Oct. 11, 1927. 1,645,406

E. L. SMITH ET AL

STACK FORMING AND FEEDING MECHANISM

Filed Nov. 27, 1926 4 Sheets-Sheet 1

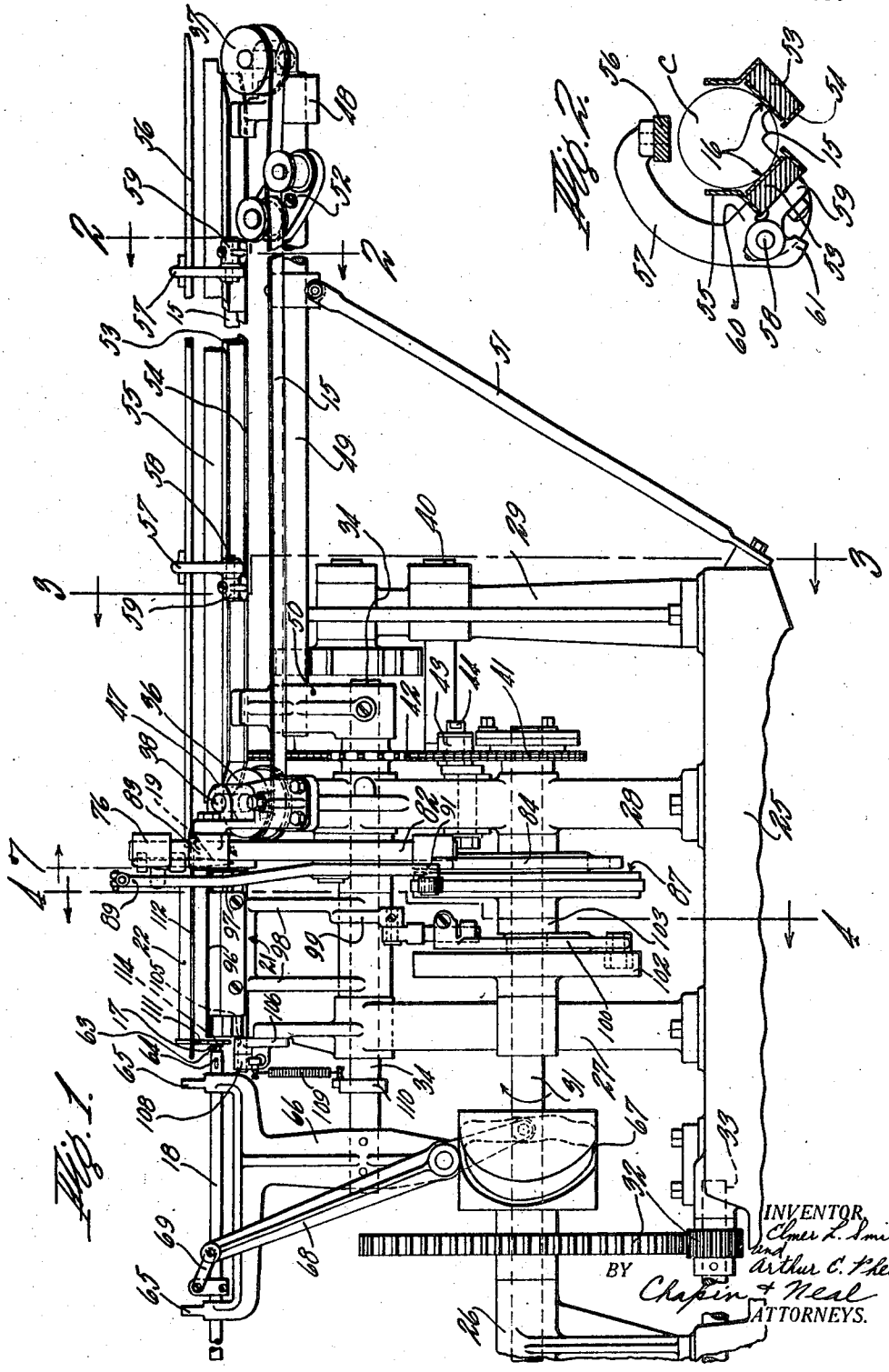

Fig. 1.

Fig. 2.

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Fig. 5.

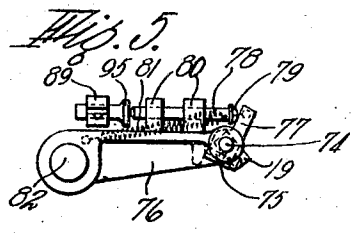


Fig. 6.

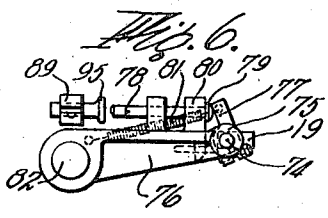
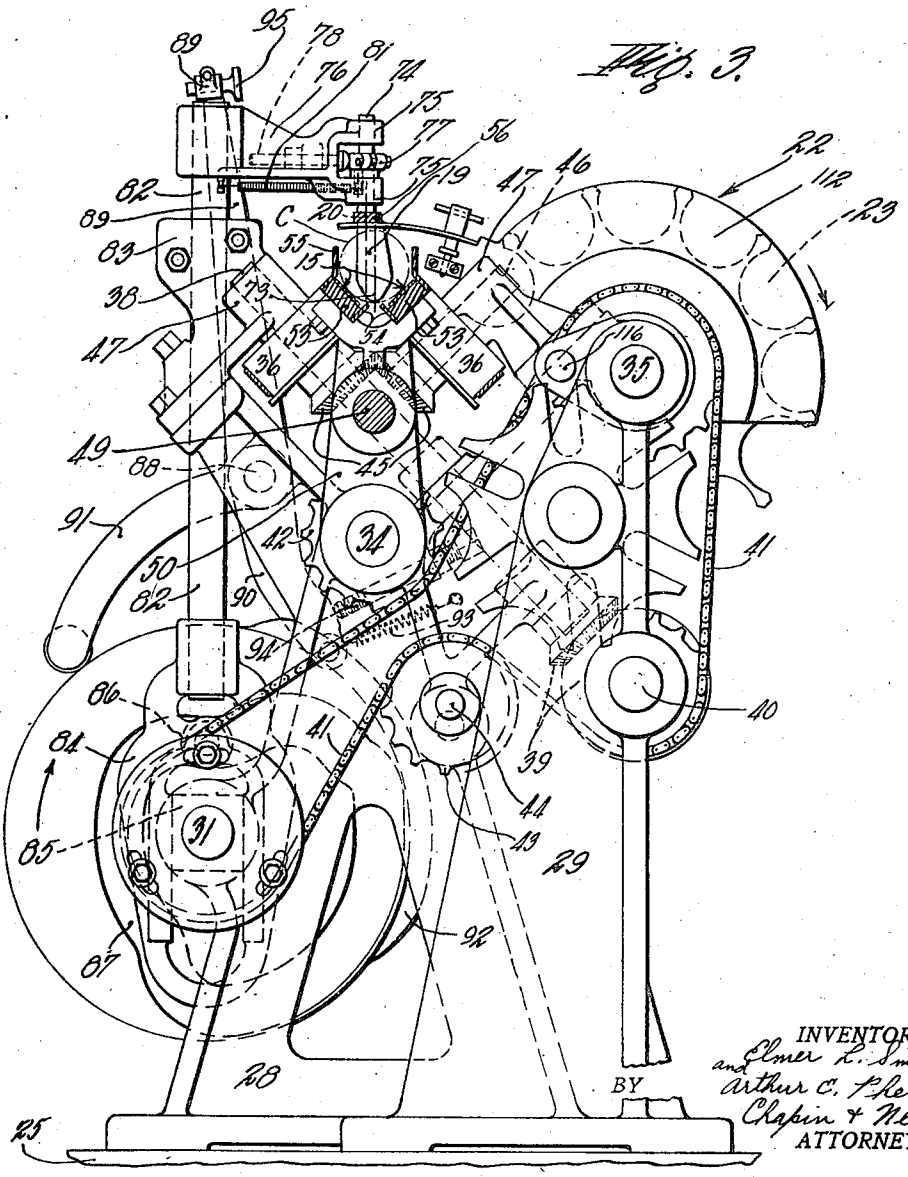


