

Jan. 6, 1942.

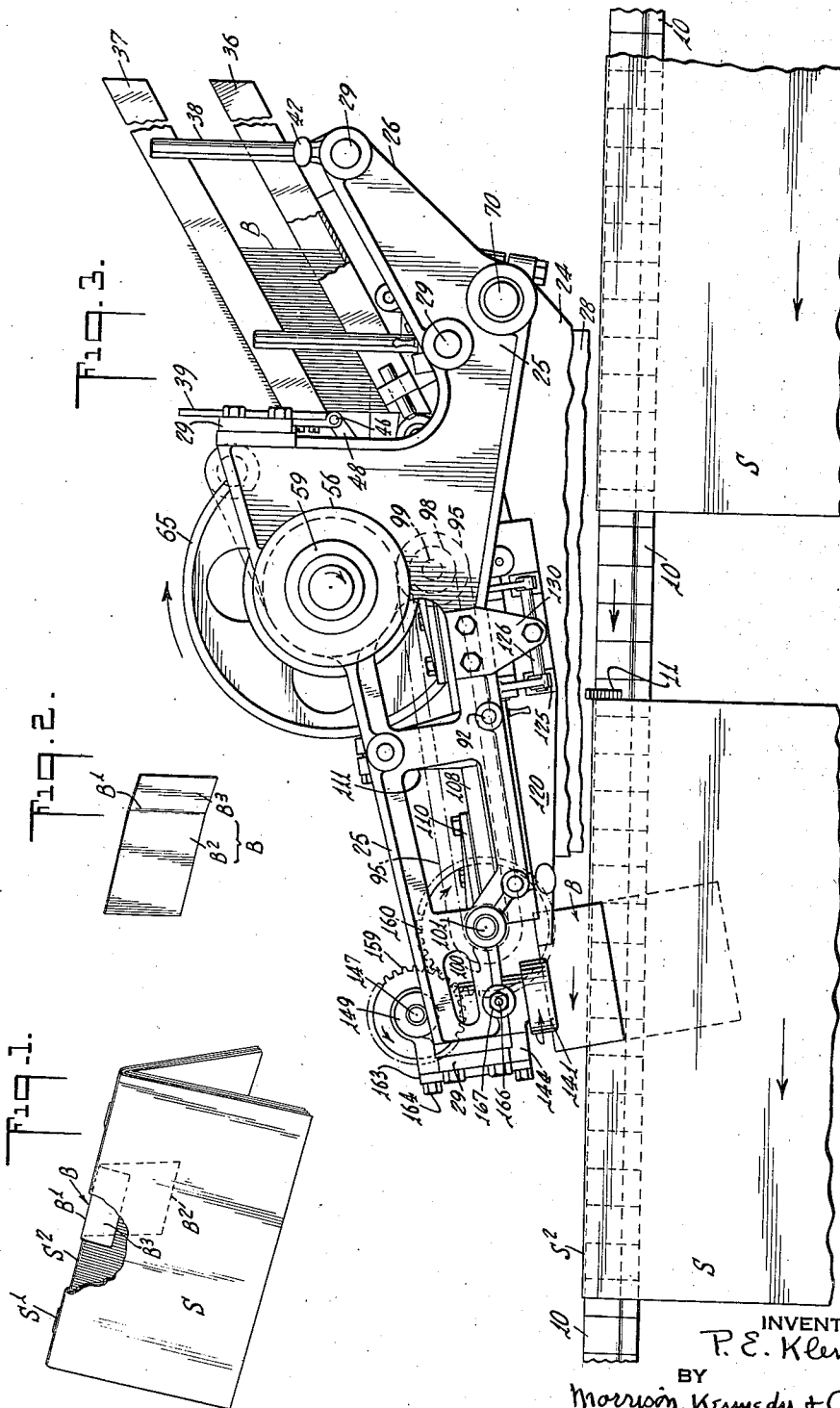
P. E. KLEINEBERG

2,268,600

INSERT GATHERING

Filed July 25, 1940

4 Sheets-Sheet 1



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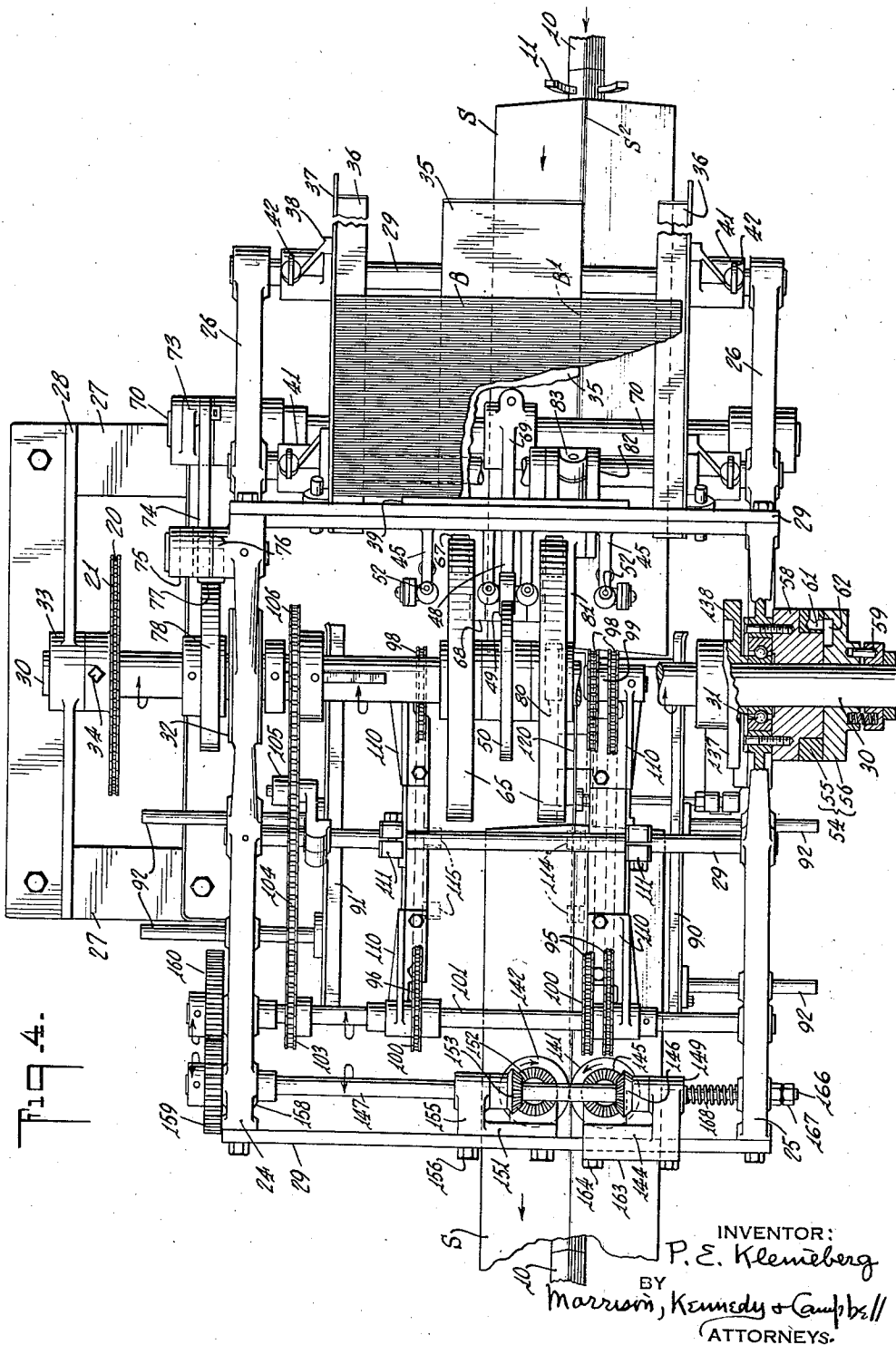
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INSERT GATHERING

