

Nov. 8, 1932.

B. BOGOSLOWSKY

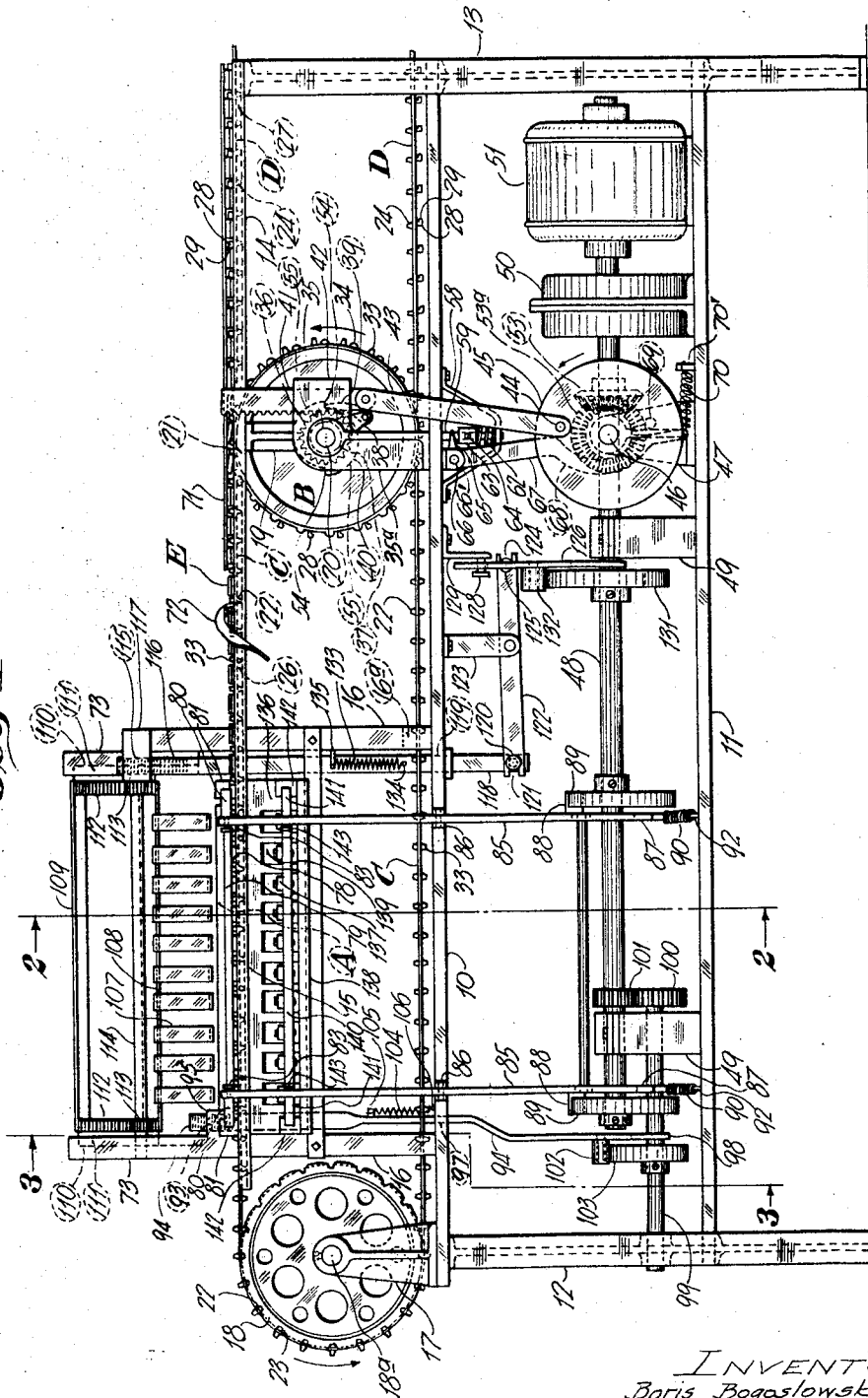
1,887,008

STACKING MACHINE

Filed March 28, 1929

5 Sheets-Sheet 1

Fig. 1.



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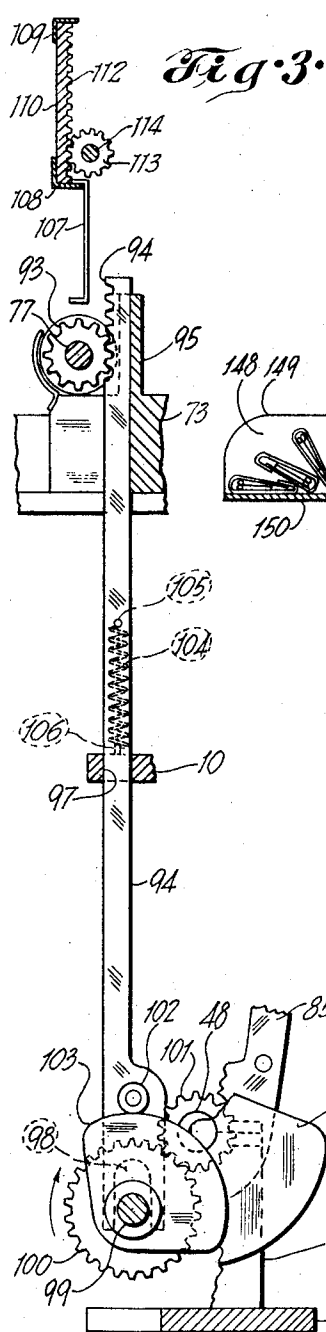
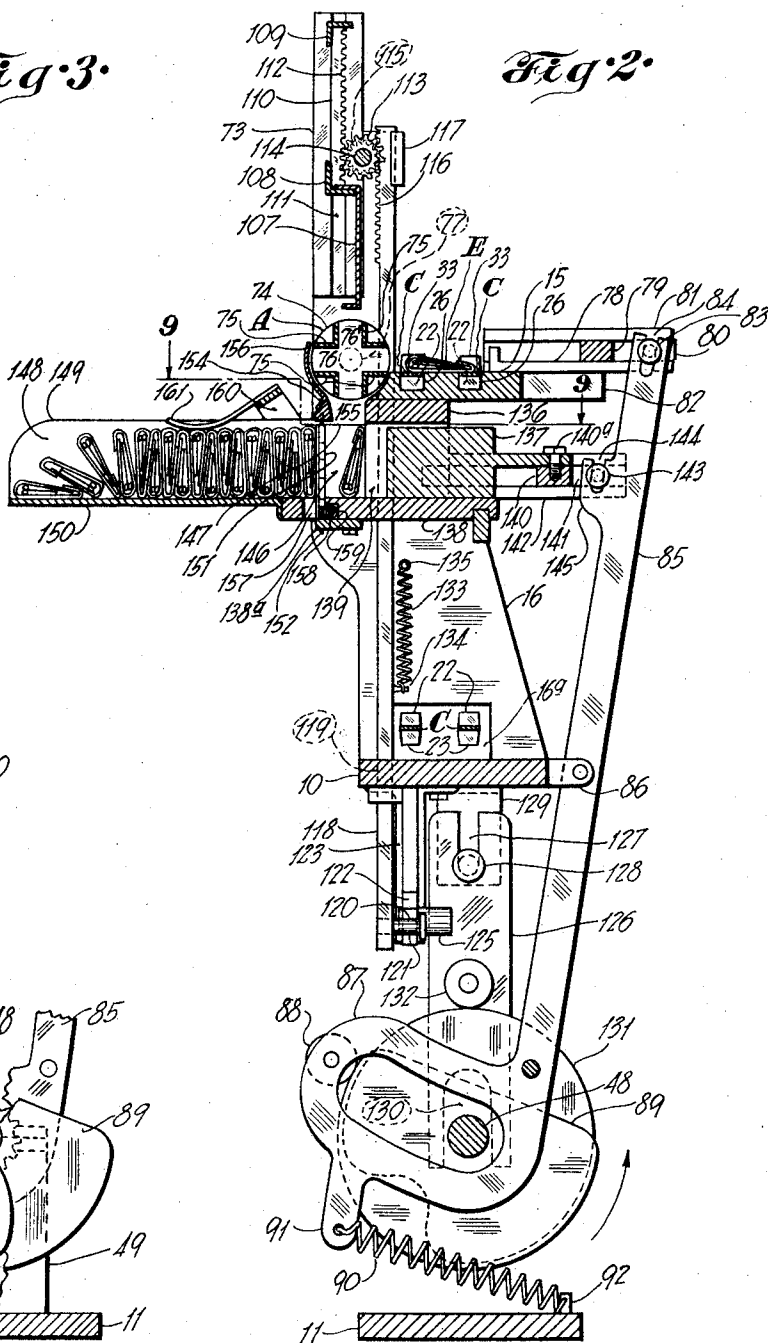
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STACKING MACHINE

