R. E. KIMBALL.

SHEET DELIVERY MECHANISM.

APPLICATION FILED DEC. 20, 1913.

1,180,651.

Patented Apr. 25, 1916

7 SHEETS—SHEET 1.

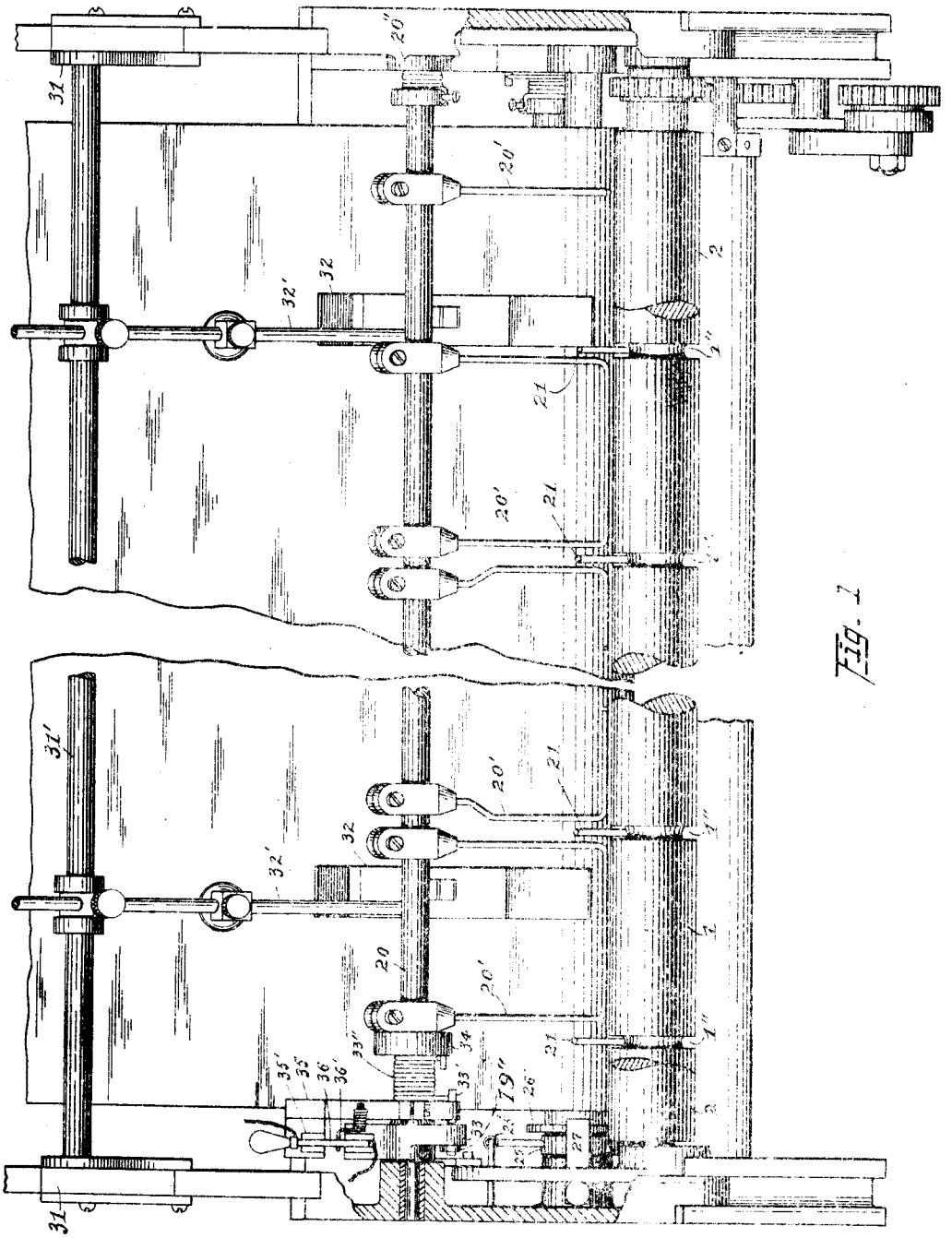


Fig. 1

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7 SHEETS—SHEET 2.