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4 Sheets-Sheet 2



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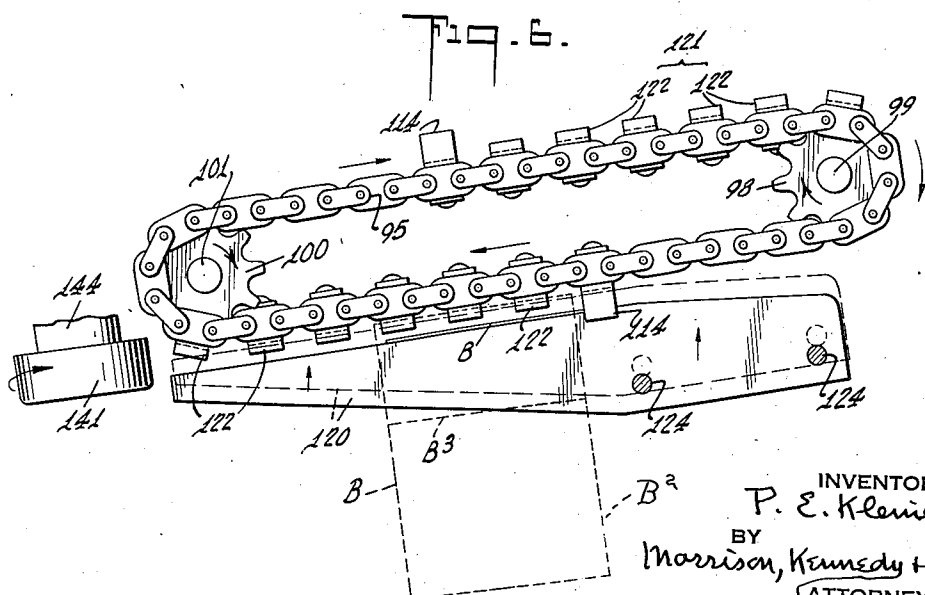
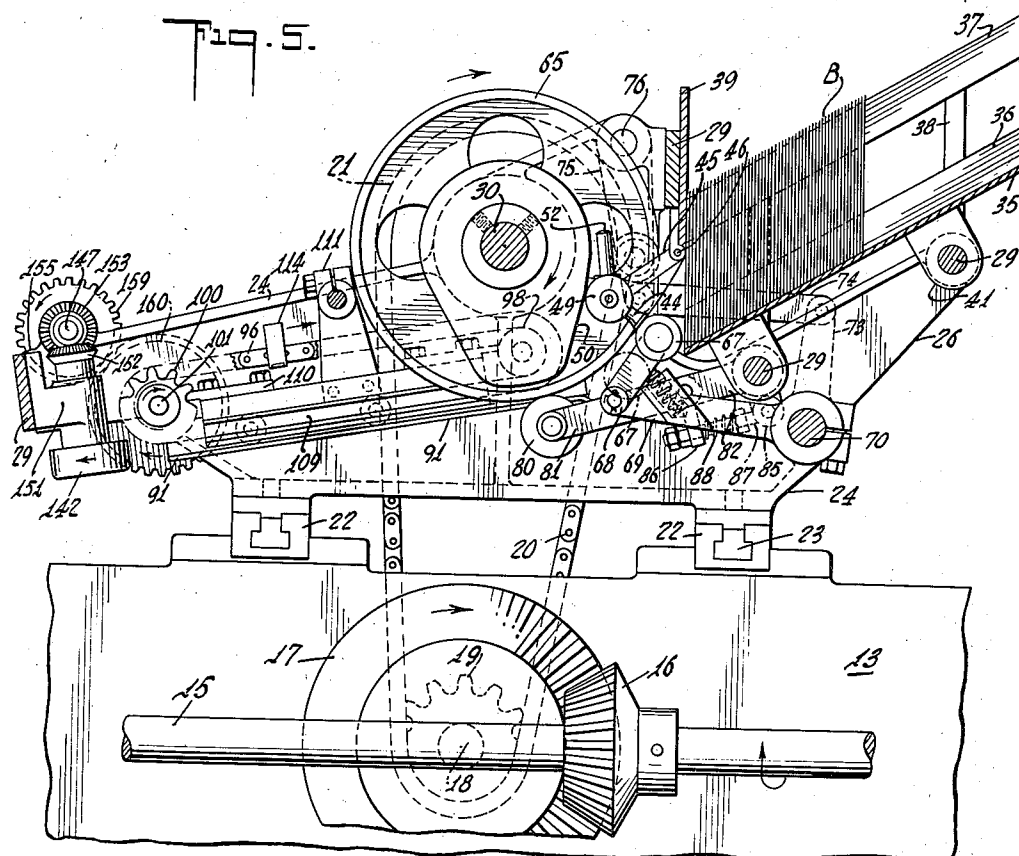
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4 Sheets-Sheet 3



