compartments for preventing the operation of the manually operable means when any sorting compartment is filled with records to substantially its capacity.

14. In a machine for sorting records and printing items in groups, record sorting compartments, a plurality of record strip printing devices and means for printing items represented by the records in classified groups by said record strip printing devices, means for feeding records to said sorting compartments, manually operable means for causing the operation of the printing means and the record feeding means, means for preventing the operation of the manually operable means when any sorting compartment is filled with records to substantially its capacity, and for preventing the operation of the manually operable means when a record strip of any record strip printing device is exhausted.

15. In a machine of the class described, the combination with a plurality of record strip printing devices each for printing upon a record strip, means for effecting the printing of items by said record strip printing devices, manually operable means for causing the operation of the printing means, means for locking said manually operable means when any record strip is exhausted, and means for accordingly giving a signal to the operator as a warning of this condition.

16. In a machine of the class described, a rotatable sorting drum carrying record receiving sorting compartments, selecting means operable to effect the rotation of said drum in either direction to select a compartment by the shorter of the two possible directions, a plurality of record

strip printing devices, and means whereby said drum in either direction of movement selects a related record strip printing device.

17. In a combined sorting and printing machine, a series of record sorting compartments, a plurality of record strip printing devices, means for selecting a record sorting compartment and a related record strip printing device, and means controlled by the slips sorted in a sorting compartment for preventing the operation of the selecting means when any sorting compartment is filled substantially to its capacity.

18. In a machine of the class described, in combination, a plurality of record strip printing platens around which pass record strips, a corresponding number of record strip feeding devices to shift the record strip over the platen operated, a corresponding number of groups of commensurately set item printing elements, operating means, a plurality of selecting devices, one for each printing platen and related group of item printing elements, and means whereby each selecting device causes said operating means to operate the related platen to print from the associated group of printing elements and causes the operation of the record strip feeding device related to the platen operated.

19. In a machine of the class described, in combination, means for printing items in classified groups upon a plurality of record strips drawn from separate rolls, a plurality of means for causing line spacing operations for the record strips, and means responsive to the exhaustion of any record strip for preventing the subsequent operation of all of the line spacing means for said record strips.

20. In a machine of the class described, in combination, a row of record strip rolls, a frame detachable from the machine carrying said rolls, a machine controlling device, means responsive to the exhaustion of any record strip for causing the machine controlling device to be effective, and means operable in response to the detachment of said frame for causing the machine controlling device to be ineffective.

21. In a machine of the class described, in combination, a plurality of record sorting compartments, a corresponding number of record strip printing devices, means for feeding the records to the compartments and means for printing items in groups on record strips according to the sorting of the records representing the items, and electrically operated means responsive to the exhaustion of any record strip for preventing the operation of the record feeding means.

22. In a machine of the class described, in combination, a plurality of record sorting compartments, a corresponding number of record strip printing devices, means for feeding the records to the compartments and means for printing items in groups on record strips according to the sorting of the records representing the items, means for initiating the operation of said feeding means and said printing means, and electrically-operated means responsive to the exhaustion of any record strip for disabling said initiating means for preventing the operation of the record feeding means and the record strip printing means.

23. In a machine of the class described, in combination, a plurality of record strip printing devices and a corresponding number of record sorting compartments, means for printing items in groups upon record strips and means for feeding records representing the items in said compart-

ments, an operation controlling device for the last named feeding means, means for causing the operation controlling device to be operable in response to the exhaustion of a record strip and means for causing said operation controlling device to be operable in response to a sorting compartment being filled substantially to capacity.

24. In a machine of the class described, in combination, a plurality of record strip printing devices and a corresponding number of sorting compartments, means for selecting the record strip printing devices and the corresponding sorting compartments, means for printing items in groups upon record strips and means for feeding records representing the items in said compartments, an operation controlling device for both of the last named means, an operation controlling device for the selecting means, means responsive to the exhaustion of a record strip and means responsive to a record sorting compartment being filled substantially to capacity for causing the first named device to be operable, and means responsive to a sorting compartment being filled substantially to capacity for causing the second named device to be operable.

25. In a machine of the class described, the combination with a movable carrier carrying record sorting compartments arranged to be selected by a certain movement of the carrier, of a plurality of record strip printing devices mounted apart from said carrier, an individual line spacing device for each of said record strip printing devices, and means rotatable with said carrier for controlling means for selecting for operation the line spacing device correlated with a selected record strip printing device.

26. In a machine of the class described, the combination with a movable carrier carrying record sorting compartments arranged to be selected by a certain movement of the carrier, of a plurality of record strip printing devices mounted apart from said carrier, individual printing platens for said record strip printing devices, and means rotatable with said carrier for controlling means for selecting for operation the platen correlated with a selected carrier strip printing device.

27. In a machine of the class described, in combination, a movable carrier carrying record sorting compartments arranged to be selected by a certain movement of the carrier, a plurality of record strip printing devices including individual platens and individual line spacing devices for record strips, an individual set of item printing type for each record strip printing device, means for simultaneously setting said sets of type, and means rotatable with said carrier for controlling means for selecting for operation the line spacing device of a selected record strip printing device and a correlated platen for printing from the associated set of type.

28. In a machine of the class described, in combination, a plurality of rows of record strip printing devices each having an individual platen, selecting means for said record strip printing devices comprising individually operated keys, one for each record strip printing device and means

controlled by said keys for selecting a row of record strip printing devices and a particular record strip printing device and a correlated platen in the selected row.

29. In a machine of the class described, in combination, a plurality of rows of record strip printing devices, an individual set of item printing type for each record strip printing device, means for simultaneously setting said sets of type, and means causing the printing from a selected set of type upon a record strip of a particular record strip printing device in a selected row.

30. In a machine of the class described, in combination, a plurality of sets of item printing type carriers arranged in separate groups, means for simultaneously setting the plurality of sets of item type carriers, and means for selecting a group of type carriers and a particular set in the selected group for a printing operation therefrom.

31. In a machine of the class described, in combination, a plurality of sets of item type carriers arranged in separate groups, an individual printing platen for each set of item type carriers also arranged in separate groups, means for simultaneously setting a plurality of sets of type carriers, and means for selecting for operation a group of platens and a platen of the selected group.

32. In a machine of the class described, in combination, a plurality of rows of platens, a platen actuating device common thereto, and manipulative devices each operable to select a row of platens and a platen in the selected row to be actuated by said platen actuating device.

33. In a machine of the class described, in combination, means for printing items in classified groups upon a plurality of record strips drawn from separate rolls, stationary means for carrying said separate rolls, means for selecting said rolls while the latter are stationary, means responsive to the exhaustion of any record strip, and means controlled by said last named means for preventing the operation of the printing means for preventing printing upon all of said record strips.

34. In a machine of the class described, in combination, a movable carrier provided with a plurality of compartments, a plurality of sets of record strip printing devices, means for effecting a predetermined movement of said carrier to select a compartment, and selecting means including a plurality of bars moved under control of said carrier and constructed so as to cause the selection of one of said record strip printing devices related to the selected compartment.

35. In a machine for printing items in classified groups, a plurality of record strip printing devices comprising a corresponding number of groups of item printing elements, means for simultaneously setting of all of said groups of printing elements, a plurality of keys, one for each group of item printing elements, and selecting means including electrical control means controlled by said keys for causing printing from selected groups of item printing elements.

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