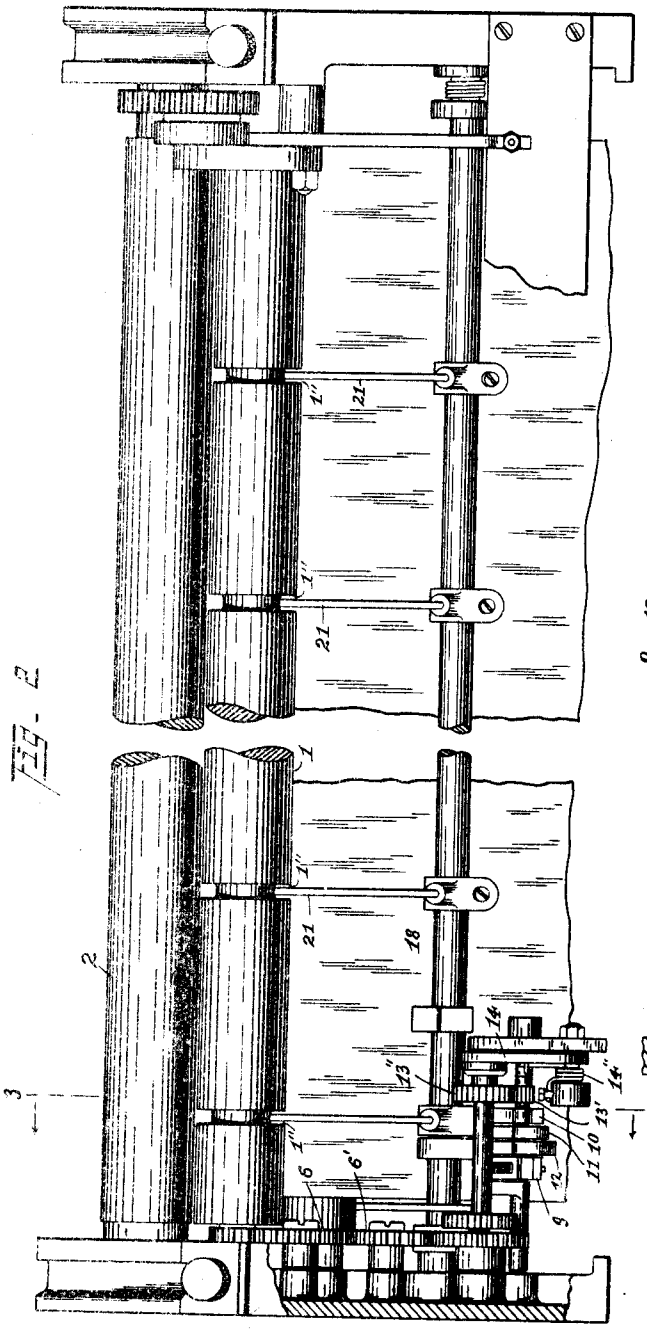


FIG. 2

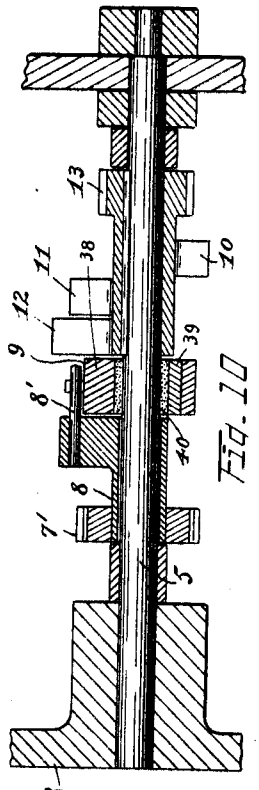


FIG. 10

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7 SHEETS—SHEET 3.

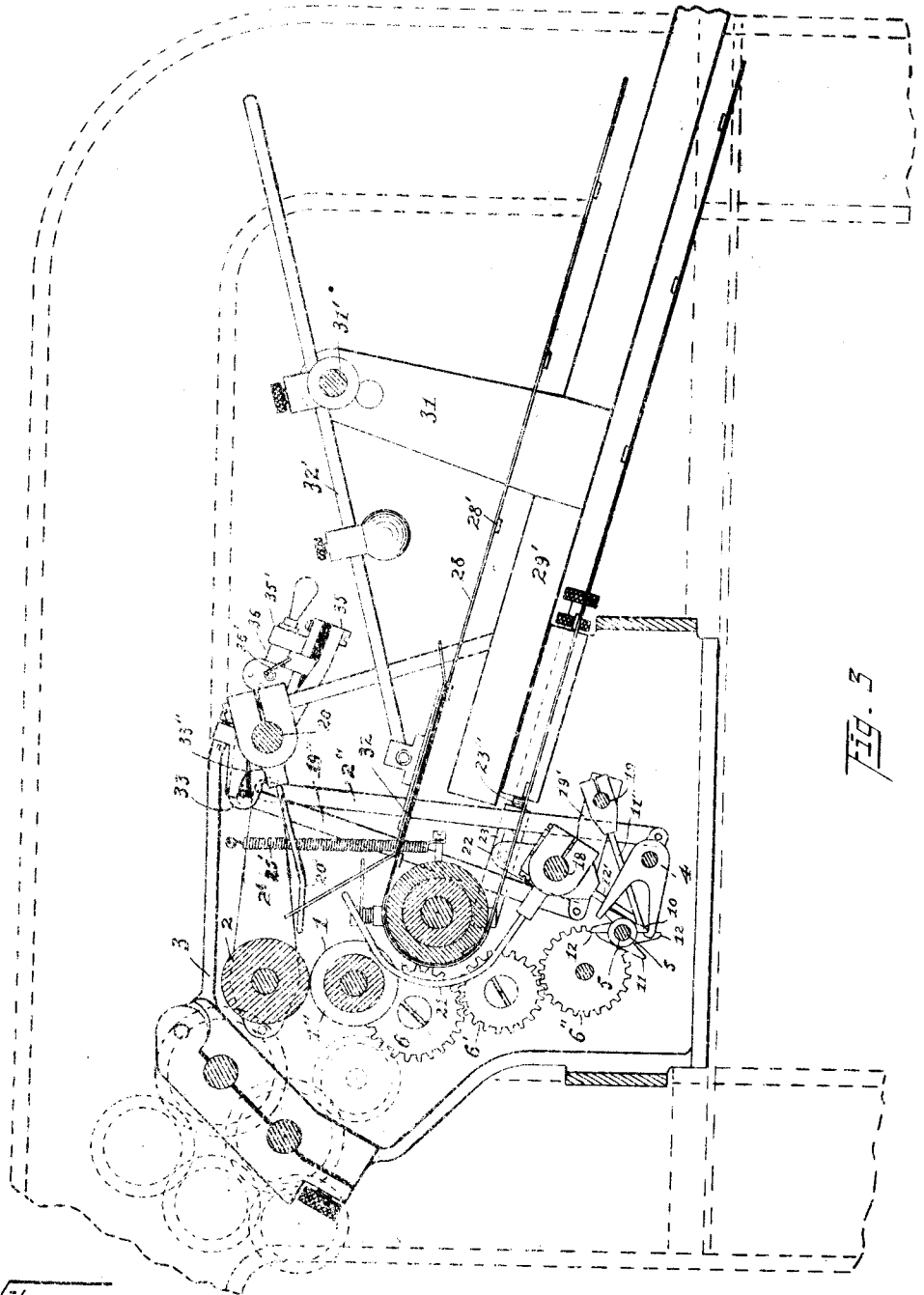


Fig. 3

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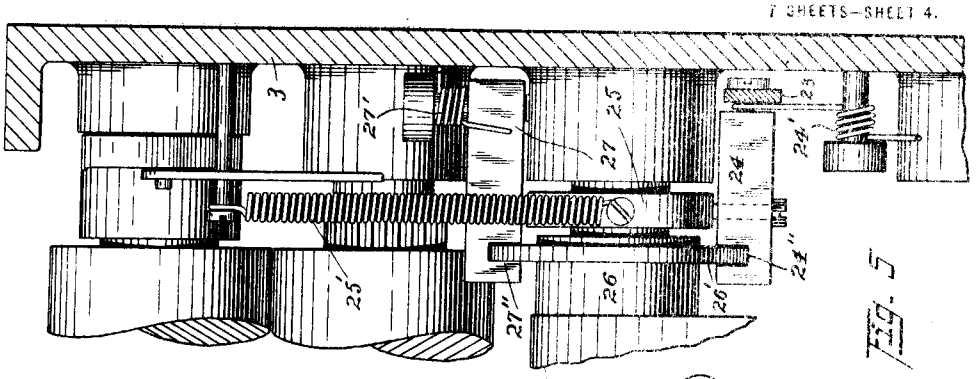