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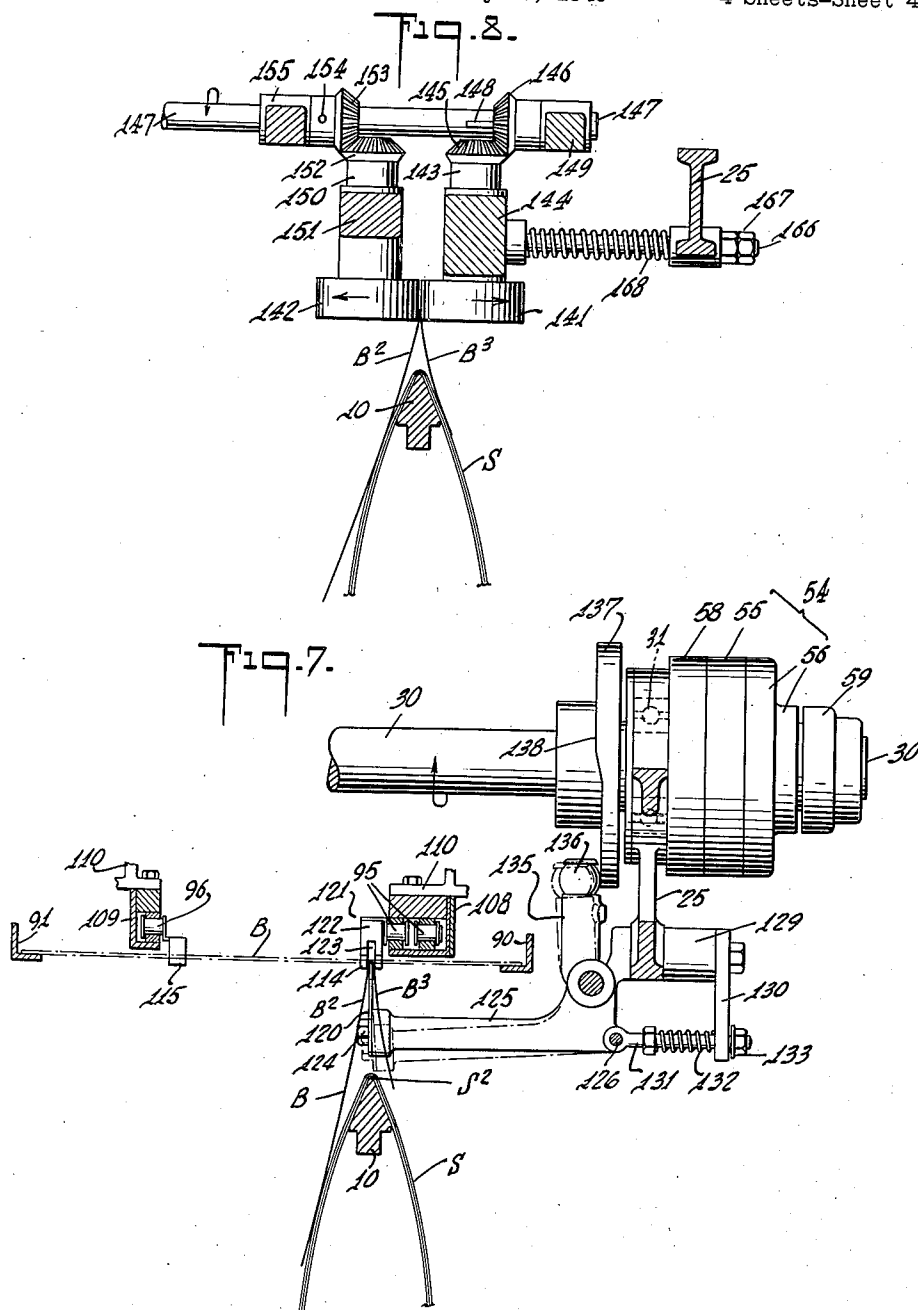
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INSERT GATHERING

Filed July 25, 1940

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,268,600

INSERT GATHERING

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25 Claims. (Cl. 270—55)

This invention relates primarily to insert gathering, or the art of feeding and depositing upon a traveling conveyor or saddle of series of signatures from a series of signature supplies, with opening of each signature to be received straddlewise upon the preceding signatures, so that progressively a succession of saddle-gathered or inserted signature groups is accumulated, and conveyed onward for binding or stapling into pamphlets or similar products; an example of a machine of this class being shown in Patent No. 2,163,732 of June 22, 1939.

The present improvement has to do with the special purpose of feeding to or depositing on the saddle, to take their place within the successive pamphlets, or in predetermined relation to, as between the, regular signatures thereof, of smaller blanks or pieces, for various purposes, which, being smaller than the signatures can not be manipulated as signatures in regular operation. Typical such blanks are subscription or other cards or envelopes intended to be removed by readers and used for mailing or other purposes; or the blanks may be thin booklets so introduced into the main products or pamphlets.

By this invention the blanks, meaning the cards or other pieces, smaller than the signatures, are extracted singly from a supply or stack and during feed are preferably first folded into inverted V-shape and then deposited in proper position upon the saddle in predetermined gathering relation to the regular signatures in each section of the saddle; typically upon a part-group, that is, on top of an intermediate signature during the building up of each pamphlet; which, by an automatic machine or mechanism is believed to be novel, while in the steps followed a new method of operation is involved.

Broadly, it is of course well known to extract a sheet from a stack, feed it away, fold it during feed, and deliver it where desired; for example in the folding of printed sheets into signatures, in which the travel is usually arrested before each folding action. It is also known to feed covers to be applied to pamphlets, an example thereof being Patent No. 1,799,857 of April 23, 1929, showing a mechanism for delivering a pamphlet cover sheet for application or gluing to a previously stapled or united signature group.

In the aspect of high-speed extraction, feeding, folding and delivering for use, it is believed the present improvement has novelty apart from the deposit of the blank into the interior of a group of signatures under accumulation; but

such is the primary purpose of the illustrated apparatus.

The inserting of a card, usually with adhesive, between an already united book or pamphlet and its cover has been practiced by various types of mechanism; but in saddle-gathering, the loose insertion of a small blank between earlier and later deposited signatures has been done only by manual operators, so far as is known, at high labor cost and unreliably. By this prevailing system at least one blank-feeding operator is stationed adacently, near the conveyor, at a gap between signature depositing positions. This worker or an assistant has to pick up a bunch of blanks, say a hundred, from the supply, and bend their tabs or wings along prescored lines. The first worker has to pick off from each bunch the blanks singly, pinch the fold of each and reach in and drop it astride a passing signature group. There is no uniformity of position nor any assurance that every pamphlet will contain one and only one card or envelope. At the higher speeds, as above 70 per minute, an extra worker is necessary to keep pace with the gatherer.

The general object of the present invention is to provide mechanism automatically to feed successive blanks for deposit astride the traveling saddle between or in other definite relation to the regular signatures, especially with suitable folding of each blank or card while on the run toward the point of delivery and discharge to the saddle. It is a further object to effect the folding, feeding and deposit of such blanks reliably at a definite position in each product or pamphlet, for example between the positions of subsequently applied staples, or at a position where a staple will penetrate the blank, according to whether it is preferred to facilitate the later extraction of the blank, or to make its accidental removal impossible.

Another object is to extract from a supply and feed in procession a series of blanks, while folding each on the run into an inverted V-shape adapted to be dropped astride another blank or conveyor.

A further object is to provide a blank folding device for cards and the like comprising male and female folding members cooperable to fold the traveling blank in one relative approach movement, and one of said members adapted to travel continuously during and between folding operations.

Other objects and advantages will be explained in the hereinafter following description of an illustrative embodiment of the invention.

In the disclosed machine, with a high gathering rate of several groups per second, the feeder is an attachable and adjustable mechanism, set in place in a gap provided between gathering operations, and delivering the successive folded blanks safely upon the traveling groups with an advancing delivery motion in the direction and at the speed of group travel.

In the accompanying drawings:

Fig. 1 is a perspective view of a signature group or pamphlet which has been supplied with an insert card or blank in accordance with the present invention, a part of some of the signatures being cut away to show a part of the blank.