Filed March 28, 1929

5 Sheets-Sheet 2



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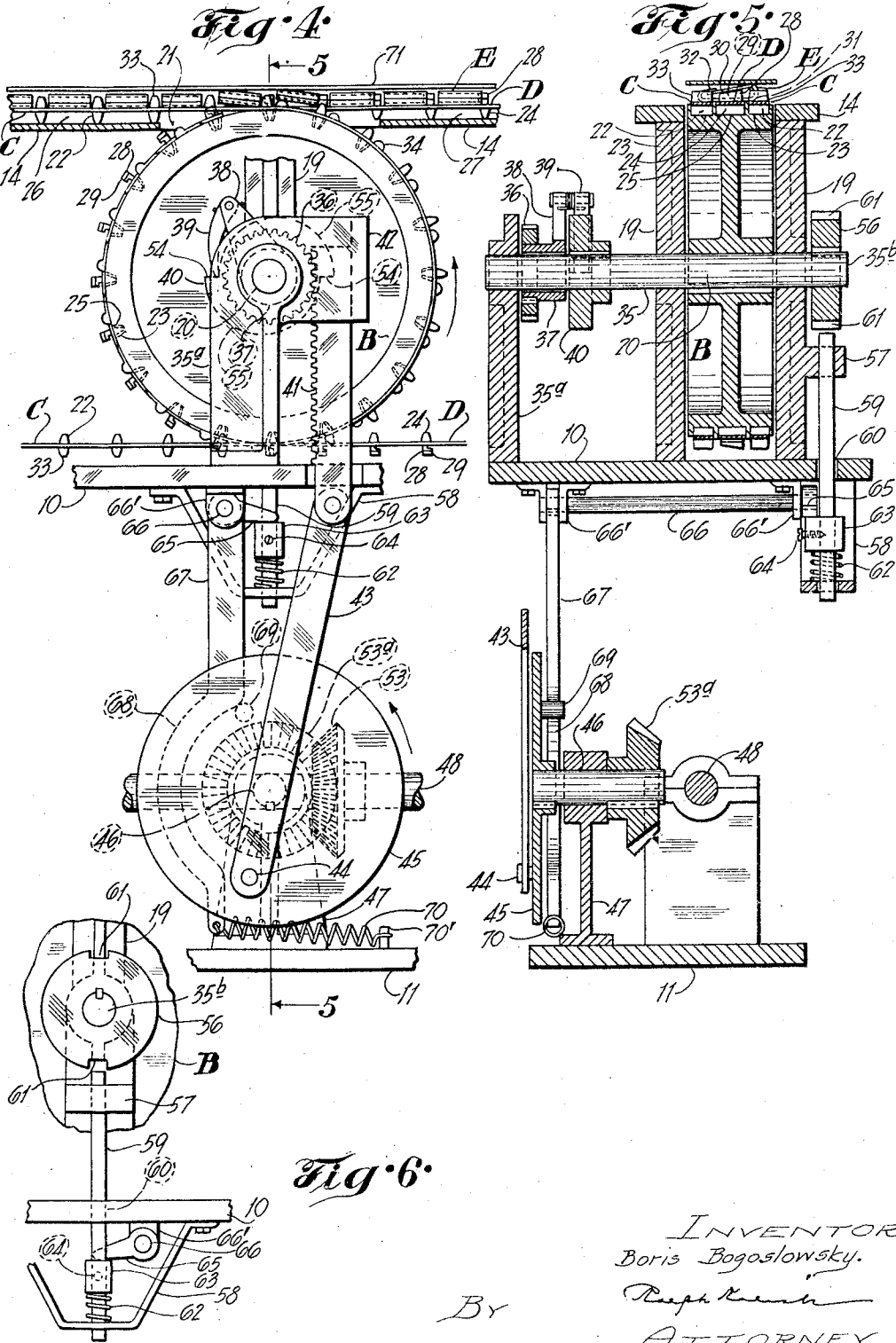
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1,887,008

STACKING MACHINE

Filed March 28, 1929

5 Sheets-Sheet 3



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1,887,008

STACKING MACHINE

Filed March 28, 1929

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Fig. 7.

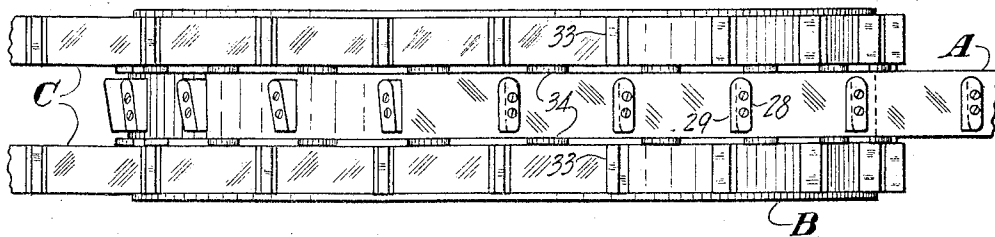
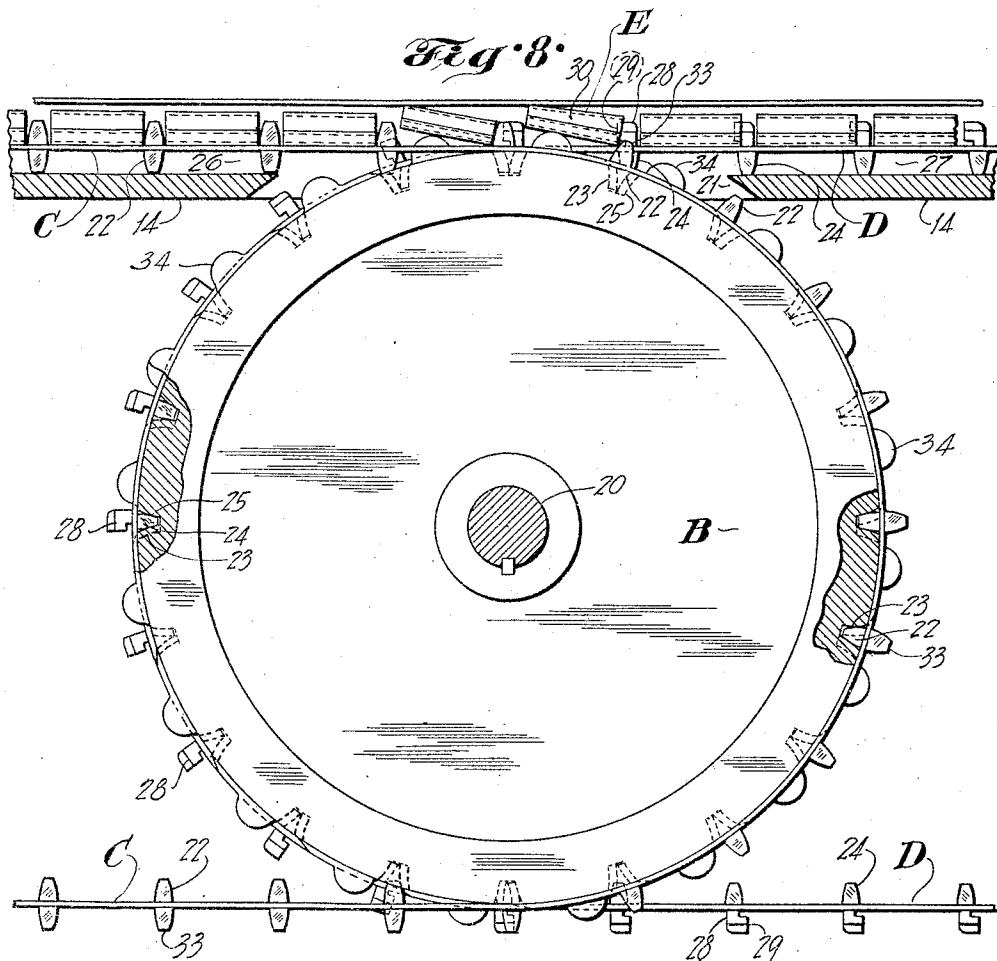