Fig. 5

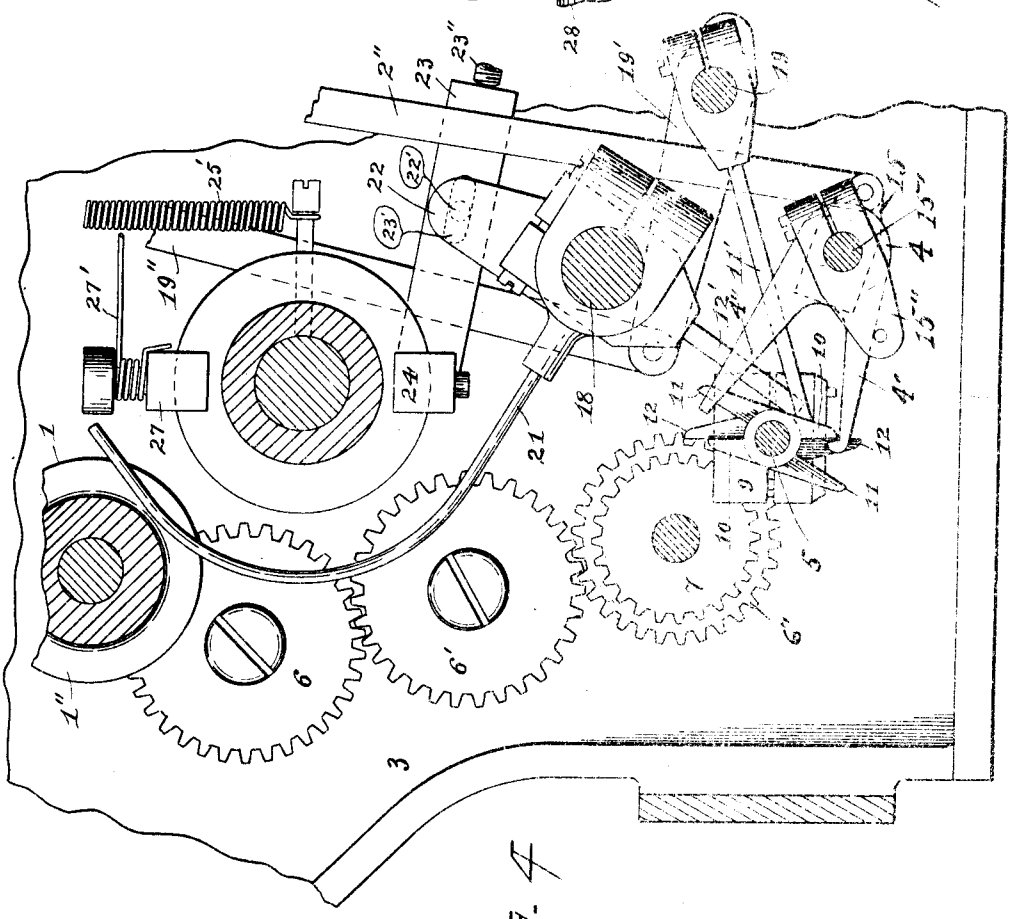


Fig. 4

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7 SHEETS—SHEET 5.

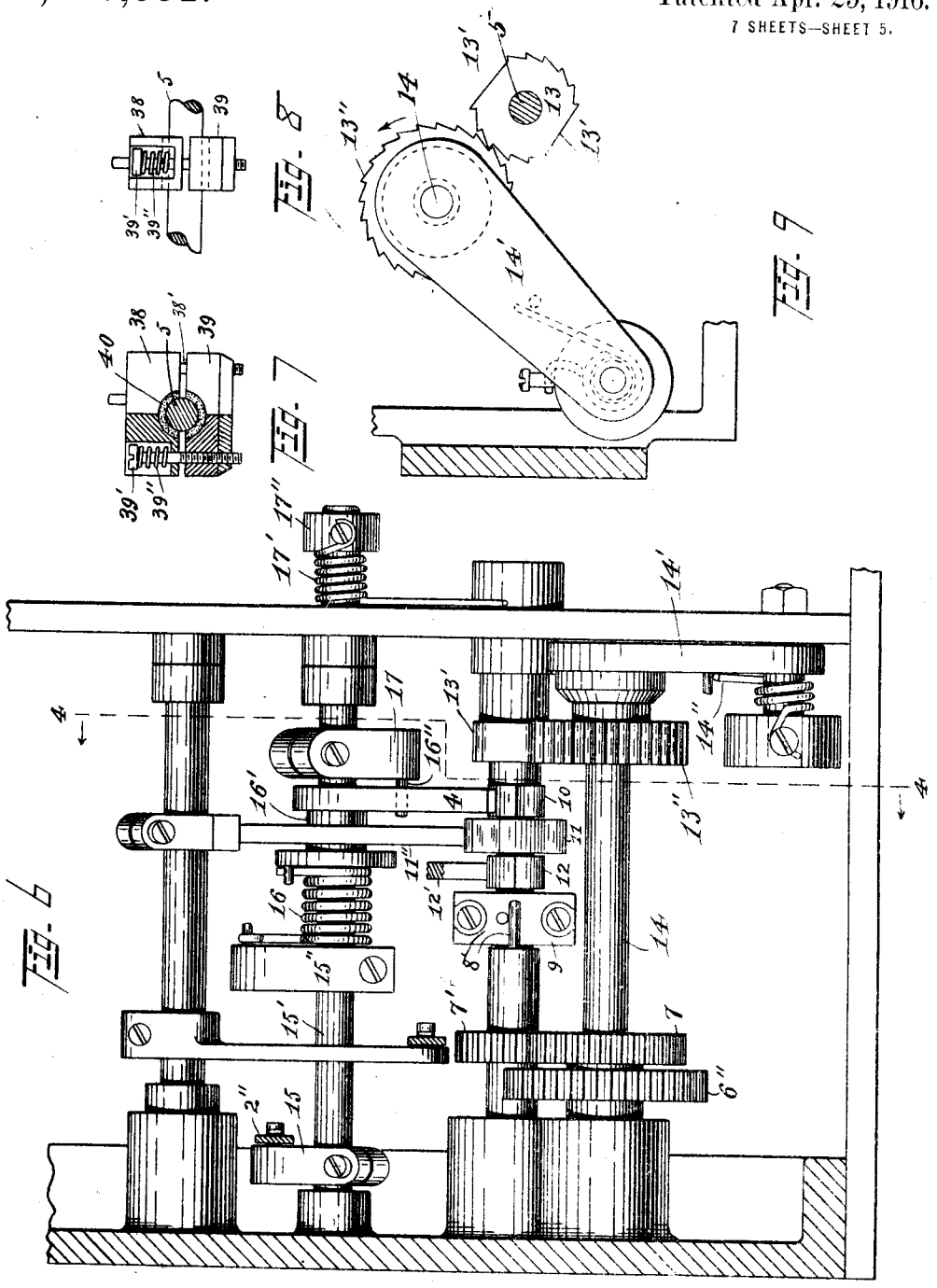


Fig. 6

Fig. 8

Fig. 7

Fig. 9

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7 SHEETS—SHEET 6.