Fig. 3.



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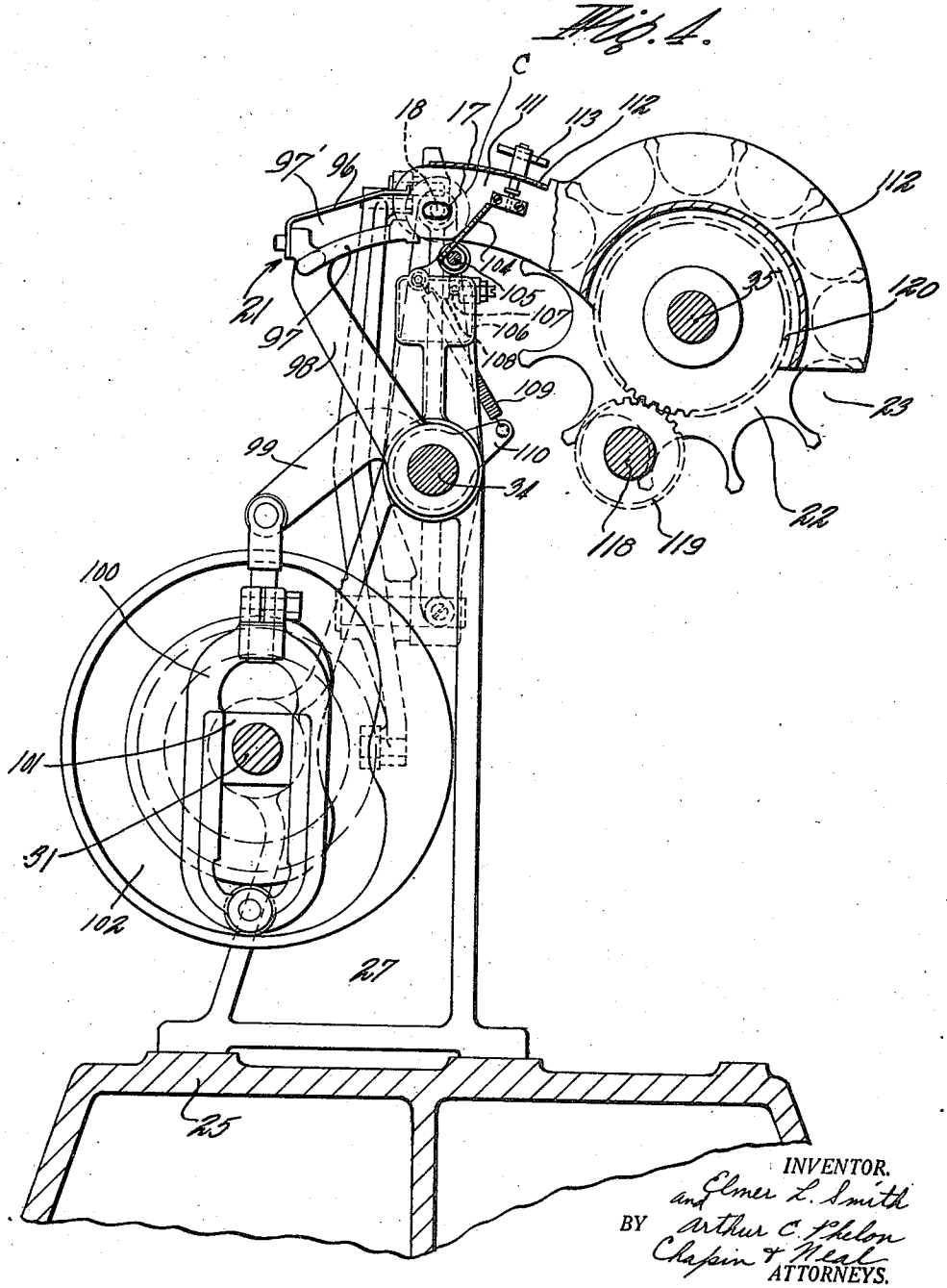
4 Sheets-Sheet 3

Fig. 4.



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STACK FORMING AND FEEDING MECHANISM

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Fig. 7.

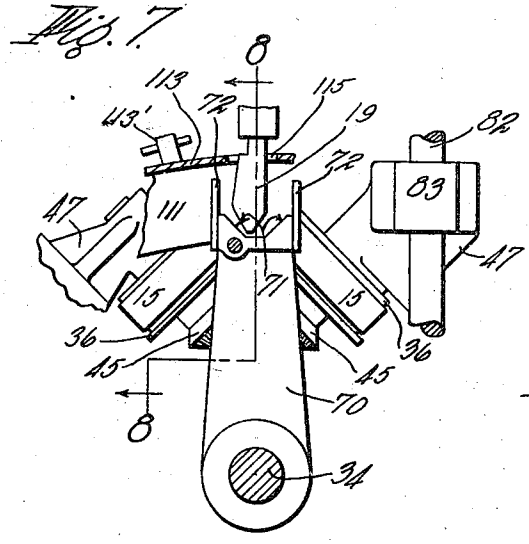


Fig. 10.