Fig. 2 is a similar view of an example of the original card or blank, in this case prescored at the desired fold line.

Fig. 3 is a front elevation view of an insert gathering machine having the combination of the signature-group-feeding conveyor and the blank folding and feeding mechanism according to the present invention; many well known parts of the gathering machine being omitted including the mechanisms to extract signatures from the several stacks, transfer them and open them for deposit straddlewise on the saddle, of which an example may be found in said prior Patent No. 2,163,732.

Fig. 4 is a top plan view of the mechanism shown in Fig. 3, looking down at a slight incline corresponding to the incline of the mechanism.

Fig. 5 is a front elevation view corresponding in part with Fig. 3, but with certain front parts omitted to show interior features of construction.

Fig. 6, also in front view, shows certain of the mechanism concerned in the feeding, folding and squeezing of the successive blanks advancing in procession.

Fig. 7 is a lefthand elevation of certain of the feeding, folding and other parts, looking however at a slight upslant corresponding to the slant of the mechanism as shown on Figs. 2, 5 and 6.

Fig. 8 is a similar upslanting left elevation view taken further along in the course of the travel of the folded blanks.

Referring first to the materials operated upon, Fig. 1 shows a signature group S adapted by the insertion of two or three staples or wire stitches S' to form a pamphlet. This is shown cut open to expose an interior point at which appears the bend or peak S² of a partial accumulation of signatures, corresponding to the point at which the smaller blank B is to be inserted in the progressively accumulating product. The card, envelope or other blank B appears in Fig. 1, where it may be held by a staple or not as desired; and it appears also in Fig. 2, where there is indicated a prescored fold line B' which afterwards becomes the peak of the inverted V-shape blank as seen in Fig. 1. This fold score line while useful is not necessary with this invention as it is with the described manual system. The fold line or scoring B' divides the area of the card into two parts which may be termed the body B² of the blank, being its main portion, and the wing or tab B³, usually but not necessarily the smaller portion of the area. These elements appear also in various other figures.

Referring next to the illustrated parts of the known insert gathering machine, the member of most direct present interest is the traveling saddle or conveyor 10, shown of the endless or sectional form, and advancing leftward with a series

of accumulating groups S of signatures thrust along by spaced conveyor pins or fingers 11.

The gatherer saddle and its guides may be mounted in a conventional manner above the frame base between frame side members or beams 13, shown in Fig. 5, extending longitudinally of the machine. The main longitudinal shaft 15 is power driven and as usual this may make one rotation for each cycle of the machine, one signature being extracted in each cycle from each stack or hopper and delivered in known manner to the traveling saddle which also is moved longitudinally in time with the gathering operations.

The gathering machine and the blank feeding and folding mechanism or attachment are interconnected for cooperative action, whereby to deliver one blank or card to each signature group traveling with the saddle. The drive connections between the gatherer and the feeder comprise a bevel gear 16 on shaft 15, this meshing with a bevel gear 17 on a cross shaft 18. The cross shaft carries also a sprocket wheel 19 connected by a sprocket chain 20 with a sprocket wheel 21 on the main shaft 30 of the feeder.

The feeder attachment or unit is mounted in a position above the saddle, and for this purpose the gatherer is provided with a support in the form of a pair of bars or dovetail tracks 22 extending transversely and giving adjustable support to the feet 23 of the feeder, this arrangement permitting the feeder to be adjusted laterally fore-and-aft so that it will deliver accurately the folded blanks slightly above but partly astride the traveling saddle. The feeder frame comprises a rear upright wall 24 above the feet 23, and a similar front wall 25, these walls having rightward bracket extensions 26 between which is located the hopper, and, as seen in Fig. 4, rearward horizontals 27 which carry an upstanding rear bracket 28 in which the main shaft 30 of the feeder has its rear bearing. Various cross bars, plates or rods 29 complete the feeder frame structure.

If, in a special case, it may become desirable to revert to hand feeding of blanks, the entire feeder attachment may be slid bodily back on the rails 22, out of the way, after uncoupling the sprocket chain 20. The shaft 30 turns in bearing 31 in front wall 25, bearing 32 in rear wall 24, and bearing 33 in bracket 28. Sprocket 21 is attached to the shaft by set-screw 34 which may be loosened to alter the timing between shafts 15 and 30 and thereby determine the position of each inserted blank in its pamphlet.

In location, the blank supplying unit may be set for example in a gap ahead of the last four signature hoppers or stacks, so that after the blank is deposited on each group four more signatures will be deposited on top thereof; the final signature often being a mere once-folded cover, as for a magazine. In a usual insert gatherer it may suffice to omit two signature stacks, and to leave a gap of about 42 inches in which to accommodate the feeder unit, with a number of stacks beyond. This is an improvement over hand feeding of blanks, for which about 7 feet of gap is necessary for reliable operations, thus reducing the gatherer capacity by at least two signature stacks. In Fig. 1 the small blank B is shown placed above several regular signatures previously deposited and below several subsequently deposited; but naturally, the gathering may cease after the blank is placed, in which case the blank will be exterior in the product, or

the gathering may not begin until after the blank is placed, as the saddle travels along, in which case the blank will be central; these differences depending on which signature stacks of the gathering machine are supplied or put into use in any particular production operation.

The general method and mechanism of the present system comprises the following, in combination with the advancing saddle and signature group procession. In a hopper at the right end of Figs. 3 to 7 is the stack of blanks set edgewise, this being sufficiently elevated to permit a downward of blank travel to the point of discharge to the leftwardly traveling signature group. The cards, envelopes or other blanks B are stacked open but preferably scored at the fold line. A blank separator, on suction principles, engages and swings outward one exposed edge (preferably the lower) of the foremost blank away from the stack. An extractor, shown of the drum and grip type, grips and pulls each separated blank (preferably downward) out of the stack and transfers it around for delivery to the blank conveyor, in flatwise posture. While supported slidingly on edge guides the conveyor engages each blank and pushes or advances it leftwards at a downslope toward discharge. The conveyor gives continuous travel, as does the drum, and may consist of endless chains with pushers, and the folding is done during conveyor travel, without need of stoppage. The folding means comprises opposed male and female members, the male blade approaching or lifting from below and tucking the blank fold line into the groove of the female member traveling with the conveyor, so that the folding is performed on the run, the folded blank sliding along on the blade towards discharge in the form of an inverted V, now low enough to span or enclose the saddle. Instead of discharge from the conveyor direct to the saddle or group a squeezing device is preferably interposed, in the form of a pair of driven rolls, on upright axes, receiving each folded blank beyond the folder blade, pinching and tightening its fold and discharging it advancingly to settle upon its signature group.

The feeder shaft 30 drives the entire mechanism and preferably makes one turn per cycle, causing one blank to be deposited per turn as one signature travels beneath. Connections to operate the separator, the extractor, the conveyor, the folder and the optional final squeezer and discharger, all in coordination with each other and with the saddle travel will be described.