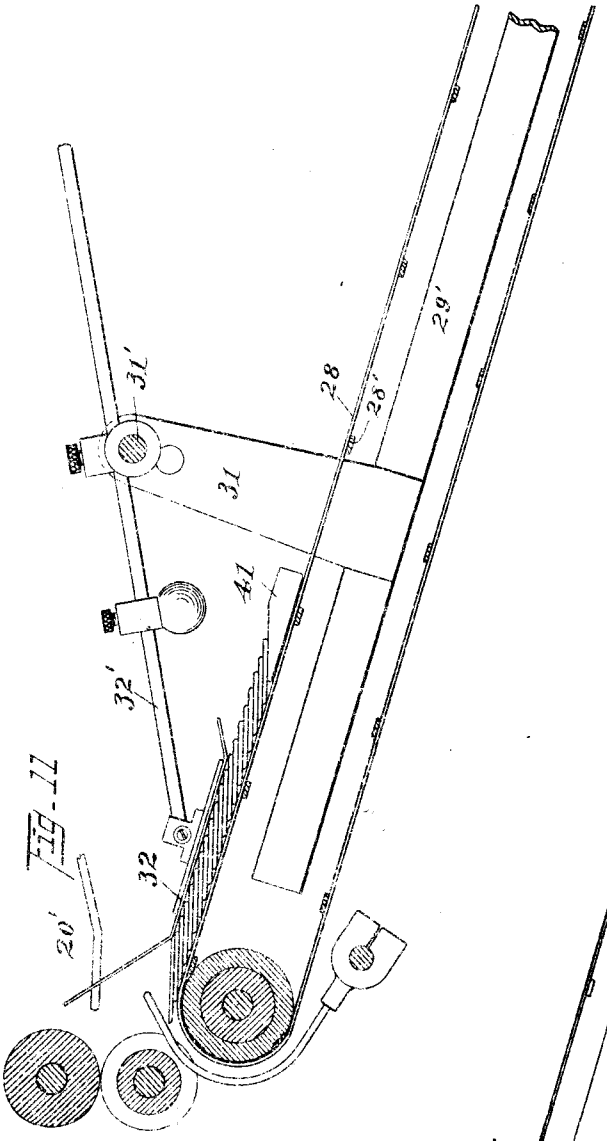


Fig. 11

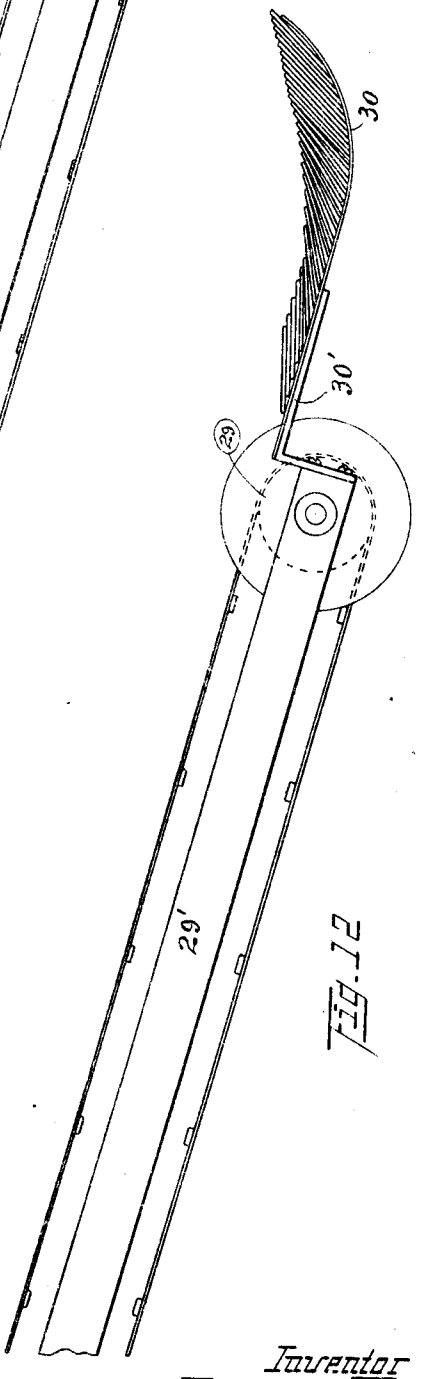


Fig. 12

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7 SHEETS—SHEET 7.

