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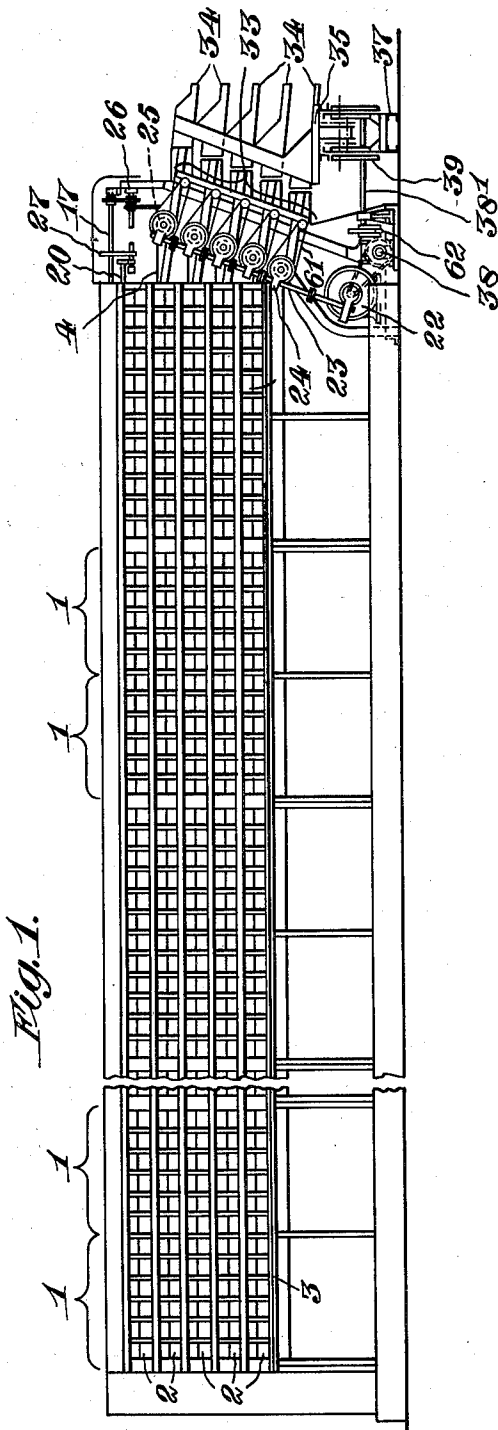
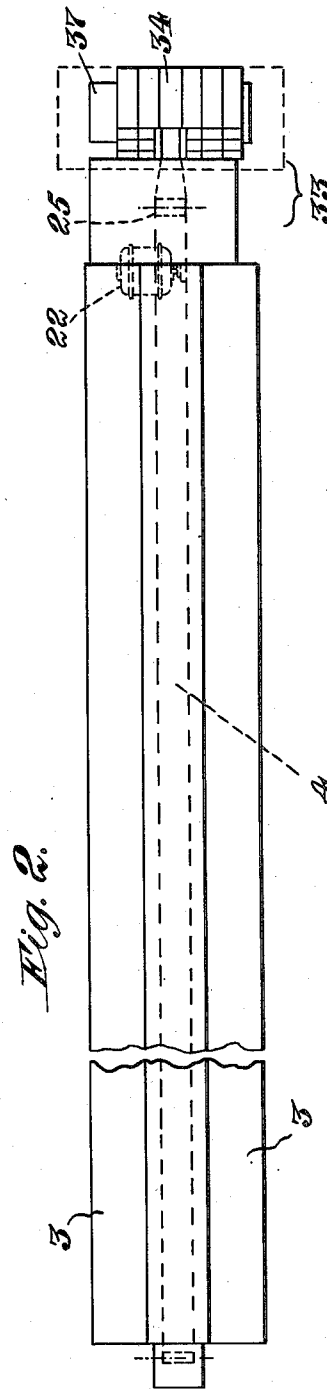
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2,046,935