The hopper has a bottom consisting of a middle plate 35 and opposite side supporting angles 36, all inclined and carried on two frame cross rods 29. Upper side strips 37 are supported by upright posts above the angles, and the hopper is completed by a front abutment plate 39 which takes the thrust of the descending stack but is abridged to expose the lower portion of the foremost blank for separation and extraction.

The hopper is adjustable for variations of the width, between hopper sides, and the position, of the cards, envelopes or other blanks, and for this purpose a pair of carriages or sliding collars 41 is provided at each side, carrying the parts 38, 36 and 37, and sliding on the rods 29, with fixing or set screws 42. When properly set the preformed score or fold line B' will come, as shown in Fig. 4, directly above the peak S² of the signatures or saddle beneath.

The blank separator, operating on the lower edge of the foremost blank, is of the kind using

suction, and comprises a series of four suction cups 44 working in unison at four points near the lower edge of the signature as shown in Figs. 4 and 5. Each suction cup 44 and the pneumatic box from which it projects is mounted at the free end of a swinging lever 45. These four levers are interconnected by being mounted upon a common pivot shaft 46 turning in small brackets depending from a frame bar 29, as seen also in Fig. 2. This system has to be swung from blank-engaging position outwardly to bring the lower edge of each blank to gripping position, shown in Fig. 5, adjacent the drum to be described. To effect the swinging of the levers 45 the shaft 46 carries also a cam lever 48, similar to the other levers, but carrying a follower 49 which runs upon and is actuated by a cam 50 secured near the center of the drive shaft 30. Spring means is to be understood acting to press the follower toward the cam and retract the suction cup and blank from the stack. This general system is analogous to known separating means, for example as shown in said Patent 1,709,857, and is believed to require no detail description. Each sucker or cup 44 is in communication with an upstanding nipple 52, which may be considered to be connected by a flexible hose, not shown, with a suction controlling valve 54.

The pneumatic valve 54 is sufficiently shown in Figs. 2 and 4, being of the rotary kind and comprising a stationary ring 55 cooperating with a rotary disk 56. The ring 55 is mounted on a carrier 58 attached to the front wall 25 and surrounding the shaft 30. The disk 56 rotates in face contact with the ring 55 and it is both driven and spring-pressed by a collar 59 fast upon the front end of the shaft 30. Arc shape passages or ports 61 and 62 are provided in the ring and disk respectively in such position that by the relative rotating thereof suitable pneumatic actions take place, first suction being applied to the suction separators from a constant source of suction, so that the blank may be engaged and drawn away from the stack; second the suction being cut off from the source, and third the suction cups vented to the atmosphere, thereby to release the blank. All of this is performed in timed coordination so that the lower edge of each blank is swung out to extracting position and released at the time the extracting action commences.

The extraction is preferably performed by means of a continuously rotary drum 65, and this is shown as of open construction, comprising two wheels mounted symmetrically upon the drive shaft 30. For gripping each separated blank to the drum, instead of employing grip fingers on the drum, as in said Patent 2,163,732, the plan of using griprolls 67 is illustrated, these being in the nature of idlers, each mounted for rotation at the free end of a swinging arm 68 through which it may be pressed toward the drum to create friction against the blank, so that the drum may pull the blank out of the stack and transfer it preferably downwardly and around for delivery to the conveyor to be described.

An advantageous arrangement is shown whereby the griproll carrying arms 68 are both mounted on the left end or head of a rockarm 69, constituting means by which the griprolls may be dropped to idle position between extractions, thereby to make room for the swinging out of each blank to the drum, following which the griprolls rise outside of the blank, coming into gripping position as the blank reaches the drum,

thereby causing prompt extraction, accompanied by release of the separating suction.

These griproll motions may be effected as follows. The rockarm or carrier 69 is mounted on a rockshaft 70, carrying the griproll arm at its free left end. To create resilient pressure, the arm 68 is thrust against by a spring device 71 mounted on the rockarm. This affords a sufficiently heavy yielding pressure for feeding purposes and at the same time affords allowance for variations in thickness of blank. Continuing the train of connections, as shown in Figs. 4 and 5, the rockshaft 70 is actuated through an upwardly extending arm 73 at the rear end thereof. This arm in turn is connected by a link 74 with the lower end of a cam arm 75 fulcrumed at 76 on the rear wall 24 and carrying a follower 77 bearing upon the periphery of an open cam 78 on the drive shaft 30 near its rear end.

By these means the griprolls 67 drop idly to the lower dotted position of Fig. 5 during each blank transfer but, as the next blank is separated out into contact with the drum 65, the griprolls rise to their full line position and the drum thereupon acts to pull the blank down and out of the stack, for transfer around and delivery to the conveyor.

The transfer requires means supplemental to the drum and rolls 67 to control the blank movement around from extraction to delivery. An endless tape might be used as in said patent, but a second griproll 80 may serve transfer purposes, acting to thrust each extracted blank advancingly to the conveyor. This transfer roll 80 is mounted on the free end of a swingable arm 81 pivoted to a short bracket 82 extending leftward from a collar 83 on a frame crossrod 29. To create frictional driving pressure spring means is shown. Between a lug 85 on the collar 83 and a lug 86 on the arm 81 extends a rod 87 on which is confined a compressed coil spring 88, thrusting on lug 86 to lift arm 81 and roll 80.

Coming next to the blank conveyor, the purpose of this is to receive flatwise the successive blanks delivered from the drum and transfer means and advance them along leftwardly toward the discharge, although as will appear, each blank is to be subjected to folding action and then an optional squeezing action between the conveying motion and the discharge. Just as the extraction and transfer of each blank is continuous, with the continuous rotation of the drum 65, so the flatwise advancing travel of each blank beyond the drum is continuous, although, when delivered from the drum, each blank may slacken or pause in its movement for a moment until the feeding elements of the conveyor overtake it. As Fig. 3 best shows, the blank feeding attachment is placed at a low elevation, as close as is practical to the traveling saddle beneath, and in order that each blank may drop a minimum distance from discharge to saddle the conveyor is preferably arranged at a downgrade slant.

The blank conveyor may be considered as comprising certain fixed guiding elements and certain moving elements adapted to engage and draw or push the blanks advancingly. Thus, as each blank is delivered from the drum 65 and transfer roll 80 it is received upon a pair of side guides consisting of a front angle iron 90 and a rear angle iron 91 shown in Figs. 4 and 5. For the purpose of adjustment of each of these to the width or position of the blank it is mounted upon a pair of horizontal rods 92. The two sup-

porting rods of the rear guide rail 91 can slide adjustably through the frame wall 24, while the similar support rods of the front rail may slide through the front wall 25. Thereby, within practical limits, any width of blank or card can have its side edges guided between the adjustable angles or rails 90 and 91, while each of these can be so positioned that the score line B' of the blank comes directly over the apex S² of the signature group beneath. To support the middle of each blank, and preventing sagging, the folding blade 120 is arranged so that when in its normal, lowered position it serves to uphold the middle part of the blank.