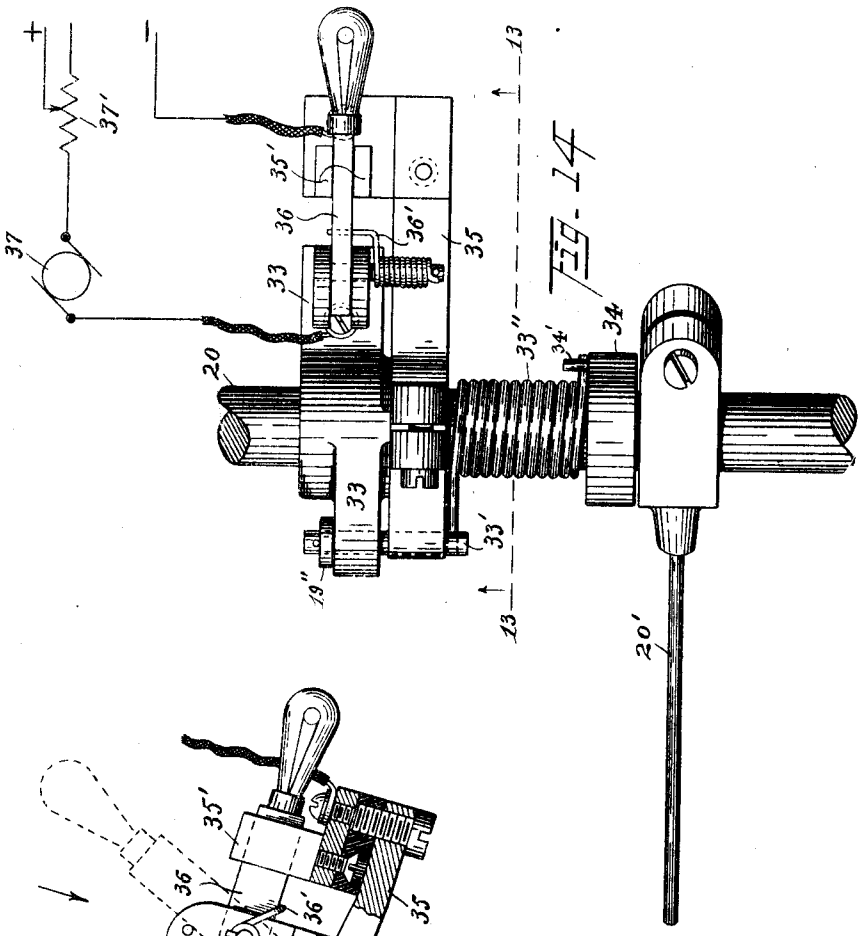


Fig. 14

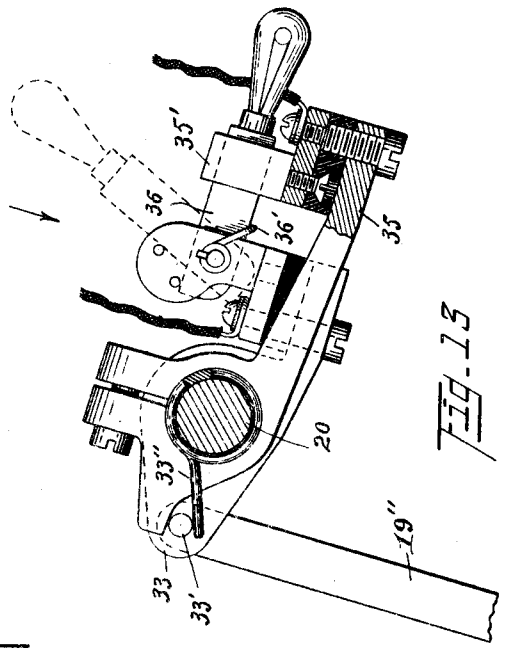


Fig. 13

Witnesses:

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SHEET-DELIVERY MECHANISM.

1,180,651. Specification of Letters Patent. Patented Apr. 25, 1916.

Application filed December 20, 1913. Serial No. 807,930.

To all whom it may concern:

Be it known that I, ROBERT E. KIMBALL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Sheet-Delivery Mechanism, of which the following is a specification.

My invention relates to improvements in delivery mechanism for paper folding machines and the like, and has for its object the provision of automatic means for consecutively delivering folded sheets of paper or signatures as they may be dropped thereon in any desired manner.

Moreover, it has been my intent to avoid as far as possible, the necessity for adjusting my improved machine to suit the requirements of different classes of work. In order to accomplish this, it has been necessary to depart from the features which distinguish timed, mechanically-actuated delivery tables and resort to the principle of initiating the cycle of operations with the entrance of a signature to the machine; retaining the mechanism inert during its passage and release the machine for completing its cycle, upon the expulsion of said signature, as by the delivery rolls thereof.

Again, I have sought to control the movement of a traveling delivery table directly by the passage of the several sheets or signatures, and have further provided against damage to the machine itself and the product handled thereby, through the provision of means for automatically controlling the driving power, as by an electric switch controlling a motor or relay.

The delivery mechanism about to be described is not restricted in its use to any particular associated machine or driving mechanism, and in consequence I will not describe these adjuncts further than to make reference thereto for the purpose of explaining my invention and its preferred structure and operation.

The embodiment of my improvements will be more readily understood by making reference to the accompanying drawings wherein:—

Figure 1 is a plan view of the delivery mechanism embodying my improvements, partly broken away and in section; omitting the lower extremity of the traveling delivery table. Fig. 2 is a rear view in elevation, of the apparatus of Fig. 1, also partially broken away, and in section. Fig. 3 is a vertical sectional view of the apparatus of Fig. 1; indicating as well by dotted lines, the relation thereof to a folding machine. Fig. 4 is an enlarged detail view in irregular vertical section, showing the actuating mechanism. Fig. 5 is a fragmentary view in elevation and vertical section showing the driving clutch for the delivery belt. Fig. 6 is a plan view of the controlling or actuating mechanism; the side frame being shown in horizontal section. Figs. 7 and 8 respectively are views partly sectioned and in elevation, showing the driving clutch. Fig. 9 is a fragmentary view showing the driving ratchet gear. Fig. 10 (Sheet 2) is a view in vertical section illustrating the clutch shaft of the actuating or controlling mechanism. Fig. 11 is a fragmentary view, principally in side elevation but partially sectioned, showing the upper end of the delivery table. Fig. 12 is a side elevation of the lower end of the delivery table. Fig. 13 is an enlarged view in vertical section, showing the automatically actuated cut-off switch, and Fig. 14 is a plan view of the latter with its associated mechanism and a diagram indicating the purpose of the switch.

Throughout the several figures of the drawings, I have employed the same character of reference to indicate similar parts, and various section-lines are indicated upon the drawings by the appropriate dotted lines, which are self-explanatory.

As indicated above, my improvements are adapted for use in association with printing and folding apparatus of any desirable or suitable type, which need not be explained herein, except to point out that preferably they are driven by a common motor device, such as an electric motor. The installation which I shall describe as embodying my invention, is electrically driven and an automatic controlling switch therefor constitutes a part of my improvements herein disclosed.

Referring first to Fig. 3, the driving gear associated with a suitable folding mechanism, is indicated by dotted lines, and this is positioned at the right hand side of the machine and is not shown in said section. Driving power is transmitted to the machine through the lower of the two delivery rolls 1, 2, which receive the paper or signature from the fold-

ing machine. Roll 1 is stationarily journaled in the frame 3, while roll 2 is journaled in a pivoted arm 2′, connected by link 2″ with the release or escapement 4. The escapement directly controls the cam-shaft 5, through which the delivery mechanism and delivery table are directly actuated. This cam-shaft normally has a constant tendency to be rotated in a clock-wise direction through the train of gears 6, 6′, 6″ and 7, 7′.