SORTING AND COLLATING APPARATUS

Filed July 2, 1935

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

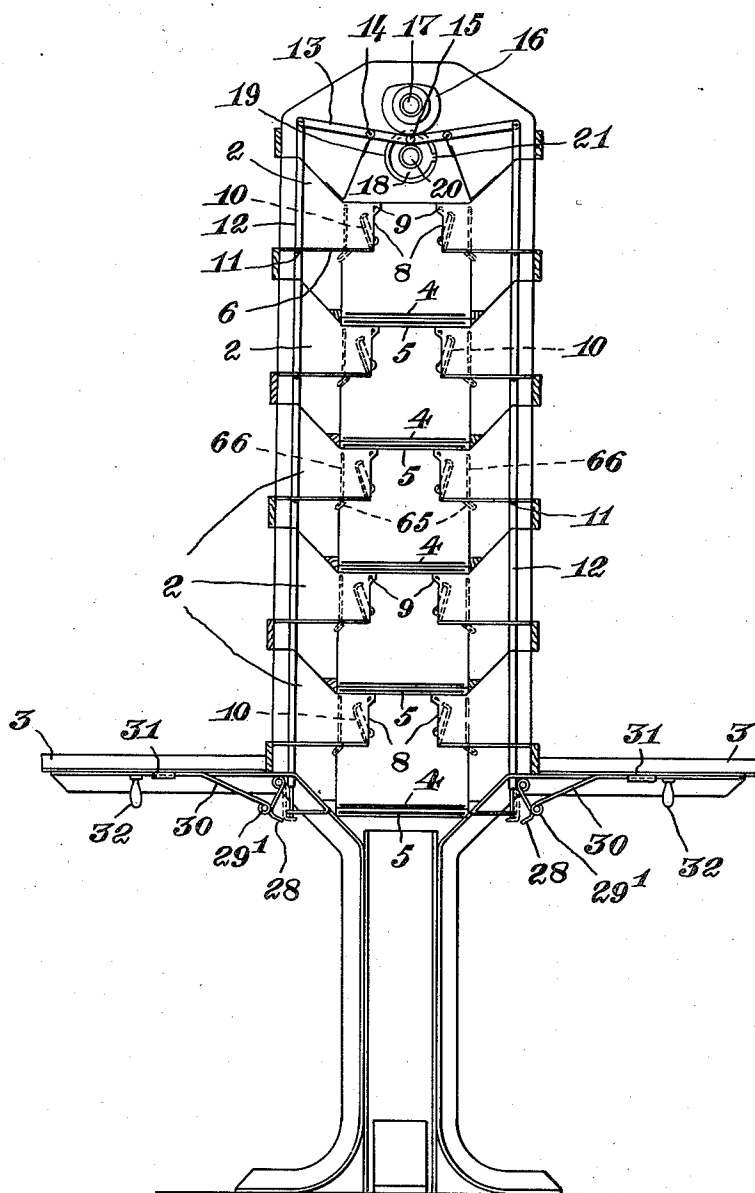
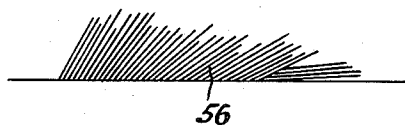


Fig. 9.

Fig. 3.



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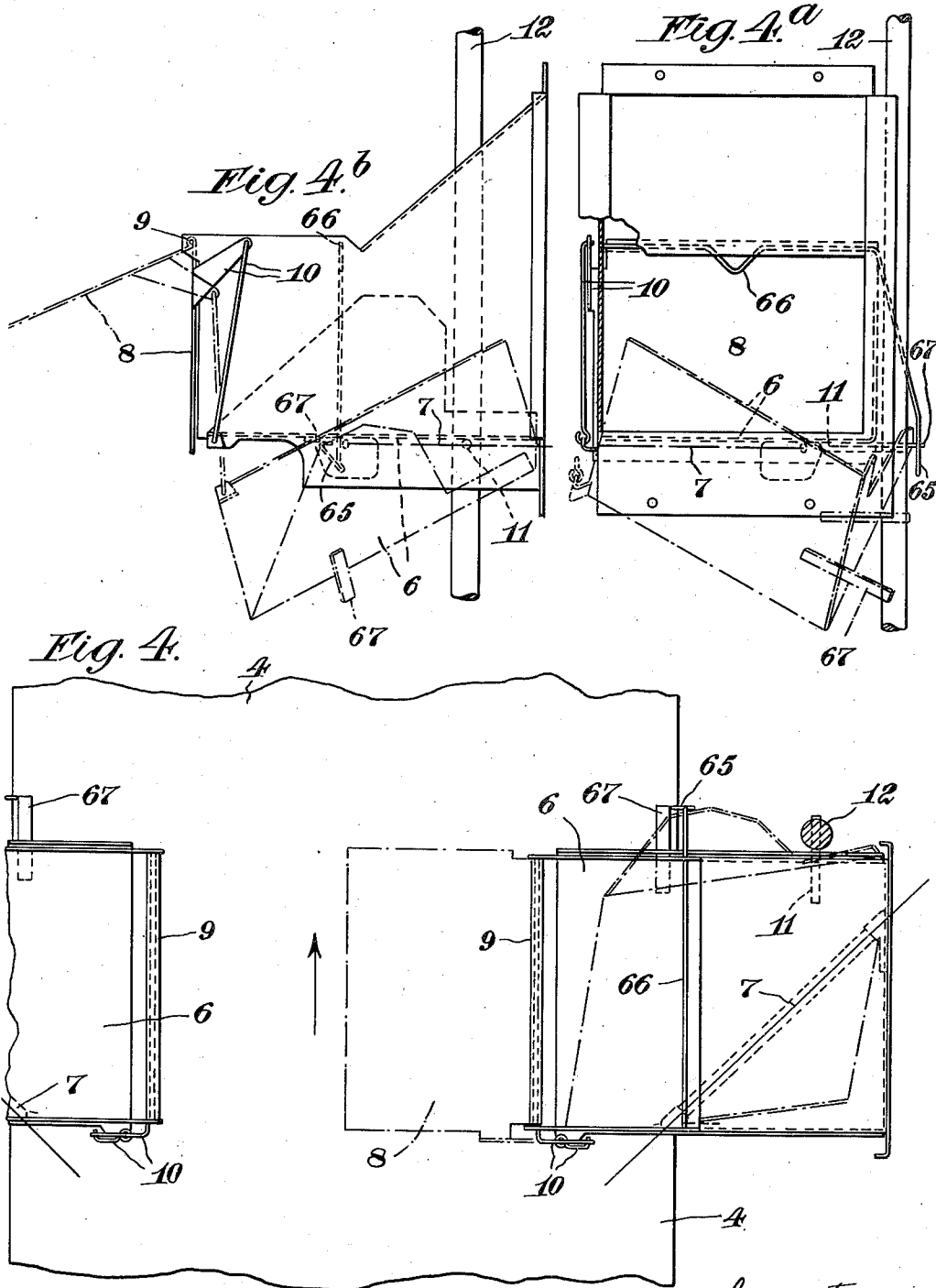
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5 Sheets-Sheet 3