The movable or thrusting members of the conveyor comprise certain endless bands or chains carrying pushing elements. Thus there is shown a front conveyor chain 95, which is double, having two strands to give firmer support to the elements carried by it, and a rear chain 96, shown as single. All three of these individual chains are shown as passing around sprocket wheels 98 at their right hand ends, these sprocket wheels being mounted on a shaft or axle 99 suitably mounted beneath the main shaft 30. Similarly each of the three chains passes around a left hand sprocket 100, and these three sprockets are fast upon a shaft 101 which is rotated to drive the three chains and their blank-thrusting elements. The drive may be effected in coordination with the other operations of the machine by connections such as the following. On the sprocket shaft 101 is a rear sprocket wheel 103 and from this extends rightwardly a sprocket chain 104, passing over a take-up idler 105 and thence around a sprocket wheel 106 on the main or drive shaft 30.

The purpose of the conveyor chains is to effect continuous feed of the blanks received from the extracting mechanism. Preferably the lower strands of the chains are used for feeding purposes, and carry the pushing elements, and these lower strands therefore are preferably mounted to run along guides or channels to maintain them in proper paths of travel. Thus, as best seen in Figs. 4, 5 and 7, there is a chain guiding channel 108 for the two front chains 95, and a rear channel 109 for guiding the rear chain 96. Each of these channels is shown as a built-up structure, comprising an angle iron with flange below the chain and an attached bar above the chain. In each case the channel is mounted by means of a horizontal bracket 110 at each end, which brackets for convenience may receive their support from the shafts 99 and 101; said brackets being supplemented by a middle bracket 111 depending from a frame rod 29. The upper strands of the respective chains may be correspondingly supported, although this is not essential and is not shown.

From Fig. 7 it is seen that the channel 108 is open at its inner side so that the chains 95 traveling within the channel are exposed. It is further seen that the chain carries one or more depending lugs or fingers 114 which project downwardly beyond the plane of the flatly supported blank B, so that with the travel of the chain the push-lug may bear against the rear edge of the blank. Similarly the channel 109 is open, and the contained chain 96 is exposed, and carries a depending push-lug 115. Since each chain has an active lower strand with advancing travel and an idle upper or return strand above, the chain being thus more than twice the length

of either strand, it is essential that each chain should carry a plurality of lugs 114 in order to insure closely spaced feed of blanks without having to wait for a single lug to complete its circuit for repeated action. It is found that the provision of two push-lugs on each chain is sufficient, and as shown in Fig. 6 there are two such lugs spaced diametrically about the orbit of the chain, the lug on the lower strand being in the act of pushing leftward the blank B lying flatwise on its guides, the upper lug returning rightwardly for feeding the next succeeding blank. Of course the two chains and their push-lugs are coordinated so that each flat blank is pushed along by two depending lugs, one on each chain and spaced apart to give a sure and parallel feed action.

The folding or shaping of each blank from its flatwise position to an inverted V-shape is preferably performed during advancing travel, being commenced during the feed by the conveyor chains 95 and 96 and indeed utilizing one of these or a similar chain to carry one of the folding or shaping members or dies. As best shown in Figs. 6 and 7 the preferred folding means comprises a male shaping member or blade 120 operating from underneath and opposed to a female or grooved member or bar 121 which is arranged above the position of the blade and indeed is mounted to travel advancingly with the lower strand of the double chain 95. The preferred plan is that the male folder or blade 120 shall rise for each folding action, without advancing travel, while the opposed or grooved member travels in the direction of feed, requiring no up or down motion. This female member is shown in its preferred sectional form, comprising a series of recessed sections or blocks 122, with grooves 123, there being six of these blocks in each group, and one group in advance of each pusher-lug 114 on the chain. This sectional construction of grooved shaper renders it flexible so that its sections or blocks may be connected to separate links of the carrier chain and thus be carried smoothly around the orbit. Instead of short groups, the grooved blocks 122 might be extended entirely around the chain, with periodic ones lengthened into pusher lugs 114.

Figs. 6 and 7 show that each of the pusher lugs 114 longer or deeper than the blocks 122, depends far enough for pushing each blank, while the blocks are adapted to advance along above the blank, without contacting it until the folding takes place. In Fig. 6 the blank shown is considerably shorter than the series of six folding blocks, but with a larger blank a larger number of blocks may come into use. The spaces between blocks are of no detriment since the rising blade forms the interior folding member and it is sufficient for example to bend the blank at spaced points, particularly if the blank is pre-scored as indicated in Fig. 2. Fig. 6 shows the blank in full lines lying flat upon the blade and being pushed ahead by the lug 114 beneath three of the blocks 122. If the blade were now to lift the blank would be bent into the form shown in Fig. 7, which is shown also in dotted lines in Fig. 6, this position being spaced somewhat further along than the full line position due to the lapse of time in the rise of the blade and the folding action.

Referring now in detail to the folding members, the male shaper or blade 120 is fitted for substantially vertical rise and drop as follows. By

a pair of screws 124 the blade is mounted upon the free ends of a pair of bent levers 125, the blade being slightly inclined corresponding to the downslant of the conveyor. The right ends of the levers 125 are interconnected by a cross bar 126, the upper portions of the levers being secured to a pivot shaft 127, so that the levers can rock in unison for the actuation of the blade. The pivot shaft turns in a bearing 128 constituting a bracket on the frame wall 25. There is also a front bracket 129 on which is rigidly mounted a depending plate 130, the lower end of which has a perforation through which runs loosely a rod 131, extended rearwardly and loosely mounted on the bar 126. This arrangement is to accommodate a coil spring 132 compressed between the plate 130 and the bar 126, thereby to effect the lifting of the arms 125 and blade 120, the extent of such lift being accurately adjustable by means of a stop nut 133 at the front end of the rod 131. By this arrangement the folding pressure is determined by the strength of the spring 132, so that the action is not positive and breakage is minimized.

In order to retract downwardly the folding blade 120 between operations the following connections are shown operating in opposition to the lifting spring 132. Above the rockshaft 127 about which the blade moves, extends a cam lever 135. This lever carries a follower 136 and this follower is operated upon by a cam 137 fast on the main shaft 30 of the feeder. The cam has a rise 138 which is adapted to throw leftward the cam lever 135, as shown in dotted lines in Fig. 7, thereby to lower the blade between folding operations. While the blade remains elevated, the overhead folding member or blocks, traveling along with the conveyor chains, maintain the feed of each folded blank, which slides smoothly along on top of the blade. When the blade drops to normal position the blocks do not contribute to the feed, but the push-lugs 114 may still continue the feed, each of them being grooved and traveling astride the blade, as Figs. 6 and 7 make clear. Notwithstanding therefore the lowering of the blade the blank feed is thus continued toward the discharge point, but to complete the discharge a supplemental feed device is preferably added as will be described.