Referring particularly to Figs. 4, 6 and 10, it will be seen that the cam-shaft is composite in its character, embracing the sleeve-member 8 mounting the gear 7′, which is loose upon shaft 5 and is adapted constantly to drive the friction-clutch 9 during the operation of the machine by means of the pin 8′. Normally, the shaft 5 is held against rotation by the lower arm 4′ of the escapement member, which engages with one or the other of detents 10, mounted upon shaft 5 in the plane of said member 4. These detents are positioned at 180 degrees and are keyed upon shaft 5 to rotate or be withheld from rotation in common with duplicate cams 11 and 12, also positioned at 180 degrees, but timed to engage their respective controlling arms 11′ and 12′ at different intervals, as will be later explained. The mutilated gear 13 also rotates in common with detents 10 and cams just mentioned, and is cut with ratchet teeth and two plane faces 13′, each of the latter permitting a rotation of some 30 degrees before meshing with the co-acting ratchet gear 13″.

Referring particularly to Fig. 9, the relation of the ratchet and mutilated gear during their meshing or driving period is best illustrated for the purpose of further explanation. The gears 6″, 7 and 13″ are mounted upon a common shaft 14, and are continuously driven during the operation of the machine. The right hand end of said shaft is journaled in a pivoted bracket 14′ and a tension spring 14″ serves to secure sufficient flexibility of the driving engagement between gears 13, 13″, to avoid breakage at the moment of their intermittent meshing.

From the foregoing, it will be understood that the controlling shaft 5 has a constant tendency to be driven through the gear 7′ and friction-clutch 9, although the latter normally imparts merely the initial tendency to rotate, while the positive drive of said shaft is intermittently secured through the ratchet-cut gears 13, 13″, when thrown into mesh. In other words, the several cams are withheld from operation during the passage of a sheet or signature between the delivery rolls, but such passage initiates the release by the escapement, so that immediately the signature is expelled from said rolls, the delivery mechanism is thrown into operation. This results from the mounting of the upper delivery roll in such manner as directly to control the escapement-member 4, first to release its lower detent and engage the one uppermost, and then release the upper detent and permit a half revolution of the controlling-shaft with its actuating cams.

Referring to Figs. 4 and 6, it will be seen that link 2″, connected with the long arm of lever 2′, is attached to lever 15 upon the shaft 15′, which mounts the escapement-member 4. Lever 15″ is secured to said shaft and is connected to actuate the escapement-member 4, through the medium of a spring 16 and sleeve 16′, which is loose upon said shaft. Stop 16″ carried by the lug 17 affords a lower rest for the escapement-member, which is thus resiliently connected to be actuated in a ratio of approximately 20 to 1, as compared with the movement of the upper delivery roll 2. A coiled spring 17′ at the end of shaft 15′, reacts against a collar 17″ thereon, to secure the normal engagement of arm 4′ with either one of the detents 10 which happens to be in the lower position. Accordingly, the escapement-member will have an appreciable movement sufficient to clear the engaged detent, both upon the entrance and exit of a folded sheet of paper or signature to or from the delivery rolls. Shaft 18 carries the actuating lever 12′ and shaft 19 actuating lever 11′, which respectively are adapted to be engaged by the timed cams 12 and 11 mounted upon the controlling shaft 5. A lever 19′ and link 19″ operatively connect shafts 19 and 20 (Fig. 1) for simultaneous actuation. Shaft 18 is equipped with a plurality of curved grippers 21, which normally lie within grooves 1″ cut in the lower delivery roll 1. A lever arm 22 mounts a pin 22′, which passes within a slot 23′ cut in the reciprocating bar 23. This is pivoted to a gripping clutch-member 24, and is normally held against the adjusting screw 23″ by means of the coiled spring 24′ (see Figs. 4 and 5). The member 24 is pivoted in turn upon the ring or sleeve 25, which is equipped with a long tension spring 25′ tending to rotate said ring and clutch-member. The upper roll 26 of the delivery table is formed with a terminal flange 26′ and a slot 24″ in the clutch-member 24 of slightly greater width than said flange, fits thereon and is cramped against the sides of the flange by means of the springs 24′. Pivoted upon the journal bearing of roll 26, there is provided a similar clutch member 27, engaging the flange within its slot 27″ and gripping the same through the medium of the spring 27′. It will be seen that springs 24′ and 27′ act in opposite directions to cramp their respective clutch-members upon the flange 26′. By reason of its

pivotal mounting upon the sleeve, clutch-member 24 is adapted to be actuated by lever arm 22 and link 23, and thereby imparts a predetermined adjustable movement to the clutch-member and roll 26.

Referring now to Figs. 3, 11 and 12, it is seen that the bed of the delivery table comprises a taut canvas band 28, extending the full width of the machine and provided at intervals with transverse strips 28', through the medium of which roll 26 serves in turn to actuate the traveling delivery table. The lower end of the canvas band 28 passes over the co-acting roll 29, journaled between side-pieces 29' of the delivery table, which terminates in an upwardly curved sheet metal chute 30, carried by the supporting bracket 30'. The upper end of the delivery table is provided with standards 31, which support a shaft 31' carrying the depressing shoes 32 at the ends of weighted arms 32'. It was previously mentioned that the link 19'' serves to connect shafts 19 and 20 for simultaneous actuation. As best shown in Figs. 1 and 4, shaft 20 extends the entire width of the machine and is provided with a plurality of depressing members 20', which are movable with said shaft, but are normally maintained in their elevated position by means of the terminal spring 20''. Link 19'', however, is not rigidly connected with said shaft, but has a flexible or spring connection, as best shown in Figs. 13 and 14. Link 19'' is pivoted to lug 33, which is sleeved upon shaft 20 and affords an actuating stud and stop 33', reacting against the end of the spring 33''. The opposite end of said spring engages a pin 34' carried by the collar 34, which is secured to shaft 20 and thereby serves to oscillate the same, together with its depressing members 20'. A frame 35, also rigidly carried upon said shaft, insulatingly mounts the gripping contacts 35' for an electric switch blade 36. Said blade is pivotally mounted upon the extension of lug 33, and is provided with a snap-spring 36' tending to open the switch, which normally is resisted by the gripping contacts 35'.

The diagram of Fig. 14 illustrates the + and — sides of a power circuit, wherein the electric motor 37 and its rheostat 37' are connected for actuating the folding machine and its associated delivery mechanism herein explained.

With the structural features above described clearly in mind, it is seen that the intermittent operation of the delivery mechanism must depend primarily upon the movement of the delivery roll, and more directly upon the rotation of the composite cam-shaft 5 (Fig. 10). The sleeved gear 7' and its connected friction-clutch 9, are constantly driven upon shaft 5, during the operation of the machine. This clutch is separately illustrated in Figs. 7 and 8, comprising two opposing blocks 38, 39, which are semi-cylindrically recessed and faced with leather bushings 40 to engage shaft 5. Screws 38', 39' and an interposed spring 39'' yieldingly connect the clutch members with shaft 5 and tend constantly to rotate the same with gear 7'. The clutch, however, is not relied upon except for the initial rotation of shaft 5, immediately it is released from either arm of the escapement, since a positive drive is desirable for actuating the cams and their associated mechanism.