Fig. 8.



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1,887,008

STACKING MACHINE

Filed March 28, 1929

5 Sheets-Sheet 5

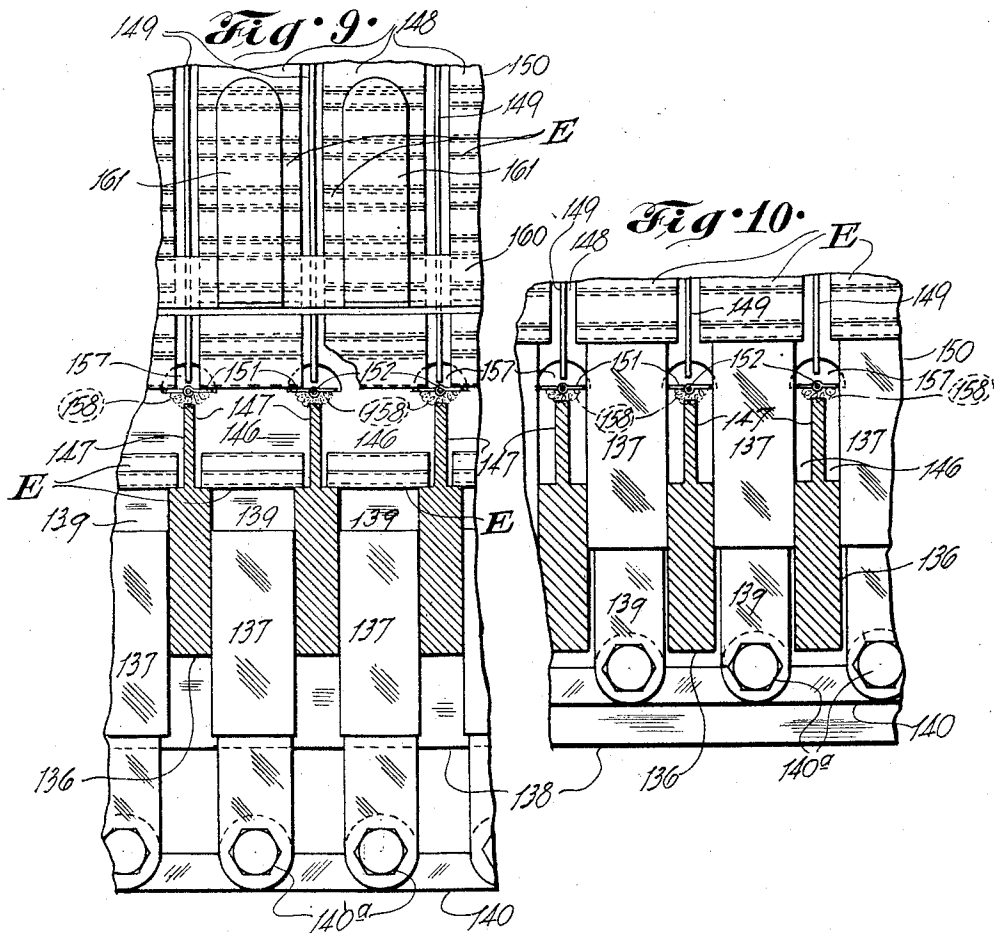
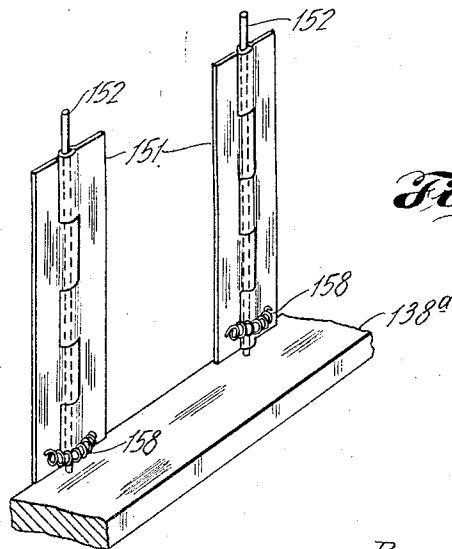


Fig. 11

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STACKING MACHINE

Application filed March 28, 1929. Serial No. 350,737.

This invention relates generally to machines for the manufacture of so-called book-matches and, more particularly, to certain new and useful improvements in machines for stacking the finished book-matches.

Book-matches, as is well known, due to the enclosed or flap-covered paper matches thereof, taper in thickness from end to end and, so far as I am aware, are delivered or discharged from the producing machine with their tapered end trending in the same direction. For compactness in packing for shipment, it is desirable that the books alternate in the trend of their tapered end. Economy in packing, also, demands speed and the elimination of manual labor, and manual operations to effect stacking and alternate reversal of the books for convenient and compact packing of the book-matches in cartons for shipment are laborious and time-consuming.

My present invention has hence for its prime object the provision of a machine adapted automatically to suitably take the book-matches as they are delivered or discharged from the producing machine proper with their tapered end trending in the same direction, then, in groups of a desired number, alternately reverse the so delivered book-matches, and then stack the book-matches, so alternating in groups in the trend of their tapered end, in chutes or receptacles, from which the book-matches may with ease and facility be removed in the desired number or quantity for compact carton-packing and shipment, a great saving and economy in labor, time, and production costs resulting and accruing.

My invention has for a further object the provision of a machine of the kind and for the purpose stated which is adapted to work hand in hand and in synchronism with the producing-machine, which may be readily constructed to automatically, with speed and exactness, handle mass production, which requires merely the over-seeing labor of a single operative, and which is efficient in the performance of its intended functions.