The bending of the blank body and wing is thus effected on the run by the male member relatively rising and tucking the blank score line into the kerf of the sectional upper shaper. This is timed to occur only after the blank has passed beyond the blade holding levers, which otherwise could interfere. Fig. 6 shows that the blank is leftward of the screws 124 when the blade is about to rise. If any choking occurs the cushion spring 132 prevents breakage. The folding produces the inverted V-shape with both blank skirts preferably hanging down below the signature group apex, so as to assure proper final deposit. The described folding may be preliminary, to be followed by a tighter closing of the fold as next to be described.

The device about to be described operates both as a fold squeezing device and as a blank discharging device, being located closely beyond the folding blade and operating to engage and shift each blank from the blade for deposit on the saddle. The blank has been folded into a bent condition, with its depending parts astride the signature group below, but before deposit it is desirable to compress further or pinch the fold so

that on deposit the blank will lie snugly upon the previously gathered group of signatures. In this sense the squeezing device is a supplemental means which completes the folding action.

The parts of the squeezing and discharging device that directly contact each blank are front and rear squeezing rolls 141 and 142, shown in Figs. 1, 3, 5, 6 and 8. These are rotated oppositely with continuous motion, constituting a driven roll pair which provides a bite, closely beyond the blade 120, so as to embrace the fold of each blank issuing from the conveyor. The blank fold is thus tightened and the blank is pulled advancingly from the blade and discharged on the run in the same direction as the signature group travel. It is preferable that the speed produced by the discharge rolls be somewhat higher than the speed of the feeding conveyor, so that the rolls will take each blank away from the pushing elements of the conveyor and constitute the feed means from this time to the discharge. The conveyor chains therefore may travel somewhat more slowly than the speed of the saddle below, the discharge rolls causing acceleration preferably to substantially the same speed as that of the saddle, so that each folded blank will be deposited accurately and with least danger of displacement and with uniform assurance of proper lengthwise location of each blank upon its signature group.

Referring to the illustrated structure, the mountings of the two rolls 141 and 142 are somewhat different so that one of them, the front roll 141, may recede under yielding pressure as is necessary to accommodate the thickness of the folded blank and ensure effective driving pressure upon the blank. The front roll 141 is shown as mounted at the lower end of a stud shaft 143 which rotates within a bearing bracket 144, slidably mounted as will be described. The roll and stud shaft are driven by means of a bevel gear 145 at the top end of the shaft meshing with a bevel gear 146 mounted on a continuously rotating shaft 147. To permit resilient yielding movements the bevel gear 146 and its hub are slidably mounted upon the shaft as by means of a spline 148. Frontward of the bevel gears 146 is a bearing 149 constituting an extension bracket 144. Thereby the system of elements 143 to 149 can move as a unit lengthwise of the shaft 147 for the purposes mentioned.

The other discharge roll 142 is mounted at the lower end of a stud shaft 150 turning in a bearing bracket 151 and having at its upper end a bevel gear 152 meshing with a bevel gear 153 made fast to the shaft 147 as by a pin 154. Rearward of the bevel gear is a shaft bearing 155 which constitutes an extension bracket in rigid relation with the bracket 151. This combined bracket is shown as attached fixedly to the frame crossbar 29 by means of bolts 156, so that the rear squeezing or discharge roll 142 turns always in a fixed location.

The driving means for the shaft 147, which turns oppositely the rolls 141 and 142, delivers the proper rotary speed for the desired speed of roll periphery movement, and the connections from the main shaft of the feeding mechanism may be as follows. The shaft 147 turning in the aforesaid bearings 149 and 155 has also a rear bearing 158 at the rear frame wall 24. Beyond the frame wall the shaft carries a gear 159 which is in mesh with a gear 160 on the rear end of the shaft 101 deriving its power from the main shaft. The drawings indicate by arrows the di-

rections of rotation of the shafts and gears mentioned. The speed of roll rotation can be regulated by any kind of speed regulator, for example between shafts 101 and 147, but for the purposes hereof it is usually sufficient to provide different sets of gears 160 and 159 on the respective shafts so that by interchange of gears the desired discharge speed may be obtained. This, for example, may be necessary when, with a change in the size of signatures, a greater spacing becomes necessary between saddle push fingers 11 and therefore a higher speed of saddle travel. In other words, without changing the speeds of shafts 15 and 30, both the saddle 10 and the discharge rolls 141 and 142 may be coordinately speeded up or slowed down according to the work in hand.

In order to provide a resilient feeding or discharging pressure between the squeezing rolls 141 and 142 the following illustrative means is disclosed. The shiftable bracket 144, 149 on which the roll 141 is mounted is arranged to receive a sliding movement upon the frame bar 29, being thus adapted to recede frontwardly with the widening of the bite between the rolls. The bracket is shaped to embrace the frame bar, and a confining plate 163 is shown as fastened by bolts 164 to the bracket, leaving the latter adapted to slide on the bar. To control and resist the receding movement the bracket is shown as provided with a rod 166 extending frontwardly for sliding motion through the front wall 25 or a boss thereon. At the front of the wall the rod is provided with stop nuts 167 to limit the rearward or closing movement of the roll, while a compressed coil spring 168 is arranged to surround the rod between the sliding bracket and the frame wall, thereby to exert resilient closing pressure on the roll for the purposes described.

The flatwise feeding of blanks and their folding about a longitudinal fold line during feed as disclosed are believed to be novel irrespective of the character of the blank supply or the manner of transfer of successive blanks from the supply to the feeding conveyor or the manner of discharge beyond the place of folding. While supported and conveyed in flat unfolded position the complementary upper and under folding members approach to bend and shape the blank into V-form by the vertical movement between the members. The male member or blade being shown beneath the blank level an inverted V is formed during conveyance which then overhangs the blade, while preferably the same conveying means slides it along on the blade. Discharge could occur as the blank is thrust from the blade, but the supplemental lateral squeezing action is preferred, afforded by the driven roll-pair beyond, these compressing the fold, feeding the blank and finally discharging it for deposit below.

There has thus been described a system of insert gathering, involving method and mechanism embodying the principles and attaining the objects of the present invention; but since many matters of method, operation, combination, arrangement and construction may be variously modified without departing from the principles involved, it is not intended to limit the invention to such matters except to the extent set forth in the appended claims.

What is claimed is:

1. In insert gathering, the method of feeding, folding and depositing small blanks in predetermined gathered relation to the signatures of traveling signature groups being accumulated on

a saddle; said method comprising maintaining the supply of blanks in open condition in a stack, extracting successive blanks and delivering them flatwise with continuous advance, conveying with continuous travel the succession of delivered blanks flatwise and at a gradual downslant toward the saddle in the same advancing direction as the signature group travel, and before discharge folding each blank on the run by bending it between a folder blade beneath and a grooved traveling member above, thereby to form it into an inverted V-shape for deposit astride a signature receiving section of the saddle.