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SORTING AND COLLATING APPARATUS

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5 Sheets-Sheet 4

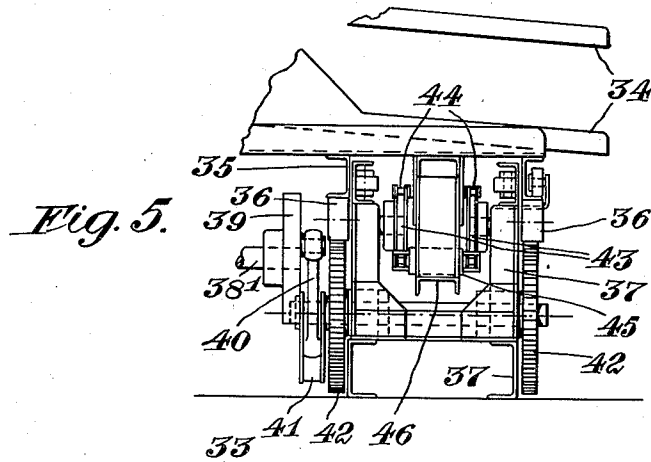
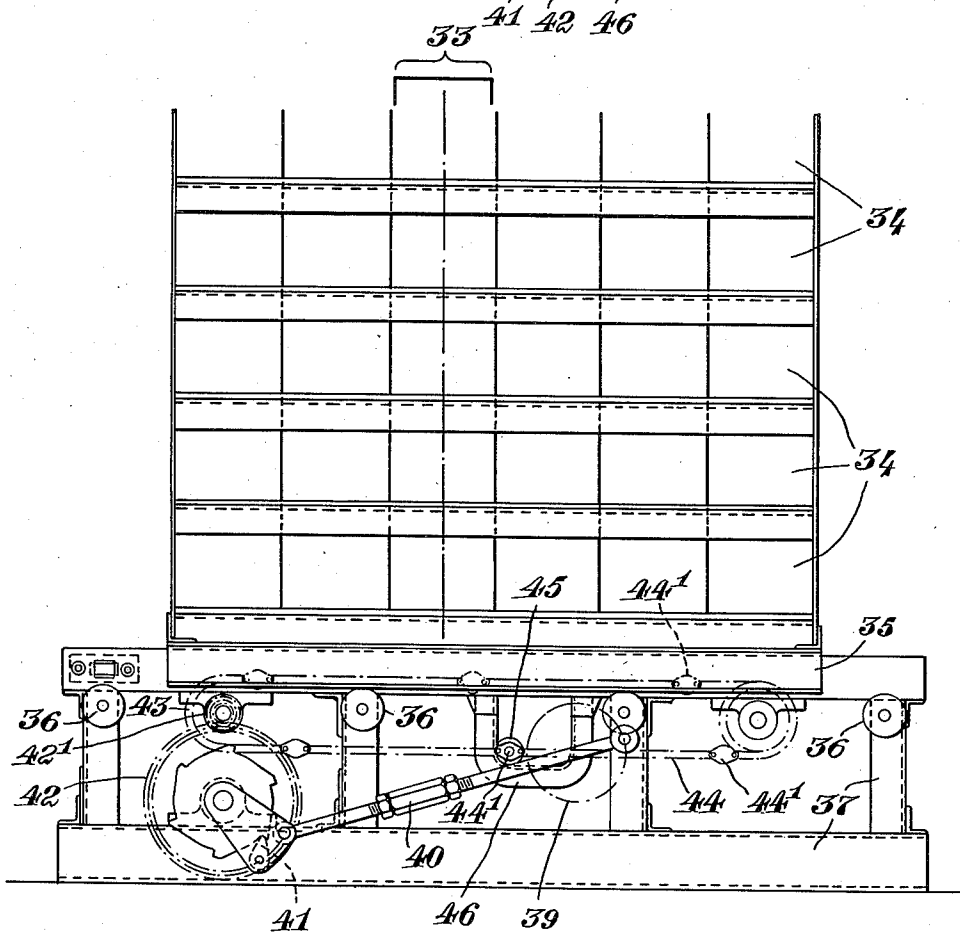


Fig. 6.