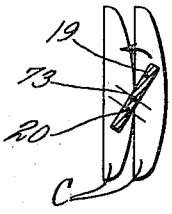


Fig. 11.

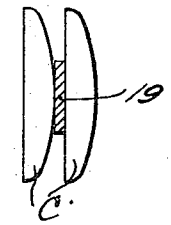


Fig. 8.

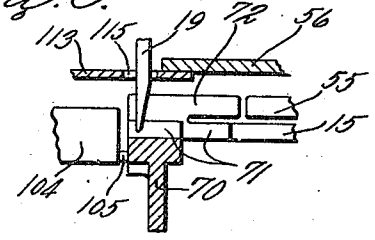


Fig. 9.

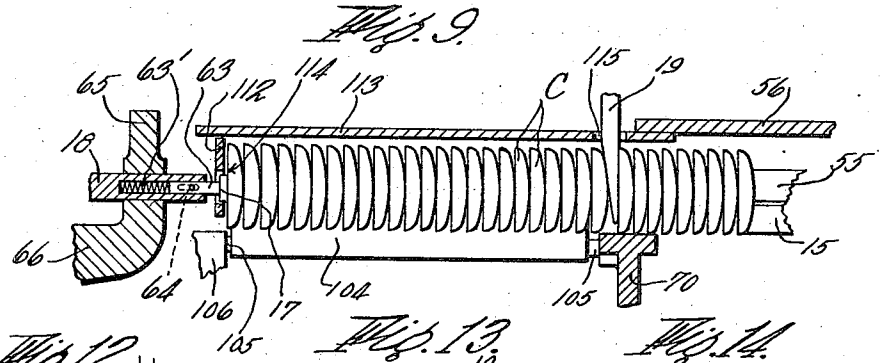


Fig. 12.

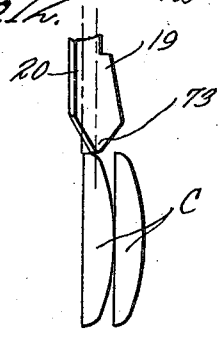


Fig. 13.

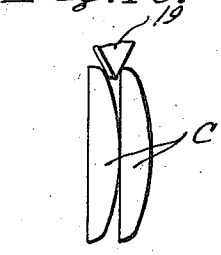
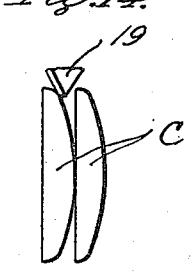


Fig. 14.



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UNITED STATES PATENT OFFICE.

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STACK FORMING AND FEEDING MECHANISM.

Application filed November 27, 1926. Serial No. 151,199.

This invention relates to improvements in machines for arranging articles into columns or stacks and for feeding the columns or stacks successively to any suitable receiver or receiving mechanism. The machine of this invention is more particularly adapted to handle articles of a substantially disc like form, such for example as cookies, wafers and the like, although it is, or can be, readily adapted to handle other substantially flat, thin articles whether or not they have a circular or rounded contour.

As an illustrative example of one specific use of the invention and as an example of a particular use which presents rather difficult problems, the invention will be disclosed in an embodiment designed for handling cookies. These cookies, which are substantially circular discs, are easily breakable and moreover they are non-uniform. After the baking operation, the cookies will be found to vary considerably in thickness and they often become warped or bent so that their faces no longer present true flat surfaces. When such articles are to be packed into cartons, or wrapped preparatory to such packing, they must be arranged in stacks of approximately a given length. To divide off the cookies into stacks by count is not feasible because, due to the variations, above alluded to, a stack containing a given number of cookies will vary in length within such limits that some of the stacks will be too long to fit into the cartons.

According to one feature of this invention, the cookies, having been arranged on edge and face to face in abutting relation, are fed in one long stream to the stack forming mechanism, into which the leading end of the stream enters for a measured length and thereafter a separator, which marks off the remote terminus of said measured length, is inserted between those two cookies whose abutting faces are spaced from the leading end of the stream by a distance most nearly corresponding to said measured length. In this way a stack of approximately the desired length is obtained and, although the number of cookies in the stack may vary within relatively wide limits, the length of the stack is maintained within relatively narrow limits at the desired predetermined figure.

According to another feature of the invention, the separator, which is always moved toward the stream of cookies in a plane located at a predetermined distance from the leading end of the stream and accordingly, except by chance, seldom moves in a plane exactly coinciding with the plane of division between two cookies, is arranged so that it can, whenever necessary feel or find its way between two abutting cookies and separate the same,—moving one ahead or back in the stream, as the case may be, whenever necessary.

More particularly and for this purpose, the separator, which is preferably in the form of a thin wedge, is mounted eccentrically for turning movement about an axis parallel to its plane of movement to and from the stream and is made to turn as it engages a cookie in the stream. In turning, the point of the wedge is moved along the stream a short ways so that, if it is not already lodged in the peripheral groove formed between the rounded edge of the front face of one cookie and the flat rear face of the abutting cookie, it can move into such groove preparatory to being later driven down between the cookies for the separating function.

According to another feature of the invention, the separator, which is moved into and out of the stream by a reciprocable carrier, is free to float in the carrier within narrow limits in one direction of its reciprocatory movement so that, if and when it engages the periphery of a cookie, it may momentarily come to rest in its descending movement while its carrier continues to move due to the provisions for floating. In this way, as distinguished from a positive and unyielding forcing of the separator into the stream, breakage of the cookies is reduced to a minimum because the separator can momentarily yield while the turning action above described takes place, thereby allowing it to find a path between two cookies before it is finally driven into position between the same.

According to another feature of the invention, the leading cookie of the stream engages one end of a reciprocable plunger which recedes as the stream of cookies advances until a stack of the desired length

is separated and said end of the plunger is mounted to yield relatively to the body thereof, when and if the stream of cookies is pushed ahead by the separator in the act of dividing off a stack from the stream,— the stack being finally held between said end of the plunger and the separator until removed from the machine.

According to another feature of the invention, the stack of cookies is moved out of the machine by a transfer device moving transversely of the path of travel of the plunger and said device is recessed to provide clearance for and permit a quick advancing of the plunger in an otherwise intercepting path back to cookie receiving position without waiting for the return movement of the transfer device.