2. In insert gathering, the method of feeding, folding and depositing small blanks between the signatures of traveling signature groups being accumulated on a saddle; said method comprising maintaining the supply of blanks in open condition in a stack, extracting successive blanks and delivering them flatwise with continuous advance, conveying with continuous travel the succession of delivered blanks in flatwise condition above the saddle in the same advancing direction as the signature group travel, folding each conveyed blank on the run by bending it between a folder blade beneath and a grooved traveling member above thereby to form it into an inverted V-shape with its body and wing spanning a signature part-group on the saddle, and squeezing on the run each folded blank beyond the blade to tighten the fold and thereupon to discharge the blank with advancing motion for deposit on the signature part group below.

3. In a combination with an automatic insert gatherer having a conveyor by which a series of successive signature groups under accumulation is advanced continuously along astride a saddle, an automatic mechanism adapted continuously to feed a series of successive blanks substantially smaller than the signatures and deposit such blanks in inverted-V folded condition astride upon the saddle in predetermined gathering relation to the signature groups, while both are in continuous advancing travel, and drive connections operating said insert gatherer and said feed mechanism in continuous coordination, so timed that each smaller blank is deposited in a definite predetermined longitudinal position on each signature group out of register therewith at both the leading and trailing edges.

4. The combination as in claim 3 and wherein the feed mechanism is so arranged that each blank spans its signature group before discharge, and there is rotary means comprising an opposite pair of delivery rolls arranged to squeeze on the run each discharging blank.

5. In a combination with an automatic insert gatherer having a conveyor by which a series of successive signature groups under accumulation is advanced continuously along astride a saddle, an automatic mechanism adapted continuously to feed a series of successive flat blanks smaller than the signatures, fold them to inverted V-shape during feed, and discharge them for deposit astride the saddle in predetermined gathering relation to the respective signature groups, while both are in continuous travel in the same advancing direction, and drive connections operating said insert gatherer and said feed mechanism in continuous coordination.

6. The combination as in claim 5 and wherein the folding and discharge are located so closely above the saddle that each blank spans or partly encloses its signature before discharge.

7. The combination as in claim 5 and wherein

is rotary means at the discharge point arranged to squeeze each blank on the run before deposit.

8. The combination as in claim 5 and wherein the mechanism is bodily adjustable relatively to the gatherer to set it for discharge of blank correctly upon saddle.

9. The combination as in claim 5 and wherein the mechanism is adjustable in timing relatively to the gatherer to deposit each blank in proper lengthwise position upon its signature group.

10. The combination as in claim 5 and wherein the mechanism is adjustable in speed of discharge to accord with the speed of saddle travel.

11. Automatic mechanism for continuously advancing successive blanks from a supply to a final discharge and folding them to V-shape during advance, comprising a traveling conveyor for advancing the blanks in flatwise position, means to transfer successive blanks from the supply to said conveyor, and means to fold each blank on the run to V-shape comprising complementary members above and below the blank position on the conveyor and connections to cause the relative approach of said folding members to bend and fold the blank between them before discharge.

12. Mechanism as in claim 11 and wherein the conveyor comprises spaced apart endless chains with push-lugs to advance the blanks.

13. Mechanism as in claim 11 and wherein the conveyor comprises spaced apart endless chains with push-lugs to advance the blanks along side guides, said lugs depending from the lower strands of the chains.

14. Mechanism as in claim 11 and wherein the transfer means comprises a rotary drum, with a griproll to press the blanks to the drum, and means to lower the griproll before and elevate it after each blank reaches the drum.

15. Mechanism as in claim 11 and wherein is rolling means for laterally squeezing on the run the fold of each blank received from the folding means.

16. Automatic mechanism for continuously advancing successive blanks to a final discharge and folding them to V-shape during advance, comprising a traveling conveyor for advancing the blanks in flatwise position, means to fold each blank on the run to inverted V-shape comprising female and male shaping members above and below the traveling blank level, connections to cause the relative approach of said folding members to bend and fold the blank vertically between them, and rolling means for laterally squeezing on the run the fold of each blank received from the folding means and discharging the blank.

17. Mechanism as in claim 16 and wherein the upper folding member is a grooved member traveling in unison with the conveyor, and the under member is a blade or edged member arranged longitudinally for travel of blank along it with means to lift it to tuck each blank into the groove of the upper member.

18. Mechanism as in claim 16 and wherein the upper or female member is sectional, consisting of a series of recessed blocks mounted upon an endless traveling chain.

19. Automatic mechanism for continuously advancing successive blanks and folding them to V-shape during advance, for discharge upon a traveling saddle, comprising a traveling conveyor for advancing the unfolded blanks in flatwise position, means to fold each blank on the run to inverted V-shape comprising female and

male shaping members respectively above and below the traveling blank level, connections to cause the relative approach of said folding members to bend and fold the blank vertically between them with the blank parts bent downwardly to span the traveling saddle beneath, and rolling means for laterally squeezing on the run the fold of each blank received from the folding means and discharging the blank advancingly upon the saddle.

20. Automatic mechanism for continuously advancing successive blanks and folding them to V-shape during advance, for discharge upon a traveling saddle, comprising a traveling conveyor for advancing the unfolded blanks in flatwise position, means to fold each blank on the run to inverted V-shape comprising female and male shaping members respectively above and below the traveling blank level, and connections to cause the relative approach of said folding members to bend and fold the blank vertically between them with the blank parts bent downwardly to span the traveling saddle beneath.

21. Automatic mechanism for continuously advancing successive blanks and folding them to an inverted V-shape during advance, comprising a conveyor for advancing the blanks in flatwise position, a device to fold each blank on the run to inverted V-shape comprising complementary members above and below the blank position on the conveyor with means to cause the relative vertical approach of said folding members to fold the blank between them, and rolling means comprising a pair of rolls for laterally squeezing on the run the fold of each blank received from the folding means.

22. Mechanism as in claim 21 and wherein the roll pair is driven at peripheral speed to pull each blank advancingly from the conveyor and folding device.

23. Mechanism as in claim 21 and wherein the roll pair has a resiliently yielding mounting to admit blanks between the rolls and maintain squeezing and feeding pressure thereon.

24. Automatic mechanism for advancing successive blanks longitudinally to a discharge and folding each blank on a longitudinal fold line during advance, comprising a traveling conveyor for advancing a procession of the blanks in flat unfolded condition, means to fold each successive blank on the run comprising longitudinally arranged female and male shaping members at the opposite sides of the plane of the traveling blanks, connections for actuating the conveyor and for advancing the female shaping member longitudinally in coordination therewith during folding, and timed connections to cause the relative approach of said shaping members to bend and fold the traveling blank between them.

25. Automatic mechanism as in claim 24 in special combination with an insert gathering machine; said mechanism being mounted closely above the traveling saddle of the machine with its discharge in the same advancing direction as the saddle travel, and the folding means having its female member above and male member below the level of the flatwise blanks and operating to fold each blank into an inverted V with its body and wing depending at the two sides of the saddle, whereby on discharge each blank is deposited astride the saddle.

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