And with the above and other objects in view, my invention resides in the novel fea-

tures of form, construction, arrangement, and combination of parts hereinafter described and pointed out in the claims.

In the accompanying drawings (5 sheets),—

Figure 1 is a side elevational view of a stacking machine embodying my invention;

Figure 2 is a sectional view of the machine taken approximately along the line 2—2, Figure 1;

Figure 3 is a sectional view of the machine taken approximately along the line 3—3, Figure 1;

Figure 4 is an enlarged fragmentary detail view of the machine, showing the intermittently movable feeding-wheel and associated parts, the view having the same aspect as Figure 1;

Figure 5 is a sectional view, approximately along the line 5—5, Figure 4, taken transversely across the machine on the axial plane of the feeding-wheel;

Figure 6 is an enlarged fragmentary detail view of the feeding-wheel locking-means, taken from the side of the feeding-wheel opposite to that shown in Figure 4;

Figure 7 is an enlarged fragmentary plan view of the feeding-wheel and the belt-conveyers co-operating therewith, other parts of the machine being omitted;

Figure 8 is an enlarged fragmentary side view of the feeding-wheel and its co-operating conveyers, the conveyer-support being shown in section, but other parts of the machine being omitted, the view being complementary to Figure 7;

Figure 9 is an enlarged fragmentary sectional view approximately along the line 9—9, Figure 2;

Figure 10 is a fragmentary view similar to, but more circumscribed than, Figure 9; and

Figure 11 is an enlarged detail view of the swingable chute-doors and their supporting hinge-posts, a fragmentary portion of the machine being shown, but other parts thereof being omitted.

Referring now more in detail and by reference characters to the present drawings, which illustrate a preferred embodiment of my invention, the main supporting frame-

work of the machine, in the form shown, includes a pair of suitable vertically spaced superposed horizontally disposed beam-members 10, 11, supported by upstanding end-frames 12, 13. The one end-frame 12 terminates at the upper horizontal beam 10, while the opposite end frame 13 continues upwardly beyond said beam for supporting one end of a horizontally disposed and lengthwise channeled member or conveyer-support 14, whose other end merges into, and is supported by, a horizontally disposed feed-plate 15, as presently to be described, supported, in turn, by a pair of suitable bracket members 16 longitudinally spaced along, and upstanding from, the beam 10 adjacent the end-frame 12, as best seen in Figure 1. It may be stated here that the brackets 16 also support the slotted reversing wheel A and the assembly means associated therewith, all presently fully described.

Also upstanding from the beam 10, and located preferably directly over the end-frame 12, is a pair of brackets 17, 17, suitably spaced laterally of the machine, journaled for rotation upon which is a shaft 18a carrying a pair of axially spaced sprocket-wheels 18, 18. And further upstanding from the beam 10 and located suitably intermediate the reversing mechanism A and the other or right-hand end of beam 10 (reference being made to Figure 1), is a second pair of spaced brackets 19. Mounted on an axle or shaft 20 journaled through and axially presented outwardly from each of said bearings 19, 19, for purposes presently appearing, and disposed between the brackets 19, is a drum or feeding-wheel B.

The feeding-wheel B is rim-wise or peripherally presented through a suitable slot 21 in the floor of the channeled-member 14 and is operatively associated, on the left or on the side towards the reversing wheel A, as best seen in Figure 1, with the sprocket wheels 18, 18, by a pair of laterally spaced co-operating conveyers or preferably steel belts C, C, each having teeth 22 of suitable form and spacing for co-operation each with tooth-receptive sockets 23 provided circumferentially upon the respective sprocket-wheels 18, 18, (Figure 1) and in circumferential rows axially spaced upon the rim or periphery of the feeding-wheel B (Figure 8).

The belts C, C, pass around the wheel B, thence over the channeled-member 14 and feed plate 15, thence around the sprockets 18, and return to the wheel B through suitable apertures 16a in the brackets 16. On the side away from the reversing mechanism A or towards the end-frame 13, which corresponds, as presently appearing, to the end of the stacking machine that is presented towards the match-book machine proper (not shown), the feeding-wheel B cooperates with

a conveyer or preferably steel belt D, which forms part of the discharging-end of the match-book machine proper, with which machine my present stacking machine is particularly adapted for association. The belt D also has teeth, as 24, of suitable form and spacing for co-operation with tooth-receptive sockets 25 (Figure 8) provided in a circumferential row in the rim or periphery of the feeding-wheel B intermediate the rows of sockets 23. The sockets 25, however, for a purpose presently appearing, have an angular lag on the wheel B with respect to the sockets 23; and it will be understood that the conveyer or belt D passes around a suitable wheel (not shown) provided in or forming part of the match-book making machine proper.

Provided in the base of the channeled-member 14 from the feeding-wheel B to the reversing wheel A, and continuing in the top surface of the feed-plate 15, is a pair of laterally spaced longitudinal grooves 26, 26, each guidably receiving the teeth 22 of the respective belts C, C, said teeth 22 preferably sliding along the bottom of the grooves 26 on movement of the belts C for supporting the upper run or book-conveying portion thereof on a level with the feed-plate 15, that is to say, the top surface of each belt C is approximately flush with the top surface of the feed-plate 15 for the lateral discharge of the book-matches from the belts C, C, across the feed-plate 15 to the reversing wheel A, as will presently appear.

In the portion thereof extending from the wheel B towards the book-match-machine proper, the base of the channeled member 14 is provided with a medial longitudinal groove 27, whose longitudinal axis, if prolonged beyond the wheel B, lies medially to the like axis of the grooves 26, 26. The groove 27 guidably receives the teeth 24 of the belt D, said teeth 24 preferably sliding along the bottom of the groove 27 on movement of the conveyer D for supporting the upper run or book-match carrying portion thereof with its upper surface on a level with, for presentation between, the upper surfaces of the respective upper runs of the belts C, C, as the belts C respectively change from a tangent to an arcuate path and from an arcuate to a tangent path, for purposes presently appearing.

The upper run of the belt D and the upper runs of the belts C, C, respectively, engage and disengage the periphery of the feeding wheel B at a common point of tangency thereto, the first belt D circumferentially entering on the wheel B as the second belts C, C, tangentially leave the same. The upper runs of the belts B and C, C, are thus adapted to travel in substantially the same plane, and to such extent the conveyers C are, as it might be said, a linear continuation of the dis-

charging conveyer D, as best seen in Figure 8.

The purpose of the belts D and C, C, is to transport the match-books, as E, produced by the match-book-machine proper from the latter to the reversing wheel A in a periodic manner or sequence, as presently appearing. The book-match-machine delivers the match-books E successively to the belt D, the opposite ends of the books E being laterally presented from each side of the belt, which supportingly engages the middle portion of each book, for a purpose shortly appearing. Thus the books E rest on the belt D with, for example, their larger ends, corresponding to the headed ends of the matches contained therein, all overhanging the same side of the belt, this being, in the present instance, the right hand side of the belt D, when looking in the direction of movement of the upper run thereof. Prior, however, to packing of the match-books in their containers (not shown), they are automatically arranged by the reversing mechanism A with their headed ends, for example, in alternately opposite directions, and stacked in a row in a convenient receptacle or assembling chute, from which the packer or operative attending the machine removes them in groups for packing in suitable containers or boxes, in a manner well known to those skilled in the art, and as will be more fully set forth as the description proceeds. I may here state, however, that by arranging the match-books in alternate endwise positions sidewise in a row in the assembling chute, the books are not only in condition to be easily grasped or handled in groups, but the maximum number of books may be packed in a given container.