According to another feature of the invention, the cookies are fed to the receiving plunger by two feed belts which travel in a substantially horizontal path at somewhat greater speed than the plunger and the adjacent courses of which move in planes disposed in downwardly converging relation,— thus forming, in effect, a trough of approximately V-shaped cross section and with moving walls into which the articles may be placed by hand or otherwise. The rounded articles engage the belts at two points only and they are frictionally carried along with the belts, as if hung on trunnions. The cookies, even if placed rather carelessly in place on the feed belts will eventually be straightened up on edge and moved into proper face to face abutting relation because as a leaning cookie strikes the cookie ahead of it or the receiving plunger, as the case may be, it will slow down to the speed of said cookie or plunger while the feed belts will continue to move the leaning cookie at greater speed at its points of contact therewith, whereby a tilting or straightening up of the cookie results.

Other features and advantages will appear in the following description and will be pointed out in the appended claims.

The invention will be disclosed with reference to the one illustrative embodiment of it in the accompanying drawings, in which:—

Fig. 1 is a side elevational view of a machine embodying the invention;

Figs. 2, 3 and 4 are cross sectional views taken on the lines 2—2, 3—3 and 4—4 respectively, of Fig. 1;

Figs. 5 and 6 are fragmentary top plan views showing, respectively, the position of the separator before and after it engages the stream of cookies;

Fig. 7 is a fragmentary cross sectional view taken on the line 7 of Fig. 1;

Fig. 8 is a fragmentary sectional elevation taken on the line 8—8 of Fig. 7;

Fig. 9 is a fragmentary sectional elevation taken on the same plane as Fig. 8 but showing a stack of cookies separated from the stream;

Figs. 10 and 11 are diagrammatical plan views illustrative of the operation of the separator; and

Figs. 12, 13 and 14 are elevational views also illustrative of the action of the separator.

Referring to these drawings; the machine with respect to its principal elements and functions will first be briefly described. A pair of feed belts 15 (Fig. 1) are mounted so that their adjacent courses travel at the same speed, in the same and in a substantially horizontal direction, and in planes which are disposed in downwardly converging relation (Fig. 2). Articles, such as cookies *c*, are placed by hand or otherwise in the trough formed by these two belts and, contacting therewith at the two points of tangency 16, are carried forwardly (to the left as viewed in Fig. 1) by frictional engagement until the leading cookie comes into engagement with the end 17 of a plunger 18. The latter is mounted to reciprocate in a horizontal path and the longitudinal center line of the plunger coincides, or substantially so, with the longitudinal center line of the stream of cookies *c*, when the same are straightened up on edge (positioned as shown in Figs. 2 and 9). The plunger, at such time lies considerably to the right of the position shown in Fig. 1 and closely adjacent the left hand ends of the path of travel of belts 15. This plunger recedes (moves to the left as viewed in Fig. 1) as the cookies are advanced by the belts but at a speed less than that of the belts and due to the difference in speed the cookies are tilted on their trunnion-like points of contact 16 until they stand vertically on edge.

The straightened up stream of cookies continues to advance and the plunger 18 continues to recede until the latter arrives at the position illustrated in Fig. 1, at which time the leading end of the stream of cookies has advanced into the stack-forming part of the machine a measured and predetermined distance, marked off at one end by the plunger-end 17 and at the other by a separator 19. The latter, which is relatively thin and wedge-like in shape, is mounted to reciprocate in the vertical path and it is also mounted for turning movement about an axis 20 (Fig. 3) located eccentrically with respect to the center line of its broad wedge-like face. The separator at this time is so positioned that the plane of its broad face is disposed at an acute angle to the planes of the faces of the cookies (see Fig. 10) and, while thus positioned, it descends relatively slowly, until its pointed end engages a cookie in the stream (Fig. 12). The separator is free to float or yield within limits

in the direction of its reciprocating movement, whereby it can halt momentarily while it turns until its broad face parallels the faces of the cookies (see Fig. 11) or until it feels or finds its way between a pair of cookies, at which time it is then driven down into the position shown in Figs. 1, 3 and 9. At this time, a stack of cookies is held by its ends between the separator and the plunger end 17 as shown in Fig. 9.

Adjacent the front side of this stack is a transfer device 21 (Fig. 4) and adjacent the opposite side is any suitable receiver, herein exemplified as an intermittently movable turret 22, having suitable pockets, such as 23, to receive the stacks of cookies. After a stack has been separated from the leading end of the stream of cookies, the transfer device 21 moves to the right (Fig. 4) and carries the stack out from between its end supporting means 17 and 19 and into a pocket 23 of the turret 22. Before this transfer is entirely completed, the plunger 18 advances to the right (Fig. 1) and as it nears the separator 19, which has meanwhile been holding back the stream of cookies, the separator rises and allows the plunger end 17 to be engaged by the leading cookie of the stream.

These various elements, above alluded to, together with other associated elements, will hereinafter be separately and successively considered and described in further detail.

The supporting frame of the machine includes a suitable base 25 and a series of upstanding brackets 26, 27, 28 and 29 all secured thereto. The brackets 26, 27 and 28 serve to support a cam shaft 31 which is driven by spur gearing 32 from a main drive shaft 33, journalled in the base 25 and driven by any suitable means (not shown). The brackets 27 and 28 also carry a shaft 34, which is fixed thereto and disposed above and parallel with shaft 31. Shaft 34 serves as a support for certain fixed and movable parts, as will later appear. Brackets 28 and 29 serve to rotatably support a shaft 35 on which the turret 22 is mounted.

The feed belts and associated parts will next be described. Each belt 15 is trained over two pulleys 36 and 37, the former being the driving pulley. One driving pulley 36 (Fig. 3) has fixed thereto a shaft 38 which is driven by bevel gearing 39 from a shaft 40, rotatably mounted in brackets 28 and 29. Shaft 40 is driven by a chain 41 (Fig. 3) and suitable sprockets from cam shaft 31, which turns continuously. Chain 41, which also serves to drive shaft 35, is guided in the desired path by idler sprockets 42 and 43 mounted, respectively, to turn freely on shaft 34 and on a stud 44 fixed to bracket 28. The drive shaft 38 of one pulley 36 is connected by bevel gears 45 to the driving shaft 46 of the other driving pulley 36. The drive shafts 38 and 46 are rotatably mounted in brackets 47 fixed to the bracket 28. The idler pulleys 37 for both belts 15 are rotatably supported by a common bracket 48 which is fixed to one end of a horizontal rod 49. The other end of rod 49 is fixed in a bracket 50 which in turn is fixed to the supporting shaft 34, above described. Rod 49 is further supported by a brace 51 from base 25. A suitable belt tensioning device 52 is provided for each feed belt.