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5 Sheets-Sheet 5

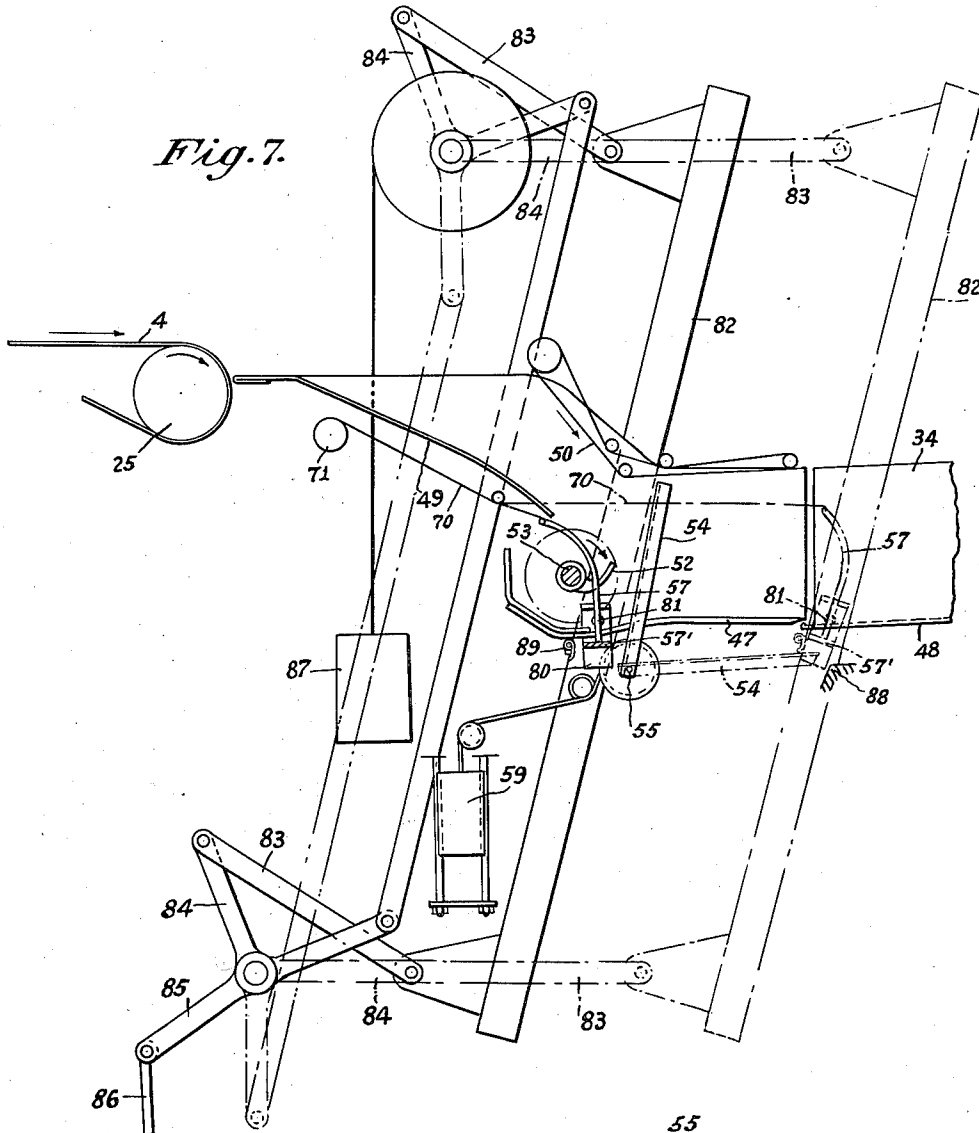
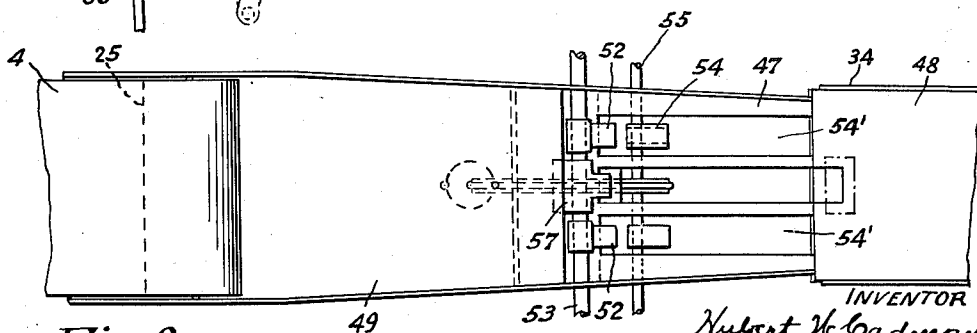


Fig. 8.