Before proceeding with the description of the reversing-wheel A and stacking mechanism proper, I will describe the shifting means for unloading or taking off the match-books E from the belt D for delivery to the belts C, C. Such shifting is required, for the match-books E are held, as presently appears, against lateral movement while on the belt D, in order that certain operations may take place while the belt D is yet in operative association with the match-book-machine proper, such, for example, as the operation of tucking the cover-flap of the book under the stapled end thereof, as is well known to those skilled in the art. On the other hand, the successive match-books are preferably presented to the reversing wheel A in lateral adjacency thereto, so that they may be sidewise shifted off the belts C, C, into the pocketed oscillatory member A, as will more particularly presently appear.

As best seen in Figure 5, the belts D and C, C, at their common point of tangency on the feeding-wheel B, all lie in the same transverse plane, and in transferring or unloading books E from the belt D to the belts C, C, the belt D passes over one side of the wheel B

downwardly between the belts C, C, and away from the middle portion of a book E, while the belts C, C, correspondingly rise over the other side of the wheel B on each side of the belt D to supportingly pass under the opposite ends of the book. Hence the belt D is preferably made of suitable width to pass between the belts C, C, and is also made correspondingly narrower than the length of a book, so that the ends thereof respectively overhang the belt D, for engagement by the belts C, C.

The match-books E, as they rest on the belt D, lie each between successive ones of up-standing hook-spurs 28 suitably spaced along the belt D to accommodate the width of the match-book therebetween, each spur 28 being preferably disposed opposite one of the teeth 24. The frontally projected hook 29 of each spur 28 is shaped preferably with its top face sloping to one side conformably to, and for engaging presentation partially between, the flap 30 and the back 31 of the cover of the match-book E. I may here state that the flap 30 is simply a continuation of the back 31, folded over the headed ends of the matches of the book, the free end of the flap 30 being tucked under the stapled end fold 32 of the match-book cover, where the matches are secured in the book, the whole forming a wedge-like or tapering article of which the larger end corresponds to the headed ends of the matches therein.

Disposed opposite the respective teeth 22, and transversely across the belts C, C, in suitable spaced relation therealong to accommodate the width of a match-book therebetween, are conveyer bars 33, which, in arcuately passing over the wheel B, so engage the books E on the tangent run of the belt D as to move or shift each book forwardly thereon for disengagement of the book from the co-operating hook 29 of the abutting spur 28, in the following manner:

Although the belts D and C, C, move in unison, the sockets 25 have, as stated, an angular lag with respect to the sockets 23 in the wheel B, and, therefore, the radial plane of each of the teeth 23 and the oppositely positioned bar 33 is in advance of the radial plane of the sockets 24, which angular lag is so proportioned that each spur 28, whose advance on the tangent portion of the belt D is, of course, determined by the relative location of the sockets 25 when engaging the teeth 24, crosses the rotating radial plane of a pair of co-operating bars 33 at a distance rearwardly of the tangent point of the belt D on the wheel B about equal to the spacing of said spurs 28 on said belt D. Hence the bars 33, in following their arcuate path, have a forward movement relatively to the spurs 28, which at this point are moving in a tangent path, and the bars 33 further have an upward movement be-

tween the successive books E on the belt D for forwardly shifting engagement therewith. Preferably, to facilitate the presentation of the bars 33 between the successive books E, the front and rear faces of the bars outwardly slope towards each other, that is to say, the bars 33 have a wedge-like or tapering cross-section, best seen in Figure 8, and I may here point out that the tapered or outer end of the respective bars 33 first engages the books E as they lie on the belt D, so that in this way the bars 33 may have a greater angular lead over the spurs 28 than would be the case if the bars 33 were constructed with their faces parallel.

To facilitate such forward shifting movement of the books E with respect to the spurs 28, lifting lugs 34 radially presented from the periphery of the wheel B in circumferential rows on each side of the belt D rise, on rotation of the wheel B, between the opposing side edges of the belts B and C, C, to lift or elevate the forward side of the successive match-books E, so that the latter may ride over or upwardly clear the preceding spur 28 as the latter drops downwardly between the belts C, C, the respective lifting lug 34, in turn, also dropping below the level of the belts C, C, to permit the match-book E to rest with its opposite ends on the respective belts C, C, between adjacent ones of the series of conveyer-bars 33 thereon.

In the present machine, the feeding-wheel B not only coacts with the belts C and C, C, for unloading or transferring the match-books E from the one or discharging belt D to the other or stacker-belts C, C, but also serves as a driving member for actuating said belts preferably in a periodic or intermittent manner, and, for a purpose soon to appear, the match-books E are correspondingly fed to the stacking apparatus in groups of ten at a time, although, of course, the number of books in each group may be more or less, at the option of the person constructing the machine or to suit the requirements at hand.

I have found, as when stacking match-books of a certain size, that the wheel B may conveniently have twenty pockets 22, 24, in each circumferential row thereof, corresponding to the feeding of ten books, as E, for each half-revolution of the wheel B. In order that certain operations may take place after each feeding of ten match-books E, it is preferable that the wheel B have an operative or intermittent feeding period of a half-revolution, followed by an idle period corresponding to and in synchronism with the operative period of the reversing wheel A of the stacking apparatus, all as will presently more particularly appear.

The axle or shaft 20 has one of its extended ends, as 35, as best seen in Figure 5, journaled in a bearing-bracket 35a upstand-

ing from the beam 10, and sleeved on the shaft-extension 35, is a pinion 36 whose hub 37 carries an arm 38 pivotally supporting a spring-set pawl 39 co-operating with a ratchet-wheel 40 keyed intermediately on the shaft-extension 35. The pinion 36, as shown in Figure 4, is adapted for oscillation by a rack 41 reciprocable in a guide-member 42 carried by the bracket-bearing 35a. The rack 41 at its lower end is operatively connected pivotally by a link 43 with a crank-pin 44 presented from a rotatable crank-disc 45 fixed on one end of a continuously rotating jack-shaft 46 journaled through a suitable bearing 47 upstanding from the lower beam 11.

A horizontal drive-shaft 48, intermediately journaled in suitable bearings 49, 49, upstanding from the lower beam 11, is driven through a suitable speed reducing mechanism 50, well known to those skilled in the art, by a suitable prime mover or motivating agency, as an electric motor 51. The drive-shaft 48 carries a bevel-gear 53 mounted for co-operation with another bevel-gear 53a keyed to the end of the jack-shaft 46 on that side of the bearing 47 opposite the crank-disc 45. Hence, when the motor 51 is in operation, the crank-disc 45 is continuously rotated for reciprocating actuation of the rack 41. The drive shaft 48, it may be stated, is extended to the other end of the machine for suitable actuation of the reversing and stacking apparatus, as will presently appear, and serves in such wise as an operating member common to the feeding, reversing, and stacking mechanisms of the machine for the proper co-operative and synchronized functioning thereof.