Each feed belt 15 in its upper course of travel moves over an underlying runway in the shape of a bar 53 which has a flat belt engaging face to prevent the belt from sagging and to guide the same in said course. These two runways are rigidly supported at one end by being bolted (Fig. 3) to the V-shaped upper end of bracket 50 with their belt engaging faces in right angular relation. The runways are similarly supported at their other ends by bracket 48. Secured to the inner and adjacent side edges of the runway bars 53 are thin plates 54 which project upwardly beyond the belt engaging faces of the bars and prevent the belts from slipping off said faces. To the opposite edge of each bar 53 is secured a plate 55 which projects vertically upwardly above the bar. These plates 55 form fixed upward extensions of the trough formed by belts 15 and serve as side guides for the moving stream of cookies carried by the belts. Centrally above the stream of cookies is a top guide in the shape of a bar 56, which is fixed at longitudinally spaced intervals to the free ends of arms 57. Each arm 57 is pivoted at 58 to a bracket 59 secured to the under face of one runway bar 53 and has upper and lower abutments 60 and 61 which are adapted to engage one of the plates 55 and the bracket 59, respectively, to limit the swinging movement of arms 57. The center of gravity of the arms 57 and connected bar 56 is so disposed with relation to pivots 58 that these parts are held by their own weight in either of their two extreme positions. The bar 56, which functions to prevent the cookies from jumping out of their trough, may be swung back to gain access to the trough for the placing of cookies thereon. The belts 15, their runways and associated parts are considerably longer than shown and have been broken away on account of space limitations.

The receiving plunger 18 consists of a long cylindrical rod in one end of which the cylindrical stem 63 of the plunger end 17 is slidably mounted (Figs. 1 and 9). There is a pin and slot connection 64 between stem 63 and plunger 18, which connection permits limited relative movement therebetween and a spring 63′ yieldingly holds stem 63 in its outwardly projected position. Plunger 18

is mounted to slide horizontally and in the direction of its axis in a pair of longitudinally spaced arms 65 (Fig. 1) of a bracket 66 which is fixed to the supporting shaft 34 in upstanding relation. Plunger 18 is reciprocated by means of a barrel cam 67, fixed to shaft 31, and a lever 68. The latter is pivoted intermediate its ends to bracket 66 and provided at its lower end with a roll to ride in the groove of the cam. The upper end of lever 68 is connected by a link 69 to plunger 18. The cam 67 is constructed to move plunger 18 from the position shown in Fig. 1 forwardly (to the right) until the forward face of the end 17 lies in the same vertical plane as the separator 19 and to thereafter recede towards its original position, dwelling for a moment shortly before it reaches said position while the separator acts and finally receding the short remaining distance to its original position in which it dwells for a short interval during the initial stage of operation of the transfer device 21. In Fig. 9, the plunger is shown in its first named dwell position and in Fig. 1 it is shown in its second named dwell position and just prior to the transfer movement of the transfer device 21.

In order to support the cookies in their passage across the gap between the feed belts 15 and transfer device 21, a bracket 70 (Fig. 7) is fixed to shaft 34 and extends upwardly into said gap. This bracket, at its upper end, is formed to provide two surfaces 71 which lie in the same planes as and in continuation of the cookie supporting surface of belts 15. Bracket 70 is also provided with upstanding side guides 72 which lie in continuation of the side guides 55. The channel formed by surfaces 71 is covered partly by bar 56, as shown in Fig. 9, and partly by an element 113 to be hereinafter described.

The separator consists of a blade 19 which is relatively thin in order to readily slide between the cookies and which is relatively wide to provide broad faces of adequate area to engage the faces of the biscuits. Each broad face terminates in a blunt point 73. The forward broad face, which from time to time acts in lieu of the plunger head 17 to hold back the stream of cookies fed by belt 15, is vertical so that the cookies when engaged therewith will be straightened up properly with their faces vertically disposed. The rear broad face of separator 19 tapers downwardly so that the separator, as viewed on edge, is in the form of a thin wedge terminating with a blunt point.

The separator has a cylindrical shank 74, the axis 20 of which is offset from the vertical center line of the board face of the separator. Such shank is slidably and rotatably mounted in two vertically spaced arms 75 of a vertically reciprocable carrier 76. Located between arms 75 and clamped, as indicated, to shank 74 is the hub of an arm 77. This hub does not fill the space between arms 75 so that the separator can rise and fall relatively to the carrier within the limits defined by the abutment of the upper and lower faces of said hub with the upper and lower arms 75. On the rear side of carrier 76, a rod 78, having a flange 79, is mounted for horizontal sliding movement in two lugs 80 formed on the carrier. The flange 79 lies in the path of arm 77 and, when the latter is turned by a spring 81, which connects it to the carrier, the arm forces the flange into abutment with one of the lugs 80 as shown in Fig. 6. Thus, the spring 81 tends to move the separator into, and hold it in, the position shown in Fig. 6 and in such position the broad faces of the separator lie at right angles to the direction of travel of the stream of cookies as indicated in Fig. 11. The separator is from time to time turned against the tension of spring 81 by other means to be later described.

The carrier 76 is fixed to the upper end of a rod 82 which is guided for vertical sliding movement in a bearing 83 fixed to one of the pulley supporting brackets 47. To the lower end of rod 82 is fixed a fork piece 84, the spaced arms of which straddle and slidably engage a square block 85 mounted on shaft 31 and free to turn thereon. Forkpiece 84 carries a roll 86 to ride in a path cam 87 fixed to shaft 31. The fork piece 84 just fits between the face of cam 87 and the end face of a hub on bracket 28 (Fig. 1) with which faces it is slidably engaged, whereby it is held from displacement in a direction parallel to the axis of shaft 31. The square block 85 prevents lateral displacement of the fork piece and thus supplements the guide afforded by bearing 83. Cam 87 is constructed so that it holds the separator 19 stationary in its lower and illustrated position until the plunger 18 has had time to advance nearly to its extreme right hand position and to then lift the separator so that it withdraws from engagement with the stream of cookies, which it has been holding back, just in time to permit the plunger head 17 to take up the load. Cam 87 is also constructed to hold the separator 19 stationary in its upper position, while plunger 17 is receding to permit a stream of cookies to advance by the measured length described, and to then move the separator from its upper to its lower position. The downward movement of the separator is not, however, uniform. Rather, it moves downwardly far enough to allow the pointed end of the separator to engage the periphery of the underlying cookie and, as it approaches the cookie, it moves at gradually decreasing speed until it eventually reaches zero speed and then immediately commences

to move again slowly at first and at gradually increasing speed, and completes its downward stroke. The separator therefore is arranged to engage the goods gently and in a manner calculated to reduce breakage of the cookies to a minimum.