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UNITED STATES PATENT OFFICE

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SORTING AND COLLATING APPARATUS

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9 Claims. (Cl. 214—11)

This invention concerns improvements in and relating to sorting and collating apparatus for letters, other postal matter or the like, hereinafter referred to as letters. Proposals have already been made to devise sorting apparatus which is cleared mechanically, but these proposals have proved to be open to various serious objections. In particular, the apparatus required too much space, the space occupied by the collating and stacking part thereof being, moreover, out of all proportion to the useful sorting space. In addition the apparatus was excessively complicated and required considerable power for its operation. Finally, if the sorting apparatus became out of order, it was difficult or impossible to continue to use the same and to clear it manually. The principal object of the invention is to provide an efficient sorting and collating apparatus which is free from the disadvantages mentioned above.

Sorting compartments are commonly arranged in extended rows. Such a row in this specification is termed a range. Each range is conveniently divided up into a series of similar groups, e. g. one per sorter, in each of which the same sorting selections are repeated. The compartments with the same selections form what is termed, in this specification, a set. Where there are several such ranges in the form of a bank, this bank will thus consist of several sorting stations, e. g. one per sorter, each of which will comprise several superimposed groups of sorting compartments. Preferably banks of sorting stations are disposed back to back and it is a further object of the invention to provide for common conveyors to serve corresponding back-to-back ranges of compartments.

A further object of the invention is to overcome various difficulties which arise in connection with the use of a stacker in sorting apparatus: In the first place the stacker may have to stack deliveries of largely different numbers of letters which may arrive singly or in irregular piles. In the second place, the usual back support commonly provided in stackers for similar purposes is an obstacle to the automatic ejection of the letters from the stacker.

One embodiment of the invention by way of example will now be described with reference to the accompanying drawings in which:—

Fig. 1 is a front elevation of a complete sorting and collating apparatus. Fig. 2 is a plan view thereof. Fig. 3 is a cross-section through the sorting apparatus to a larger scale. Figs. 4, 4a, and 4b are a plan view and front and side

elevations of a detail. Fig. 5 is a side elevation of part of the collating or stacking apparatus to a larger scale. Fig. 6 is an end view of the collating or stacking apparatus. Fig. 7 is a cross-section of the stacking means. Fig. 8 is a plan view thereof, and Fig. 9 is a diagram illustrating the shape of the stack in side elevation.

In the example illustrated, the sorting apparatus (Figs. 1-4b) consists of a bank of sorting stations, for ten sorters, similar in external appearance to a manually cleared apparatus, that is each sorting station 1 comprises sorting boxes 2 ranged in several superposed groups above a sorting table 3. As shown, there are five superimposed groups each of six boxes. Behind and below the level of the boxes 2 of each group, extends a continuously operating endless conveyor band 4 extending the full length of the bank of sorting stations 1. In the present instance there are thus five such bands 4, the return flights of which are indicated at 5 (Fig. 3).

The boxes 2 have bottoms 6 (Fig. 3) pivoted about an axis 7 (Fig. 4) and backs 8 pivoted at their upper edges 9, the bottoms 6 and backs 8 being connected together by linkages 10. Each bottom is normally held closed by a lug 11 on a vertical bar 12, there being one such bar 12 to each vertical row of boxes 2. At its upper end, each bar 12 is connected to one end of a lever 13, pivoted at 14, whereof the other end carries a follower 15 which not only runs upon an edge cam 16 on a continuously rotating shaft 17 but also engages in a face groove 18 of a selector disc 19 carried on an intermittently driven shaft 20. The disc 19 has a slot 21 at one part of its periphery and only when the intermittent movement of the shaft 20 brings this slot 21 into the uppermost position is the follower 15 free to move up and down and follow the cam 16. The cams 16 are alike for each vertical row of boxes but the discs 19 for each vertical row of a station are offset angularly so that the followers 15 are freed successively and at intervals. The timing of the intermittent movement of the shaft 20 is such that each slot 21 remains in the uppermost position during one complete rotation of the shaft 17. When, during this rotation, the shallow part of the cam 16 comes opposite the follower 15, the unbalanced weight of the box-bottoms 6 and their contents, assisted by biasing means if necessary, causes the bar 12 to drop and the follower 15 to rise through the slot 21. Thus all the boxes of the vertical row open at their bottoms 6 and, due to the linkages 10, the backs 8 also swing out so that a wide opening is made