The ratchet-wheel 40 is provided with two diametrically disposed radial tooth-faces 54, 54, the root of each tooth-face being joined to the extremity of the other by an arc, as at 55, 55, over which the pawl 39 may ride from tooth-face to tooth-face when the rack 41 is moved downwardly by the rotating crank-disc 45 and its carried crank-pin 44, the arm 38 thereby swinging in non-operative or retrograde movement over the ratchet-wheel 40 until the pawl 39 slips over the next tooth-face 54, at which time, by suitably proportioning the several parts, the crank-pin 44 will be about at its lower dead center on the disc 45, as shown in Figure 4. As the crank pin 44 is carried upwardly and past its lower dead center by the continuously rotating crank-disc 45, the rack 41 is moved upwardly to rotate the pinion 36, thus swinging the arm 38 and its carried pawl 39 in operative movement, the pawl 39 impinging the adjacent tooth-face 54 for rotation of the ratchet-wheel 40 and the shaft 20 keyed thereto, thereby rotating in like manner the feeding wheel B, until the crank-pin 44 has reached its upper dead center on the disc 45,

when the operative period of the rack 41 is terminated and its retrograde downward movement begun. During the operative period of the rack 41, the feeding wheel B is preferably rotated one-half revolution, for the reasons stated, which rotation, as described, feeds ten match-books E from the belt D to the belts C, C.

The reversing operation of the stacking apparatus, as will presently be described, occurs while the crank pin 44 passes from its upper dead center to its lower dead center, during which interval the wheel B is at rest and the pawl 39 rides over the cam-shaped ratchet wheel 40 to engage the next successive tooth-face 54 thereon, when the foregoing operation is repeated.

During the idle period of the feeding wheel B, it is desirable to lock the wheel B against rotation in a selected position, as the reversing operation aforesaid requires the alignment of the match-books E carried by the belts C, C, with certain portions of the reversing wheel A. For this purpose, a locking disc 56 (Figures 5 and 6) is suitably keyed preferably to the other or opposite extension 35b of the shaft 20. Having its upper end slidable in a guide-member 57 disposed on the adjacent bracket 19 and its lower end slidable in a bracket 58 depending from the upper beam 10, is a lock-bar 59 reciprocally passed through an aperture 60 in the beam 10 and adapted at its upper free end for projection into diametrically oppositely-disposed locking-notches 61 provided in the periphery of the locking-disc 56. Normally the locking-bar 59 is upwardly urged for locking engagement with the lock-disc 56 by a spring or tensional member 62, whose lower end abuts the bracket 58 and whose upper end abuts a tappet-block 63 slidably mounted on the lock bar 59 and adjustably secured thereon by a set-screw or like means 64. Thus the lock-bar 59 is spring set or pressed for operative engagement with the lock-disc 56 for normally retaining or locking the feeding-wheel B in selected position, but the bar 59 may be withdrawn out of engagement with the lock-disc 56 for permissive rotation of the wheel B by a tappet-arm 65 mounted for the purpose on one end of an oscillatory shaft 66 journaled in suitable bearing-brackets 66', 66'', depending from the beam 10, the shaft 66 oscillating or rocking at selected or periodic intervals for actuation of the tappet arm 65 to depress or shift the lock-bar 59 in releasing movement from the lock-disc 56 against the tension of the spring 62.

For oscillating the shaft 66, a cam-lever 67 is dependingly mounted on the other end of the shaft 66 from the tappet arm 65, the lower end of the lever 67 having an arcuate cam-portion 68 engageable, for swinging movement of the lever 67, by a pin 69 preferably laterally or axially presented from the crank-

disc 45, as best seen in Figure 5, the pin 69 being so disposed on the crank-disc 45 as to operatively engage the lever 67 about the time the crank-pin 44 has reached its lower dead center (Figure 4), whereby, through co-operation of the pin 69 with the cam-portion 68 of the lever 67, the shaft 66 will be rocked or oscillated to engage the tappet-arm 65 with the block 63 of the lock-bar 59 for downward actuation of the latter in lock-disc releasing movement preferably just before the commencement of the operative period of the rack 41 for feeding or operative rotation of the wheel B (Figure 6). A spring or like tensional member 70 has one end attached to the lower end of the lever 67 and its other end attached to a pin 70' upstanding from the beam 11 for yieldingly returning the lever 67 to normal position after disengagement thereof by the pin 69, but the latter preferably slidably or operatively engages the arcuate cam-portion 68 of the lever 67 for holding the lock-bar 59 in lock-disc releasing position until just before the termination of the operative period of rotation of the wheel B (Figure 1). The pin 69 is then disengaged from the lever 67 for retractive movement thereof by the spring 70 to permit the lock-bar 59 to ride upwardly under urging of the spring 62 and engage one of the notches 61 in the lock-disc 56, as the latter is brought into registration with the lock-bar 59 by rotation of the wheel-shaft 20.

Extending from the match-book receiving end of the machine partially over the upper runs of the belts C, C, is a retaining-member or strip 71 flatwise presented over the belts D and C, C, by any suitable means (not shown). If, as occasionally happens, the match-book making machine does not properly tuck a flap, as 30, under the stapled end 32 of a match-book E or if a match-book is improperly shifted from the belt D onto the belts C, C, the defective or improperly shifted match-book E will slidably engage the strip 71 as the successive books are moved thereunder by the belts C and C, C, until the end of the strip 71 is passed, when the said so-called defective match-book will be engaged by a throw-out member 72 spirally mounted over and across the belts C, C, whereby the defective match-book will be automatically ejected from the belts C, C, the other books E being conveyed to the reversing wheel A, now to be described.

Extending laterally adjacent to and along the feed-plate 15, for a distance preferably corresponding to ten match-books E as they lie on the belts C, C, is an oscillatory member A, termed a reversing-wheel, which is mounted for rotation in upwardly extended portions 73 of the brackets 16. The wheel A, best seen in cross-section in Figure 2, comprises a plurality of discs or circular partitions 74, there being eleven in the present in-

stance, axially aligned and spaced from one another to accommodate a match-book E edgewise between adjacent pairs of discs, the discs 74 being respectively united to form a unitary structure by four relatively spaced angle members 75 arranged in quadrature between the discs to provide diametrically opposite series of open-end slots or chambers, as 76, 76', intersecting at right angles to each other, there being, in the present machine, ten of said slots or chambers, formed by and between the eleven discs 74, in each of said series.

Stub-shafts 77 are axially presented from the opposite ends of the wheel A and journaled in the bracket extensions 73 with their center of rotation somewhat above the plane of the top surface of the feed-plate 15, so that, when one series of the chambers 76 or 76', as the case may be, is horizontally positioned to receive the match-books E from the feed-plate 15, the lower walls of that series of chambers will be approximately flush with the top of the feed-plate 15.

The belts C, C, are brought to rest with a group of ten match-books E thereon opposite one series of the chambers 76 or 76', whichever happens to be presented to the feed-plate 15 at the moment (Figure 2). From this position, the match-books E are shiftably fed from the belts C, C, across the feed-plate 15 to the respective series of chambers 76 or 76' of the reversing wheel A by a corresponding series, ten in number, of reciprocatory plungers 78, slidable over the top surface of the belts C, C, and feed-plate 15 in respective paths aligning with the presented chambers of the reversing wheel A, the several plungers 78 being united or conjoined for simultaneous reciprocatory movement by a bar 79 extending from one end plunger to the other and terminating at each end in pin-blocks 80 slidable in horizontal guide-members 81 supported on brackets 82 laterally presented from each end of the feed-plate 15 (Figure 2).

Each block 80 carries a pin 83 working in a longitudinal slot 84 in the upper end of a lever 85 intermediately pivoted on a bracket 86 suitably presented from the beam 10, as shown, each lever 85 having at its lower end a slotted arm 87 working over the shaft 48 and carrying a roller 88 riding on a segmental edge-cam 89 supported, in turn, by and for rotation with the shaft 48 for swinging actuation of the lever 85 in synchronism with the idle period of the feeding wheel B, the cam 89 having a concentric portion for holding the lever 85 in position corresponding to the retracted position of the plungers 78 during the operative period of the feeding wheel B, and falling and rising portions for reciprocatory movement of said plungers first to feed or shift the match-books E to the reversing wheel A and then to retract

the plungers 78 in preparation for another operative cycle of the feeding wheel B and consequent successive movement of another group of match-books into the path of the respective plungers 78.