The motion just described is that of the separator when it moves with the carrier. As described, the separator can also move vertically relatively to the carrier so that its motion is not always exactly that of the carrier. For example, when and if the pointed end of the separator engages a cookie, as distinguished from the groove between two cookies, the separator is arrested thereby and the carrier can continue to descend for a short distance leaving the separator for the moment stationary in its vertical path and pressing against the cookie only by its own weight.

It is at this time that the separator is turned and the means for turning it will now be described. Pivoted on a stud 88 fixed to bracket 28 is a bell crank lever having a vertically disposed arm 89, a depending arm 90 and a laterally extending arm 91, which carries a roll to ride on the periphery of the cam disc 87 and on a cam 92 fixed to said periphery. A spring 93 acts on arm 90 to pull the roll against the cam and an adjustable stop 94 coacts with arm 90 to limit the movement under the force of spring 93. The upper end of arm 89 carriers an adjustable abutment 95 which is adapted to engage rod 78, move arm 77 and thus turn the separator into the position shown in Figs. 5 and 10 in which the broad face of the separator is disposed at an acute angle to the direction of travel of the cookies. The cam 92 is constructed to turn the separator into such position just shortly after the separator has been raised to its upper position, in which rod 78 will lie in the path of abutment 95. The cam releases the separator, allowing it to swing back under the yielding force of spring 81, shortly after the separator has commenced its decending movement and at just about the time when the end of the separator has engaged a cookie. At such time, it will be noted, the separator is, or may be, virtually stationary and is pressing against a cookie only by its weight. The spring swings the separator in the direction of travel of the cookies, as indicated by the arrow in Fig. 10, and a movement of the point of the separator along the cookie equal to about half the thickness of the cookie results. It is this turning of the separator which permits it to hunt for an easy path and feel its way between the two cookies. Thus suppose that the separator in descending strikes the periphery of a cookie about midway between its faces, as shown in Fig. 12, the separator will swing and its point will travel forwardly (in the direction of travel of the cookie stream) and the motion is sufficient to carry its point to the forward face of this cookie so that the separator, when straightened out to parallel the face of the cookie lies in the plane of division between two cookies. At or about this time, the separator is positively forced down to separate a stack from the stream. Suppose that the point of the separator strikes exactly into the peripheral groove between two cookies, as shown in Fig. 13, then when the separator turns the forward cookie will be pushed ahead for the separator is constantly forced down by its own weight and prevented from climbing up the rounded edges of the forward cookie. It is to take care of such cases, viz, when a cookie is pushed ahead by the separator, that the plunger head 17 is yieldably connected to its plunger. Accordingly, the spring 63′ compresses in such cases. Also, in the final descending movement of the separator there is a wedging apart of the separated cookies which pushes the stack forwardly and compresses spring 63′. Suppose for a third example, that the separator strikes in between the two points described (see Fig. 14) so that it cannot, in turning, move far enough ahead to reach the next division plane, then the point is lodged on the rounded edge of the cookie and has dropped down so far that it will not climb up the rounded surface when the separator turns. If the separator can then turn, which is not always possible, the cookie may be pushed ahead thereby but if it is so lodged as to be held from turning then the cookies are separated more by a wedging action. Thus, the descent of the separator will wedge the forward cookie ahead and as it descends the spring straightens it up and aids in the separation. The essential idea is that the separator can hunt for the nearest groove between two cookies and lodge in such groove before being positively moved down.

The transfer device consists of upper and lower pusher arms 96 and 97 (Fig. 4) separated by a slot or recess 97′ which provides clearance for the movement of the plunger 17 in what would otherwise be an intercepting path. These arms 96 and 97 are connected together and to a pair of arms 98 which have a common hub mounted to turn freely on shaft 34. Connected with said hub is an arm 99 which is pivotally connected to a yoke 100 mounted to slide on a square block 101 free to turn on shaft 31. Yoke 100 fits between and slidably engages the face of a cam disc 102 and the end face of a collar 103 fixed on shaft 33. The yoke has a roll to ride in a path cam formed in disc 102. This cam is constructed to swing the pusher arms 96 and 97 to the right, as viewed in Fig. 3, almost immediately after the plunger 17

comes to rest in its left hand position to thereby carry the stack of cookies into a pocket 23 of turret 22. The cam is also constructed to return the transfer device into the illustrated position immediately that the transfer function has been accomplished and to hold the device stationary in such position until the plunger 18 again comes to rest in its receded or extreme left hand position. It will be remembered that the plunger has a short movement of recession just after the separating operation and the purpose of this final receding movement is to relieve the spring 63′ of any stress to which it may have been subjected during the separating operation and also to loosen the cookies of the stack enough to facilitate the transfer of the stack without breakage. For example, if the arms 96 and 97 pushed the cookies out of engagement with the head 17 and such head had been moved inwardly during the separating operation (as shown in Fig. 9) compressing spring 63′, then the latter would, as soon as permitted, push the head 17 outwardly and this would occur just as the end cookie was being disengaged therefrom. The result would likely be a breaking of the cookie which it is desired to avoid.

The pusher arms 96 and 97 coact with an inclined gate 104 to form a trough to support the cookies as they advance into position for the stack forming function. Gate 104 is fixed on a shaft 105 mounted at one end in bracket 70 and at the other end in a bracket 106 which is fixed to bracket 27. The bracket 106 carries an adjustable stop 107 which is adapted to be engaged by a lug 108 on the gate. A spring 109, connecting lug 108 to a collar 110 fixed to a shaft 34, normally holds lug 108 against stop 107 and the gate in the illustrated position. During the transfer of a stack of cookies, the gate swings back until it forms a floor over which the stack passes to a pocket 23. The gate, being at all times yieldingly pushed against the stack of cookies, holds them in proper stack formation during the transfer. Side plates 111, formed as extensions of arcuate side plates 112 for turret 22, engage the end cookies of a stack during the transfer. A top plate 113 is mounted on the upper edges of walls 111 and is preferably held in place in manner to permit convenient removal, as by the handle bolt 113′. The rear side plate 111 has an opening 114 (Fig. 9) to permit passage of plunger 18 and the front side plate terminates short of the path of travel of the plunger and separator 19 as shown in Fig. 7. The top plate 113 has an opening 115 to permit the descent and turning of the separator.