The operation of my improved machine may now be quite easily comprehended. The signatures may be individually supplied to the delivery rolls in any desired manner, as from a printing press, a folding machine, a delivery table, or even by hand. As each signature is entered between the delivery rolls 1, 2, the latter is elevated by the thickness or body of the folded paper and this movement is multiplied by the arm 2' link 2'' and its connection with the escapement 4, so that the arm 4' is at once released from the engaged detent 10. The arm 4'' of said escapement, however, is simultaneously drawn down sufficiently to engage the uppermost detent 10, which is pivotally rotated to engage said arm, together with the cam-shaft, approximately through an arc of 30 degrees. By means of the spring connection, the escapement-member has considerable latitude of movement with respect to roll 2 and its connecting mechanism, regardless of the thickness of the signature. The cams are so positioned upon shaft 5 that neither of the actuating levers is engaged during its initial rotation, which, however, has placed the mechanism in condition for immediate and independent operation as soon as the rear edge of the signature has passed from the delivery rolls. Immediately this occurs, the upper roll drops slightly into engagement with the lower roll and this movement releases the upper detent 10, and permits shaft 5 to be further rotated. Instantly the ratchet gears 13', 13'' are in mesh and shaft 5 with its connected cams is positively driven through an arc of approximately 150 degrees with the following sequence of actuation. Cam 12 first engages the lever 12', which serves immediately to retract the curved grippers and thereafter actuate the lower clutch-member 24 upon the upper roll of the delivery table. This is accomplished through the medium of the lever 22, bar 23 and the slotted clutch-member 24, which grips the flange 26' and rotates the roll 26, together with its attached band 28, the desired distance for receiving each signature in turn. This is controllable through the medium of the adjusting screw 23'', which regulates the position of engagement of pin 22' with slot 23' (Fig 4) The upper

clutch-member, it will be remembered, is stationary and permits the flange to slip through the slot, when rotating in a clockwise direction (Fig. 4), but prevents any reverse rotation of the roll, by its grip upon the flange 26'. The continued rotation of shaft 5 (and of course these operations occur in very rapid sequence) serves to engage cam 11 with the lever arm 11', before the operations above described have been completed. This in turn actuates shafts 19 and 20 through the connecting link 19'', and normally engages the depressing members 20' with the signature which has just been expelled from the delivery rolls and fallen upon the delivery table in its slightly advanced position. The shoes 32 are upwardly inclined at such an angle as to permit the passage of the forward edge of each signature beneath the same, as is well shown in Fig. 11. The positions of these shoes 32 may be adjusted upon the delivery table to correspond with the length of the folded signature. Initially a wooden block 41 is positioned upon the delivery table; the same having an inclined face to receive and maintain the signatures approximately in horizontal layers. Cam 12 has now rotated sufficiently to disengage its lever arm 12' and the grippers are thereby released to engage the rear edge of the signature a moment before the depressing members in turn are released by the disengagement of cam 11 from the lever arm 11'. The cam shaft having now rotated through an arc of 180 degrees is checked by the reëngagement of hooked arm 4' of the escapement-member with the detent 10, which has now reached the lower position, and the cycle of operation of my improved machine has been completed under normal conditions. The various interposed springs provided in association with the escapement, depressing members and electric switch are adapted to avoid breakage or damage to the machine in case of accidents. Moreover, by use of the controlling switch (Figs. 13 and 14) I am enabled to stop the delivery mechanism whenever the depressing members are accidentally obstructed. The base or lug 33 whereon the switch-blade is pivoted, necessarily is rotated concurrently with each actuating movement of the cam 11, and normally the interposed spring 33'' serves to maintain the switch-blade closely gripped between the contacts 35'. However, if any obstruction prevents the full depression of members 20', which is accompanied by the flexing of spring 33'', the outer frame 35 of said switch therefore, is withheld from corresponding rotation and the switch-blade 36 is withdrawn sufficiently from its contacts 35' to enable spring 36' immediately to open the power circuit and thereby disconnect the motor. Consequently, the attendant at once has his attention drawn to the difficulty, which will be remedied before the machine is again started.

Referring to Fig. 12, which shows the lower end of the delivery table, it is seen that the traveling band will carry the overlaid stack of signatures directly upon the curved sheet-metal receptacle or chute 30, which causes them to assume approximately an edgewise position and enables the attendant to gather quantities of stacked signatures more readily from time to time, as they have accumulated. During their progress down the delivery table, said signatures are initially depressed by the members 20' held by the curved grippers 21 and retained evenly in place by the block 41 and the shoes 32. The block, of course, is removed from the table as soon as it is carried to the lower end thereof by the travel of the canvas band.

Consideration of the foregoing description of the mechanism employed and the resultant functions of the operations thereof, will serve sharply to differentiate my improved delivery mechanism from those which are timed to operate at definite intervals. Instead, it is seen that the entrance of the paper or signature between the delivery rolls immediately serves to place the mechanism in condition for performing its sequence of operation and as this is not at all dependent upon the length of the signature, or its thickness, my improved mechanism requires no individual adjustment for each successive run of work. This results from the fact that the release or expulsion of each successive sheet or signature from between the delivery rolls serves instantly to release the actuating mechanism and causes the machine to complete its cycle of operation.

The simple automatic disconnection of power is a highly advantageous feature; particularly with machines of this character, which are capable of being run at very high speeds, with consequent increased danger of damage in case of accidents. In machines of this class, which ordinarily act upon folded sheets or signatures having several folds, both the gripping and depressing devices are commonly used to prevent the signatures from opening, and thereby cause them to lie evenly upon the delivery table. However, with certain classes of work, the grippers and depressing members have been dispensed with. Preferably the type of weighted shoe employed in connection with my machine, however, is utilized to maintain the sheets or signatures in position. The angularly extending forward edge of said shoe serves as a stop which is engaged by the forward edge of the sheet and brings it to rest upon the delivery table in proper position, as the same is discharged from the delivery rolls. The shoe support is adjust-

able to accommodate sheets or signatures of different lengths. A set screw is provided for the slidable rod 37' adjacent to its pivoted shaft 31' for the purpose of providing this adjustment. The curved chute or receptacle at the lower end of the delivery table, enables the machine to be operated for relatively longer periods without attention by the operative, since the sheets or signatures are assembled or stacked upon the traveling delivery table, they are automatically gathered and compressed in edgewise position within the chute. Accordingly, a much shorter delivery table may be employed, than would be required if the curved receptacle were omitted.