The roller 88 is caused to follow the falling portion of the cam 89 by a spring or tensional member 90 having its one end attached to a lug 91 on the lever 85 and its other end attached to a pin 92 upstanding suitably from the beam 11. The levers 85 are thus spring set or tensionally actuated for feeding movement of the plungers 78, in order that damage to the mechanism may be avoided in the event of accidental derangement of the co-acting parts thereof.

When a group of ten books E, or as many books as may be contained on those portions of the belts C, C, that are opposite the reversing wheel A, have been thus shifted into the respective presented series of slots or chambers of the wheel A, as 76, for example, the wheel A is given a quarter turn on its axis, thus directing the contained books E from a horizontal to a vertical position, with the larger or headed ends of the matches pointing upward or downward according to the stroke of the wheel A, so that the books E thus disposed may be ejected downwardly from the reversing wheel A in a manner more particularly soon to appear (Figure 2).

For oscillating the slotted or reversing wheel A, a pinion 93 is fixed on one of the stub-shafts 77 (Figure 3), co-operatively meshing with which is a vertically reciprocable rack 94 whose upper end is slidable in a guide-bracket 95 forming a part of one of the bracket-extensions 73 (Figure 1) and whose other end-portion is intermediately slidable through a guide-slot 97 in the beam 10. At its lower end, the rack 94 is bifurcated to form a slot 98 working over and guided by a jack-shaft 99 having one end journaled in the frame 12 and its other end journaled through the adjacent one of the bearing-brackets 49 (Figure 1), the latter end of the jack-shaft 99 carrying a gear 100 co-operating, preferably in a ratio of two-to-one, with a pinion 101 fixed on the drive shaft 48.

Adjacent its bifurcated or slotted end 98, the rack 94 carries a roller 102 having co-operative engagement with an edge-cam 103 supported for rotation by and with the jack-shaft 99 for reciprocation of the rack 94, the cam 103 having a concentric portion for holding the rack 94 in elevated position during one reciprocation of the plungers 78, thence a falling portion for downward movement of the rack 94 and consequent rotation of the wheel A a quarter turn in one direction while the plungers 78 are held in retracted position and the feeding wheel B is actuated to bring another group of ten

books E in front of the reversing wheel A, thence a concentric portion corresponding to a stationary period of the rack 94 while the plungers 78 are again reciprocated for shifting another group of match-books E into the wheel A, and thence a rising portion for raising the roller 102 onto the first concentric portion of the cam 103 to elevate the rack 94 and rotate the wheel A a quarter turn in the other direction while the plungers 78 are again held in retracted position and the wheel B passed through another feeding cycle, as described. The roller 102 is caused to follow the contour of the cam 103 by a retractile spring or tensional member 104 whose one end is attached to a pin 105 on the rack 94 and whose other end is attached to a pin 106 upstanding from the beam 10, as best seen in Figures 1 and 3.

Thus the reversing wheel A is oscillated first in one direction and then in a reverse direction, each oscillation or stroke of the wheel A corresponding to an operative feeding period of the wheel B, and each idle period of the wheel A corresponding to an operative period of the plungers 78. By this construction, the wheel A is oscillated in a manner to receive successive groups of match-books E and dispose them alternately in reverse positions as to their larger and thinner ends, that is to say, during one or a downward actuation of the rack 94, the wheel A is rotated to bring its contained match-books E in vertical position with their smaller or stapled ends presented downwardly, and on the next succeeding upward stroke of the rack 94, the wheel A is rotated to bring its contained match-books E in vertical position with their larger or headed ends presently downwardly (Figure 2).

After each stroke or oscillation of the reversing wheel A, the contained match-books E therein may drop, by reason of their own weight, out of the wheel A, or they may be ejected from the wheel A by a series of push-out bars 107 reciprocably mounted in vertical alignment with, for entry into, the series of respective slots or chambers 76 or 76', whichever may at the moment be upwardly presented thereto. The bars 107 depend for reciprocation from the lower horizontal member 108 of a rectangular frame which includes an upper horizontal member 109 united at each end to the lower member 108 by vertical rack-bars 110 each slidable in vertical guide slots 111 provided in the respective bracket extensions 73. Each of the rack bars 110 carries a rack 112 cooperating with respective pinions 113 fixed on a shaft 114 suitably journaled in the respective bracket extensions 73. At one end, the shaft 114 carries a pinion 115 co-operating with a vertically reciprocable rack 116 whose upper end is slidable in a guide-bracket 117 forming part of the adjacent bracket extension 73

(Figure 1). The depending portion 118 of the rack 116 is intermediately guided in a suitable aperture 119 in the beam 10, and at its lower end, the rack 116 has a pin 120 co-operatively working in a slot 121 in one end of a lever 122 pivoted intermediately its ends on a bracket 123 depending from the beam 10 (Figure 1). At its other end, the lever 122 is also slotted, as at 124, for co-operation with a pin 125 laterally presented from a vertically reciprocable member 126, whose upper end is bifurcated, as at 127, for sliding engagement with a guide-pin 128 carried by a bracket 129 depending from the beam 10, and whose lower end is slotted, as at 130, for guiding co-operation with the shaft 48 (Figure 2).

Fixed upon the drive shaft 48 is an edge-cam 131, co-operating with which is a roller 132 carried by the reciprocable member 126, the cam 131 having a concentric portion normally holding the member 126 in elevated position corresponding to the retracted or elevated position of the frame 108, 109, and the push-out bars 107 carried thereby. Suitably located in correspondence with an idle period of the reversing wheel A, the cam 131 has falling and rising portions for reciprocating the push-out bars 107 through the wheel A for ejecting the vertically contained match-books E therefrom just prior to actuation of the plungers 78 for feeding the succeeding group of match-books E from the feed-plate 15 to the then horizontally presented series of the chambers 76 or 76', as the case may be.

The roller 132 on the reciprocable member 126 is caused to follow the falling portion of the cam 131 by a retractile spring or tensional member 133 having one end attached to a pin 134 on the rack-extension 118, and its other end attached to a pin 135 on the adjacent bracket 16. The push-out bars 107 are thus yielding for ejecting movement to avoid damage to the reversing mechanism in event of the accidental derangement thereof.

Reciprocably mounted in a plunger frame 136, disposed between the brackets 16 below the feed-plate 15, is a plurality of series of stacking plungers 137 slidable on a floor-plate 138 extended under the reversing wheel A, as presently appearing, there being ten of the plungers 137 in the present instance, corresponding in such regard to the series of ten slots or chambers 76, 76', in the wheel A, each plunger 137 working respectively in one of a group of ten guideways 139 provided in the frame 136.

The group of ten plungers 137 is transversely united for simultaneous reciprocal movement by a bar 140 attached to the respective plungers by suitable fastening elements 140a, the bar 140 extending from end to end of the group of plungers 137 and terminating at each end in pin-blocks 141 slid-

able in horizontal guide-members 142 presented from each end of the frame 136. Each block 141 carries a pin 143 working in a vertically disposed slot 144 in an arm 145 of the lever 85 for reciprocation thereby of the plungers 137 simultaneously with like movement of the feeder-bars 78. On their advancing movement, the plungers 137 are respectively projected into a group of ten match-book receiving chambers 146 formed by partitions 147 upstanding from the floor plate 138 (Figures 9 and 10), the series of chambers 146 vertically opening to, and registering with, the respective vertically presented series of chambers 76, 76', in the reversing wheel A, but in a horizontal plane therebelow, for the reception of the match-books E ejected from the wheel A.