for the deposit of the contents of the boxes 2 on the respective bands 4. When the deeper part of the cams 16 come opposite the follower 15, it forces the latter down again through the slot 21 so that the bar 12 is raised to reclose the boxes. The next intermittent motion of the shaft 20 prepares for the opening of another vertical row of boxes 2 in similar fashion, the followers 15 of all the other vertical rows being meanwhile held within the grooves 18 of their discs 19 so that the latter rows of boxes cannot open. As will be understood, therefore, the boxes 2 of each horizontal group of a station are opened automatically and successively to deposit their contents upon the corresponding conveyor band 4. Thus each such band serves to clear in succession all the boxes of its associated horizontal group. Furthermore, as the above description applies equally to each station, the stations generally being duplicates of each other, each band clears at one and the same time all the corresponding boxes in the groups with which it is associated. Otherwise expressed, each single conveyor band 4 serves for the conveyance of several sorting selections in succession over an endless time cycle.

Preferably, as shown in Figs. 2-4, two ranges of sorting stations are disposed back to back and common conveyors 4, if desired with a central longitudinal partition, and common cam mechanisms are used for the corresponding rows of boxes 2 of the said ranges of boxes. Unless specially provided against, a difficulty might arise with this arrangement owing to the fact that, for example, postal sorters always place the letters in the sorting boxes with the stamps in a certain position. If letters from corresponding boxes in a back to back relationship were simply deposited upon a common conveyor band, it would be found that the letters from the two boxes were oppositely disposed upon said band, which is inconvenient in the subsequent handling of the letters.

One way of overcoming this difficulty is to provide means whereby the letters from the ranges of boxes are all placed in the same position upon the conveyor bands. This is conveniently effected by turning all the letters one way in depositing them upon the bands. It is for this purpose that, in the example illustrated, the boxes 2 are provided with bottoms 6 which open by pivoting about a roughly diagonal axis 7. The letters lying in the boxes 2, in positions transversely of the bands 4, are initially deposited diagonally thereon. The moving bands, however, draw the letters off from the box-bottoms 6 longitudinally of the bands. Furthermore, since the box-bottoms of the two ranges of boxes are pivoted about opposite diagonals (Fig. 4), the letters from corresponding boxes in back to back relationship are caused to assume the same longitudinal position upon the bands 4, i. e. with the stamps similarly located.

A latch 65 controlled by a detector 66 in the upper part of each box (Figs. 3-4b) is normally out of engagement with a lug 67 on the box-bottom 6. If, however, the box is filled too full, so that it would discharge irregularly, the detector 66, pushed back by the top letter inserted, causes the latch 65 to engage under the lug 67 and prevent opening of the box until the excess letters are taken out again.

The arrangement so far described is by itself extremely economical of space and extremely simple to install and operate. There are not a

large number of conveyor bands and the power-consumption is moderate. The power is transmitted to the bands 4 from a relatively slow-speed electric motor 22, shaft 23, individual oil-immersed spiral gearing 24 and driving rollers 25. The cam-shaft 17 is driven from the same motor 22 through chain gearing 26 partly seen in Fig. 1. The selector shaft 20 is operated from the shaft 17 through intermittent drive mechanism indicated at 27.

In the case of stoppage of the mechanism, e. g. due to the failure of the power supply, the sorting apparatus can be temporarily cleared by hand in the normal way of a manually cleared sorting apparatus.

With, as will generally be the case, a comparatively large number of sorting stations 1 in a bank, it may be necessary in certain circumstances to isolate one or more stations from the rest, and possibly, to revert to manual clearing from these stations for a certain period of time. Accordingly, means is provided whereby the box-opening mechanism for any particular station can be locked or rendered inoperative by the sorter or person in charge without interfering in any way with the normal functioning of the remainder of the apparatus. The locking means shown in Fig. 3 comprises a series of latches 28, one for each bar 12 of the station, which latches are pivoted at 29 and connected by way of a rod 29¹ to a bar 30. The latter is slidable in a guide 31 under the table 3 and carries an operating handle 32. Normally the latches 28 occupy the ineffective position illustrated by the full lines. By pushing the handle 32 inwardly, the latches 28 can be brought into the dotted line position immediately under the lower ends of the bars 12. In this position, the latches prevent the bars 12 from descending, so that the mechanism 16, 19 is ineffective for permitting opening the boxes of the station in question. The provision of such locking means also ensures that in the case of failure of the box mechanism, only one station need be affected while repairs are being made. To facilitate such repairs each box, complete with all its essential moving parts, Figs. 4-4b, may be made as a separate unit so that it can be readily detached from the framework of the apparatus and replaced by a new one.