The turret 22 is disclosed herein merely as one illustration of some suitable receiving means. This turret, as shown, is designed to carry the stacks successively to a wrapping mechanism but the invention, obviously, is independent of the particular receiving means to which the stacks are transferred. As shown, the turret is designed to be driven intermittently and in timed relation to the stack forming mechanism, above described. Referring to Fig. 3, the shaft 35, which is driven by chain 41 from cam shaft 31, has fixed thereto a crank 116 adapted to cooperate with a Geneva cam 117 fixed on a shaft 118, supported in brackets 28 and 29. Fixed to shaft 118 is a pinion 119 (Fig. 4) which drives a gear 120. The latter, which has a pitch diameter twice that of pinion 119, is fixed to turret 22. The arrangement is such that during a portion of each revolution of shaft 35 (while the cookies are being fed into the stack forming mechanism) shaft 118 is turned one sixth of a revolution, as a consequence of which the turret 22, due to the gearing 119—120 is turned one twelfth of a revolution. Thus, the pockets 23 of turret 22 are successively advanced into stack receiving position in proper timed relation with the stack forming mechanism.

The operation will be clear from the foregoing description but will be summarized here. The cookies *c* are placed manually or otherwise in the approximately V-shaped receiving trough formed by and between the inner and adjacent courses of feed belts 15. These cookies are placed on edge and so that their broad faces lie transverse to the path of travel of belts 15, whereby on account of the rounded contour of the cookies each thereof has point contact with each belt. Accordingly, the cookies are carried along by the belts as if hung on trunnions. Consequently, when the leading cookie of the stream engages the plunger end or abutment 17, which travels in the same direction but at somewhat slower speed, said cookie, is tilted, and succeeding cookies in the stream are tilted by engagement with the cookies preceding them, until all are brought into upright position with their flat faces in abutting relation.

This stream of cookies is fed forwardly past the separator 19,—the plunger 18 travelling in the same direction and the cookies being continually pushed thereagainst by the feed belts to maintain the cookies in abutment and in upright position. After the plunger has travelled a measured distance in such direction, the separator 19 descends until it touches one of the cookies, halts momentarily in its descent if necessary while the separator turns to hunt for, and feel its way into, the division plane between two cookies and thereafter continues its descent into the stream and separates a stack from the leading end thereof. In many cases, the stack of cookies will be shoved ahead as the

separator wedges in between two cookies wherefore the spring 63′ is provided to allow abutment 17 to yield and prevent breakage of the cookies. The stack having been thus separated the transfer device moves against the stack held between the plunger 18 and separator 19 and moves the stack transversely against the yielding pressure of plate 104 and into a pocket 23 of turret 22. Just prior to this transfer, the plunger 18 moves back just enough to take the stress off spring 63′ so that the abutment cannot be projected outwardly by the spring when the stack of cookies is pushed out of contact with the abutment. Immediately after the stack of cookies has been disengaged from the plunger and separator, the former moves back towards the separator without waiting for the return of the transfer device, passing freely between the pusher arms 96 and 97. As the abutment 17 nears the separator the latter is lifted and by the time that it has been raised free from the cookies, which it has theretofore been holding back, the abutment 17 takes its place and takes up the load. The plunger immediately starts its advancing stroke to permit another measured length of cookies to advance past the separator and be formed into a stack as above described.

The invention has been disclosed herein, in an embodiment at present preferred, for illustrative purposes but the scope of the invention is defined by the appended claims rather than by the foregoing description.

What we claim is:

1. In combination, means for supporting a plurality of articles on edge and face to face in abutting relation and for feeding the articles in a continuous stream while thus supported, a receiving plunger against which the leading article in the stream abuts, means for moving said plunger in the same direction as the stream, a separator mounted adjacent the path of travel of said articles and for movement into and out of the stream, means operable after a measured length of the leading end of said stream has been moved past said separator to move the latter into said stream and divide off from the leading end thereof a stack of articles of approximately predetermined length, and means for removing the stack of articles held between said plunger and separator.

2. In combination, means for supporting a plurality of articles on edge and face to face in abutting relation and for feeding the articles in a continuous stream while thus supported, a receiving plunger against which the leading article in the stream abuts, means for moving said plunger in the same direction as the stream, a separator mounted adjacent the path of travel of said articles and for movement into and out of the stream, means operable after a measured length of the leading end of said stream has been moved past said separator to move the latter into said stream and divide off from the leading end thereof a stack of articles of approximately predetermined length, means for removing the divided off stack of articles held between said plunger and separator in a direction transverse to that of the travel of the articles in said stream, and a receiving means into which the stack is moved by the last named means.

3. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator blade mounted for movement into and out of said stream in a path transverse to the path of travel of said articles and mounted also for limited movement along said stream, means whereby the blade in moving toward said stream is also moved along the same into the plane of division between two abutting articles, and means for moving the blade into and subsequently out of said stream.

4. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator blade mounted for movement into and out of said stream in a path transverse to the path of travel of said articles and mounted also for limited movement along said stream, means whereby the blade in moving toward said stream is also moved along the same into the plane of division between two abutting articles, and means for moving the blade into and subsequently out of said stream, said last named means constructed and arranged to permit the blade to yield if necessary in its movement into the stream while it moves along the same into said division plane.

5. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator blade mounted for movement into and out of said stream in a path transverse to the path of travel of said articles and mounted also for limited movement along said stream, means operable while the blade is moving toward said stream to yieldingly move it along the same into the plane of division between two abutting articles, and means for moving the blade into and subsequently out of said stream.

6. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a relatively thin, broad-faced separator blade, each broad face of which converges into a blunt centrally disposed point adapted to engage the articles, and a reciprocable carrier in which said blade is supported for

limited turning movement about an axis parallel with but offset from the center line of said broad faces and by which the blade is moved into and out of said stream in a direction parallel to said axis and at right angles to the direction of movement of said stream.

7. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a relatively thin, broad-faced separator blade, each broad face of which converges into a blunt centrally disposed point adapted to engage the articles, a reciprocable carrier in which said blade is supported for limited turning movement about an axis parallel with but offset from the center line of said broad faces and by which the blade is moved into and out of said stream in a direction parallel to said axis and at right angles to the direction of movement of said stream, means for initially positioning the broad faces of said blade to lie at an acute angle with the plane of the abutting faces of said articles, and resilient means tending to turn said blade on engagement with the articles into a position such that the broad faces thereof parallel said abutting faces.

8. In combination, means for supporting articles on edge and face to face in abutting relation and for feeding the articles in a continuous stream while thus supported, a separator adjacent the path of travel of said articles and past which a measured length of the leading end of the stream is fed, means for moving the separator into the stream to divide off a plurality of articles from the leading end of said stream, and means for turning the separator as it moves toward the stream and at approximately the time when it is brought into engagement with one or more of the articles composing such stream.

9. In combination, means for supporting articles on edge and face to face in abutting relation and for feeding the articles in a continuous stream while thus supported, a separator adjacent the path of travel of said articles and past which a measured length of the leading end of the stream is fed, said separator comprising a blade adapted to be inserted between adjacent articles in said stream and having a wedge like point, a carrier in which said separator is mounted for limited turning movement about an axis offset from the center line of said wedge like point, means for moving the carrier to move the separator into and out of the stream, and means for turning the separator during its movement toward the stream.

10. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator comprising a relatively thin blade adapted to be inserted between the abutting faces of two articles in said stream and having relatively broad faces adapted to engage said faces of the articles and provided with an approximately V-shaped point, means for moving said blade in a direction at right angles to the path of travel of said articles to carry said point first into engagement with said articles and then between two abutting articles to separate the same, means for positioning said blade so that its broad faces lie at an acute angle with respect to the abuting faces of said articles as said point first engages the same, and means for turning said blade about an axis offset from the center line of said V-shaped point to carry the point along the stream of articles and into the plane of division between succeeding articles, said turning means operating at about the time of initial engagement of said point with the articles and before the same is finally thrust in between adjacent articles.

11. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator comprising a relatively thin blade adapted to be inserted between the abutting faces of two articles in said stream and having relatively broad faces adapted to engage said faces of the articles and provided with an approximately V-shaped point, means for moving said blade in a direction at right angles to the path of travel of said articles to carry said point first into engagement with said articles and then between two abutting articles to separate the same, means for positioning said blade so that its broad faces lie at an acute angle with respect to the abutting faces of said articles as said point first engages the same, means for turning said blade about an axis offset from the center line of said V-shaped point to carry the point along the stream of articles and into the plane of division between succeeding articles, said turning means operating at about the time of initial engagement of said point with the articles and before the same is finally thrust in between adjacent articles, and means permitting said blade to yield temporarily in its movement toward the stream while said turning means operates.

12. In combination, means for moving a stream of articles while disposed face to face in abutting relation in a direction at right angles to the plane of their abutting faces, a separator comprising a relatively thin blade adapted to be inserted between the abutting faces of two articles in said stream and having relatively broad faces adapted to engage said faces of the articles and provided with an approximately V-

shaped point, means for moving said blade in a direction at right angles to the path of travel of said articles to carry said point into engagement with said articles, then between two abutting articles to separate the same and subsequently out of said stream, means for positioning said blade so that its broad faces lie at an acute angle with respect to the abutting faces of said articles as said point first engages the same, means for yieldingly turning said blade about an axis offset from the center line of said V-shaped point to carry the point along the stream of articles and into the plane of division between succeeding articles, said turning means operating at about the time of initial engagement of said point with the articles and before the same is finally thrust in between adjacent articles, and means permitting said blade to yield temporarily in its movement toward the stream while said turning means operates.

13. In combination, a pair of feed belts mounted so that adjacent courses thereof travel in the same direction and at the same speed and so that said belts form between them a substantially V-shaped trough into which substantially disc-like articles may be placed with their faces disposed transversely to the path of travel of said belts and so that the rounded peripheries thereof have point contact with each belt, an abutment disposed in the path of travel of said articles and adapted to be engaged by the leading articles in the stream, and means for moving said abutment in the direction of travel of the articles but at a somewhat slower speed, whereby as the leading article engages said slower moving abutment and succeeding articles in the stream engage the articles ahead of them, the articles are tilted about said points of contact as pivots and straightened up so as to lie vertically on edge and face to face in abutting relation.

14. In combination, feeding means for moving a stream of disc-like articles arranged on edge and face to face in abutting relation in a direction transverse to the plane of their abutting faces, a receiving plunger mounted to move back and forth in the path of travel of said articles, means for moving the plunger to meet the stream of articles and cause the leading article to engage the same and for subsequently moving said plunger at a rate substantially commensurate with that of said stream and in the same direction, a separator mounted adjacent the path of travel of said articles and for movement into and out of said stream, means operable after a measured length of articles have moved past the separator for moving the same into said stream to divide off a stack from the leading end thereof, and means for removing the divided off stack held between said abutment and separator, said plunger moving means operable just prior to the removal of said stack to move the plunger away from the end of the stack sufficiently to free the articles therein from end pressure.

15. In combination, feeding means for moving a stream of disc-like articles arranged on edge and face to face in abutting relation in a direction transverse to the plane of their abutting faces, a receiving plunger mounted to move back and forth in the path of travel of said articles, an abutment mounted on said plunger for limited movement relatively thereto in the direction of movement of said plunger, resilient means normally projecting said abutment outwardly relatively to said plunger, means for moving the plunger to meet the stream of articles and cause the leading article to engage said abutment and for subsequently moving said plunger at a rate substantially commensurate with that of said stream and in the same direction, a separator mounted adjacent the path of travel of said articles and for movement into and out of said stream, means operable after a measured length of articles have moved past the separator for moving the same into said stream to divide off a stack from the leading end thereof, said resilient means permitting said abutment to yield if the divided off stack is forced ahead by the separator, means for removing the divided off stack held between said abutment and separator, and means for relieving the stress in said resilient means prior to the operation of the last named means.

16. In combination, feeding means for moving a stream of disc-like articles arranged on edge and face to face in abutting relation in a direction transverse to the plane of their abutting faces, a receiving plunger mounted to move back and forth in the path of travel of said articles, means for moving the plunger to meet the stream of articles and cause the leading article to engage the same and for subsequently moving said plunger at a speed substantially commensurate with that of said stream and in the same direction, a separator mounted adjacent the path of travel of said articles and for movement into and out of said stream, means operable after a measured length of articles have moved past the separator for moving the same into said stream to divide off a stack from the leading end thereof, and intermittently operable means comprising upper and lower spaced pusher arms movable back and forth in a path transverse to that of said articles for successively removing the divided off stacks held between said plunger and separator, said plunger moving means operable to move the plunger back to again meet the stream of articles immediately after the divided off stack has been removed

therefrom and without waiting for said intermittently operable means to return and come to rest, said plunger when so moved passing through the space between said pusher arms.

17. In combination, an intermittently reciprocable transfer device comprising upper and lower spaced pusher arms, a gate opposed to said device and yieldingly held in the path of movement thereof, said plate and the ends of said arms when at rest forming between them a substantially V-shaped receiving trough, means for successively feeding stacks of disc-like articles into said trough while the plate and transfer device are at rest, a plunger engaged by the leading article of the stack and movable therewith as the same is fed into said receiving trough, said plunger dwelling momentarily after a stack has been fed into said trough during the initial stage of operation of said transfer device and then returning in the space between said pusher arms to meet the leading end of a succeeding stack of articles before the completion of the movement of said transfer device.

In testimony whereof we have affixed our signatures.

ELMER LOVELL SMITH.
ARTHUR E. PHELON.