In dropping from the wheel A, the match-books E lodge in the respective chambers 146 and in the path of the respective plungers 137, which latter, as they advance, impinge the several match-books E so deposited in their path and push the same from the respective chambers 146 into stack or assembling chutes 148 presented rearwardly from the floor plate 138, the floor of each chute 148 being flush with the floor plate 138.

Preferably the chutes 148 are formed by spaced partitions 149 upstanding from a horizontal plate 150 extending across, and rearwardly presented from, the floor plate 138, each chute 148 being aligned with a respective chamber 146, but partially closed or cut off therefrom by suitably spaced opposing spring-set swingable doors 151 hingedly mounted on posts 152 (Figures 9 to 11) upstanding from a plate 138a preferably detachably supported from the floor-plate 138 (Figures 2 and 11) and having their upper ends supportingly presented suitably into a transverse member 154 extending between the brackets 73, 73a, the member 154 being spaced from the feed-plate 15 and the upper portion of the frame 136 to provide therebetween a throat, as at 155, communicating with the chamber 146 below and the particular chambers 76, 76' in the wheel A above. The member 154 also carries an arcuate stop wall 156 partially closing the rear side of the wheel A to prevent the overrun of the match-books E therein as they are shifted thereinto, as shown in Figure 2.

Each hinge-post 152 (Figure 9) is disposed opposite a partition 147, and with the exception of the respective end hinge-posts 152 opposite the end partitions 147, each of which latter posts carries only one door 151, each of the several hinge posts 152 supports a pair of the doors 151 in opposed relation and also related to adjacent chambers 146, each pair of the doors 151 being adapted to oppositely swing on their supporting post 152 for outward opening movement with respect to their relative chambers 146, as presently appear-

ing. Each pair of the doors 151 further, at their lower end, is arranged to swing in a semi-circular recess or aperture 157 in the floor 138, the straight side of such recess or aperture being approximately in the plane of the rear side of the chambers 146 to provide an abutment or stop against which the doors 151 impinge on closing movement thereof. This closing movement of the doors 151 results in a partial obstruction of the opening between the respective chambers 146 and their adjacent assembling-chute 148, but the several doors 151 are so arranged that, when closed, their opposing edges are spaced to permit the passage therebetween of the respective plungers 137, as will presently more particularly appear.

A tensional member or spring 158 is passed around each hinge-post 152 for attachment at its opposite ends to the respective doors 151 mounted on the particular post, the spring 158 being disposed in a suitable recess 159 in the lower side of the plate 138, closed on its under side by the plate 158 (Figure 2). Thus, the doors 151 are spring-set for normally partially closing the respective chambers 146 from the chutes 148 extending therefrom, and I may here state that the width of the chambers 146 and assembling chutes 148 is accommodated to the width of a match-book E positioned therein, but is greater than the width of the respective plungers 137.

The plungers 137 each freely pass between the opposing pairs of doors 151 at the rear of each chamber 146, but the match-books E, being wider than said plungers, engage the doors 151 for swinging actuation thereof, each plunger 137 advancing sufficiently to be presented between the doors 151, so that the match-book E will be moved beyond the doors 151 after passage therebetween, whereupon the doors 151 may swing back in opposing relation behind the match-book E. Thus the several match-books E, as they are shifted into the discharge-chutes 148, are prevented from accidentally or otherwise, as the plungers 137 move outwardly for another shifting operation, moving or falling back into the respective chambers 146.

Mounted over the chutes 148, is a finger support 160 carrying a plurality of spring-fingers 161 adapted to tensionally bear upon the match-book E as they are so shifted into the chutes 148 for yieldingly, in opposition to the doors 151, retaining the same in compact so-called upright rows for convenient manual removal in desired numbers for suitable carton-packaging, it being understood, of course, that a sufficient quantity of the match-books E is initially suitably disposed in the respective chutes 148 to enable the doors 151 and spring-fingers 161 to efficiently function.

The operation of the machine has been fully described as the description of its co-

operating parts and instrumentalities has proceeded, and thus, as shown and described, the machine automatically, economically, and efficiently performs its intended functions.

5 It is to be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the machine may be made and substituted for those herein shown and described
10 without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

15 1. A match-book stacking machine comprising, in combination, a feeding-wheel, a conveyer traveling over the wheel for transporting the books to be stacked, and means for intermittently actuating the feeding
20 wheel a half revolution at a time for effecting successive conveyance of the books for stacking in groups of predetermined number, said means including a ratchet-wheel operatively connected to the feeding-wheel and having
25 angularly spaced tooth-faces, a rotatory pinion, a pawl carried by the pinion for engagement successively with said faces, a reciprocatory rack meshing with the pinion for rotatorily actuating the same first in one
30 direction and then in the other direction for carrying the pawl in successive engagement with said ratchet faces, and mechanism for reciprocating the rack.

2. In a match-book stacking machine, in
35 combination, travelling conveying means for carrying the books to be stacked, and means liftably co-operable with defective books residing on the conveying means for automatically ejecting said defective books therefrom.

40 3. In a match-book stacking machine, in combination, a travelling conveyer for carrying the books to be stacked, and means including a stationary throw-out member positioned over the path of travel of the conveyer and cooperable with defective books
45 residing thereon for automatically ejecting said defective books from the conveyer.

4. In a match-book stacking machine, a
50 floor-plate, a plurality of spaced partitions upstanding from the floor plate providing a series of receiving-members, a plurality of stacking-chutes each adapted for communication with one of the receiving-members,
55 means for shifting a match-book from each of the receiving-members into a corresponding chute, and means including pairs of opposing doors for preventing retrograde movement of the shifted match-books from the chutes into the receiving-members, said doors
60 being swingably mounted in pairs, each pair opposite one of said partitions.

5. In a match-book stacking machine, a
65 floor plate, a plurality of spaced partitions upstanding from the floor plate providing a series of receiving-members, a plurality of

stacking chutes each adapted for communication with one of the receiving members, means for shifting a match-book from each of the receiving-members into a corresponding chute, a pair of opposed swingable doors
70 disposed intermediate each receiving-member and its corresponding chute, said doors being mounted in pairs, each pair opposite one of said partitions, a hinge post upstanding from said floor plate opposite each partition for
75 supporting each pair of doors, and tensional means connecting the opposing doors of each pair of doors for normally preventing retrograde movement of the shifted match-book from the chute into the receiving-member. 80

6. In a match-book stacking machine, in combination, a floor-plate, a plunger frame carried by the floor-plate, a plurality of plungers reciprocable on the floor-plate in
85 said frame, a plurality of spaced partitions upstanding from the floor-plate intermediate the path of reciprocatory-travel of the plungers, a transverse throat-forming member spaced from the floor-plate and connecting
90 said partitions for forming a series of individual match-book receiving-chambers, a feed plate carried by the plunger frame, a reversing wheel journaled laterally adjacent to said feed plate and over the throat formed
95 by said transverse member, means co-operating with said feed plate for feeding match-books to said reversing wheel, and means for actuating said plungers and said reversing wheel in timed relation with said feeding means. 100

In testimony whereof, I have signed my name to this specification.

BORIS BOGOSLOWSKY.

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