The stacking apparatus will now be described: This comprises a plurality of superimposed stacking means, preferably of the kind hereinafter described, which stacking means, indicated generally at 33 in Figures 1 and 2, occupy relatively fixed positions at the ends of the superimposed conveyor bands 4. Beyond the stacking means there are horizontal rows of stacking trays 34 movable horizontally past the stacking means in a direction transverse to the ranges of sorting boxes 2. With the sorting apparatus illustrated, there require to be five rows each of six stacking trays, one tray corresponding to each box of the horizontal groups of sorting boxes 2 associated with the corresponding conveyor band 4. By means hereinafter explained, the trays 34 are advanced past the stacking means 33 and the letters are ejected on to the said trays from the said stacking means in a timed relationship with the time cycle of the conveyor bands 4, so that each tray 34 only receives the letters from one predetermined sorting box 2 at all of the sorting stations 1. There is, however, only one stacking

means 33 to each conveyor band 4. Thus the space occupied by the stacking means proper is small and the space occupied by the trays, whilst also small in itself, has the further advantage that its principal dimension is at right angles to the length of the sorting apparatus, a direction in which space is generally economically available in any case. The column of stacking means is disposed at an angle to the vertical, an arrangement which saves space vertically.

Referring now to Figs. 5 and 6, the tray-supporting frame 35 runs on rollers 36 carried upon a fixed frame 37. Traversing movement is imparted to the frame 35 from the motor 22 by way of worm reduction gearing 38, shaft 38¹, crank 39, adjustable connecting rod 40, pawl and ratchet device 41, gear wheels 42, 42¹, sprocket wheels 43, and sprocket chains 44. The latter chains have, at intervals, means 44¹ for the attachment of a driving roller 45 extending between them. This member 45 engages with a U-shaped bracket 46 on the underside of the trays. The crank 39 makes one revolution per delivery period (i. e. the period in which a band 4 is delivering from a certain box 2 to the stacking means 33,) and at the end of each delivery period imparts one stroke to the pawl and ratchet device 41, thus advancing the driving roller 45 and the bank of trays 34 by two tray widths (say, from right to left in Figure 6), so that alternate trays are brought in turn opposite the stacking means 33. When, upon reaching the left-hand end of its travel with the tray-bank, the roller 45 rounds the end, before commencing to travel from left to right along the return limb of its path, it will advance the said tray-bank by one tray-width only. Consequently in the return of the tray-bank from left to right, the trays not brought opposite the stacking means 33 in the right to left movement are then brought opposite the same. Finally after a similar action of the roller 45 at the right hand end, the cycle recommences. By changing the position of the roller 45 from one attachment means 44¹ (of which there are the same number as there are sorting boxes in a horizontal group at a sorting station) to another, the correspondence of the delivery trays with the sorting boxes can be varied to suit requirements.

A preferred form of stacker will now be described more especially by reference to Figs. 7-10. From the level of the end of each conveyor band 4 to the somewhat lower level of its associated stacker-bottom 47 and tray-bottom 48, the letters fall by way of a chute 49 into the reach of the curved arms 52 of a flyer-device on a continuously rotating shaft 53. Back-supporting means for the letters comprise a pair of straight fingers 54 initially extending upwardly, through slots 54¹ in the stacker-bottom 47, in front of the flyer device 52 from a transverse spindle 55. As the letters are deposited in front of the fingers 54 with the assistance of the flyer device 52, the said fingers are pressed back by the said letters, initially in such manner as to continue to afford support. By the time that the fingers 54 afford little or no support to the stack and permit it to pass over them (see dotted line position of fingers 54 in Fig. 7) the said stack (56 in Fig. 9) is of such size and form as to be self-supporting. In order to assist in the production of the stack-form shown in Fig. 9, there may be provided above the chute 49 and flyer-device 52, an endless continuously driven

band 50, which may have a roughened or tacky surface for engaging the upper ends of the letters.

Just before the tray-bank is advanced as already explained, the stack, or such part of it as remains on the stacker-bottom 47, is finally ejected into the tray 34 by an ejector plate 57 which performs a motion for an initial position (full-line in Figure 7) near the flyer-shaft 53 to a final position (dotted line in Fig. 7) just beyond the end of the stacker bottom 47 and is advantageously rocked from a somewhat rearwardly to a somewhat forwardly canted disposition towards the end of the ejection movement. It is then at once drawn back to its initial position. During the time that the ejector plate 57 is moving to and fro, the gap between it and the edge of the chute 49 is bridged by steel tapes 70 attached to the tip of the plate and unwound from a spring loaded drum 71. These tapes prevent stray letters being deposited behind the ejector plate.

Each flyer-shaft 53 is driven by chain 61 from the corresponding gearing 24 (Fig. 1). For the to and fro motion of the ejector plates 57, their supporting bars 57¹ are each carried by brackets 80 pivotally mounted as at 81, in a common, horizontally slidable, frame 82. This is moved forward (from the full to the dotted line position, Fig. 7), at the correct instant in relation to the time cycle of the sorting and receiving apparatus, by links 83 which are connected to coupled crank-arms 84. The lower crank-arm 84 is connected to a crank-arm 85 which is periodically rocked through a link 86 from cam means 62 (Fig. 1). A loading weight 87 returns the linkage and frame to its initial position. The forward rocking of each ejector plate 57 is effected by contact of a downwardly extending part of the bracket 80 with a fixed stop 88. A spring 89 biases the bracket and plate towards its normal position.