It may be explained that while I prefer to effect the actuation of the several co-acting members upon the release of each sheet from the delivery rolls, this is not necessarily a feature of my invention, which contemplates an actuation by the passing of each sheet through said rolls or equivalent members, and at any suitable time during the passage of the sheet or signature.

Having now described the preferred embodiment of my invention and its mode of operation, I claim as new and desire to secure by Letters Patent, together with such modifications thereof as may be made by mere skill, the following:—

1. In delivery mechanism of the class described, the combination with separable members for passing and delivering sheets of paper, of mechanism for individually depressing and holding the sheets as the same are delivered, and means actuated upon the release of the sheet by said members for controlling said mechanism, substantially as set forth.

2. In delivery mechanism of the class described, the combination with apparatus for passing and delivering sheets of paper, of mechanism for individually depressing and holding the sheets as the same are delivered, and means initiated but withheld from actuation during the passage of a sheet, and operatively active upon the release thereof for controlling said mechanism, substantially as set forth.

3. In delivery mechanism of the class described, the combination with paired delivery rolls, of gripping and depressing members, means for securing their sequential actuation, and an escapement associated with said means and with the delivery rolls adapted to release said members for actuation upon the passage of a sheet through the rolls, substantially as set forth.

4. In delivery mechanism of the class described, the combination with paired delivery rolls, of gripping and depressing members, means for securing their sequential actuation, a controlling cam-shaft governing said members and an escapement actuated by said delivery rolls and controlling the cam-shaft, whereby the latter is released for actuation upon the passage of each sheet or signature, substantially as set forth.

5. In delivery mechanism of the class described, the combination with a traveling delivery table adapted to receive the sheets, of paired delivery rolls successively supplying the sheets to said table, mechanism for intermittently advancing the table as the sheets are delivered, and means connecting said mechanism with the delivery rolls adapted to effect the movement of the table upon release of each sheet from the rolls, substantially as set forth.

6. In delivery mechanism of the class described, the combination with a traveling belt forming the delivery surface or table, of delivery rolls feeding the sheets or signatures thereto, associated gripping and depressing members, means for advancing the delivery table intermittently, and controlling mechanism actuated by the passage of each sheet from the rolls, adapted to effect the intermittent advance of the delivery table and the actuation of the gripping and depressing members, substantially as set forth.

7. In delivery mechanism of the class described, the combination with a traveling belt forming the delivery surface or table, of end rolls over which said belt is movable, an actuating mechanism therefor comprising a wheel or flange, a slotted member engaging said flange and withholding the same from actuation in one direction, its tension-spring, a co-acting slotted actuating member engaging said flange and adapted to rotate it in one direction, its tension-spring, and means for reciprocating the latter member to advance the delivery table, substantially as set forth.

8. The combination with delivery mechanism of the class described including separable spring connected parts, of an electric motor connected to actuate the delivery mechanism, an electric switch in the motor circuit mounted upon said separate spring-connected parts of the delivery mechanism and adapted to be opened automatically for disconnecting the motor immediately said parts are not actuated concurrently, substantially as set forth.

9. In delivery mechanism of the class described, the combination with a traveling band or belt forming the delivery table, of associated gripping and depressing members acting in conjunction therewith, paired delivery rolls passing the sheets or signatures individually to the delivery table, and actuating mechanism connected with said rolls comprising individual means for independently operating said gripping and depressing members and the delivery table,

cams controlling the same and an escapement controllable by said delivery rolls and actuated by the entrance of a sheet or signature therebetween to initiate the cycle of operation and release said cams upon the passage of said sheet or signature therefrom, substantially as set forth.

10. In a controlling and actuating mechanism of the class described, the combination with sheet delivery mechanism, of a cam shaft governing said mechanism, an escapement-member normally retaining said cam-shaft against rotation, an escapement detent and cams mounted to rotate with said shaft when released, a clutch-member thereon tending normally to rotate said shaft, mutilated gearing normally maintained out of mesh but adapted to effect the positive drive of the cam-shaft and means for actuating the escapement to release its detent and permit the partial rotation of the camshaft by the mutilated gearing, substantially as set forth.

11. In a controlling and actuating mechanism of the class described, the combination with sheet delivery mechanism, of a cam shaft governing said mechanism, a friction drive therefor, mutilated gearing normally maintained out of mesh but adapted to effect the intermittent drive thereof, an escapement associated with said camshaft, and an actuating-part mounted to rotate with said shaft when released by the escapement, substantially as set forth.

12. In sheet-delivering mechanism, the combination with a traveling table of an overlying shoe positioned to rest upon the table and its contents, said shoe having an angular extension above the level of the table serving as a stop for the sheets as they are delivered to the table, and means for supporting the shoe in different positions upon said table, substantially as set forth.

13. In sheet-delivering mechanism, the combination with a traveling table, of a shoe positioned above said table having an angular forward extension to form a stop for the sheets as they are fed upon the table, an adjustable pivotal mounting for the shoe, and an adjustable weight associated with the mounting for said shoe, substantially as set forth.

14. In sheet-delivering mechanism, the combination with a traveling delivery table adapted to receive the sheets, of paired delivery rolls successively supplying said sheets to the table, mechanism for intermittently advancing the table, and means connecting said mechanism with the delivery rolls and controlling the former, whereby the table is caused to advance by passing the sheets successively between the rolls, substantially as set forth.

15. In sheet-delivering mechanism, the combination with separable controlling members between which the sheets are successively passed, of a traveling table and means for assembling said sheets upon said table, and mechanism connecting said members with the traveling table, and assembling means, whereby they are controlled by the passage of the sheets, substantially as set forth.

16. In delivery mechanism of the class described, the combination with a traveling delivery table, of means for assembling folded sheets or signatures thereon, actuating mechanism associated therewith, a detent member normally restraining said actuating mechanism, and means controlled by the passing of the sheets to said delivery table for intermittently releasing said detent, substantially as set forth.

17. In delivery mechanism of the class described, the combination with a traveling delivery table, of actuating mechanism therefor, a detent member normally restraining the latter from actuation, delivery rolls, and means connecting said rolls and detent, whereby the latter is actuated to release said mechanism upon passing the sheet between the rolls, substantially as set forth.

In testimony whereof I do now affix my signature in the presence of two witnesses.

ROBERT E. KIMBALL. [L. S.]

Witnesses:

RUEBEN HITCHCOCK,

ALBERT LYNN LAWRENCE.