The back-supporting fingers 54 may be loaded and biased towards the initial position by springs or, as shown, weights 59. When the stacker is required to deal with occasional matter of considerably greater density than usual, e. g. small catalogues and booklets, the weights 59 may be increased so as to increase the resistance offered by the fingers 54.

I claim:—

1. Sorting and collating apparatus for letters, other postal matter and the like, comprising at least one range of grouped sorting compartments associated with a conveyor leading to a single delivery point means for transferring the contents of the compartments to the conveyor, power-operated control means for the said transferring means adapted for causing the contents of sets of corresponding compartments to be transferred in succession (over a time cycle) to the conveyor, whereby they are delivered separately at the delivery point, a series of receivers movable in relation to the delivery point, and means for moving said receivers in succession said delivery point in timed relation to the operation of said transferring means and conveyor whereby to selectively receive from the conveyor the contents of respective sets of corresponding compartments.

2. Sorting and collating apparatus for letters, other postal matter and the like, comprising at least one range of grouped sorting compartments associated with a conveyor leading to a single delivery point means for transferring the con-

tents of the compartments to the conveyor, power-operated control means for the said transferring means adapted for causing the contents of sets of corresponding compartments in the groups to be transferred in succession (over a time cycle) to the conveyor, a series of receivers, and means operating in timed relation with said transferring means and conveyor for moving the said receivers horizontally past the delivery point in a direction transverse to the length of the range of sorting compartments so that the receivers are disposed in succession to receive from the conveyor the contents of respective sets of corresponding compartments.

3. Sorting and collating apparatus for letters, other postal matter and the like, comprising several ranges of groups of corresponding sorting compartments disposed back-to-back, a plurality of conveyors respectively associated with and common to back-to-back ranges of compartments, and means associated with the sorting compartments for depositing letters from the back-to-back ranges of compartments in similar positions upon the conveyors by turning all the letter longitudinally of the conveyors in depositing them thereon.

4. Sorting and collating apparatus for letters, other postal matter and the like, comprising several ranges of groups of corresponding sorting compartments, a plurality of conveyors associated with the said ranges of compartments, and automatic means for swinging down the bottoms of the said compartments to deposit their contents upon the conveyors, the said bottoms being pivoted, for their swinging, about substantially diagonal axes.

5. Sorting and collating apparatus for letters, other postal matter and the like, comprising several ranges of groups of corresponding sorting compartments disposed back-to-back, a plurality of conveyors respectively associated with and common to back-to-back ranges of compartments, and automatic means for swinging down the bottoms of the said compartments to deposit their contents upon the conveyors, the said bottoms of compartments in the back-to-back ranges being pivoted to swing about opposite substantially diagonal axes.

6. Sorting and collating apparatus for letters, other postal matter and the like, comprising several ranges of groups of corresponding sorting compartments each having the sorting opening in the front and each having a movable bottom and back wall, a plurality of conveyors respectively associated with the said ranges of compartments, and automatic means for opening both

the bottoms and back-walls of the compartments for depositing the contents thereof upon the conveyors.

7. Sorting and collating apparatus for letters, other postal matter and the like, comprising a plurality of superimposed ranges of grouped sorting compartments, conveyors respectively associated with the said ranges of compartments, means for transferring the contents of the compartments to the conveyors, and automatic control means including a cam-follower connected with the transfer means, a first continuously driven cam adapted for controlling movement of the said follower, and a second intermittently driven cam adapted for withholding the said follower from the control of the first cam and for periodically releasing the said follower to the said control.

8. Sorting and collating apparatus for letters, other postal matter and the like, comprising a plurality of superimposed ranges of grouped sorting compartments, the compartments forming vertical as well as horizontal rows, conveyors respectively associated with the said ranges of compartments, means for transferring the contents of the compartments to the conveyors, automatic actuating means common to the transfer means of each vertical row of compartments, and manually operated means for setting the transfer means of selected vertical rows of compartments out of operation without interference with the remainder of the compartments.

9. Sorting and collating apparatus for postal matter, comprising ranges of sorting compartments, conveyors respectively associated with the said ranges of compartments, means for transferring the sorted postal matter from the compartments to the conveyors in a series of periods over a time cycle, stacking means at the delivery ends of the said conveyors for receiving the postal matter from the conveyors and stacking it, ejector means for discharging the stacked postal matter from the stacking means at the ends of the said periods, a series of receivers associated with each conveyor, and intermittent operating means for moving the series of receivers past the stacking means with a step-by-step motion so timed (over the same cycle) that each individual receiver is brought in succession into operative relationship with the associated conveyor for receiving, by way of the stacking means, postal matter transferred from the compartments to the conveyor in one period of the time cycle.

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