Aug. 6, 1940. F. PARRY 2,210,378

PACKING MACHINE

Filed March 22, 1939 4 Sheets-Sheet 1

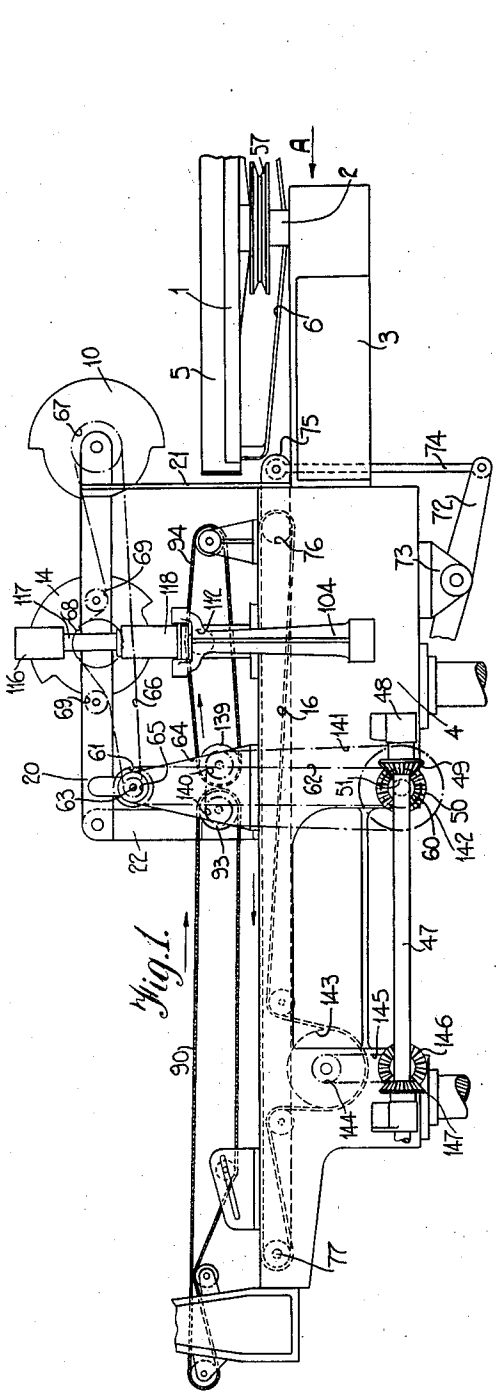


Fig. 1.

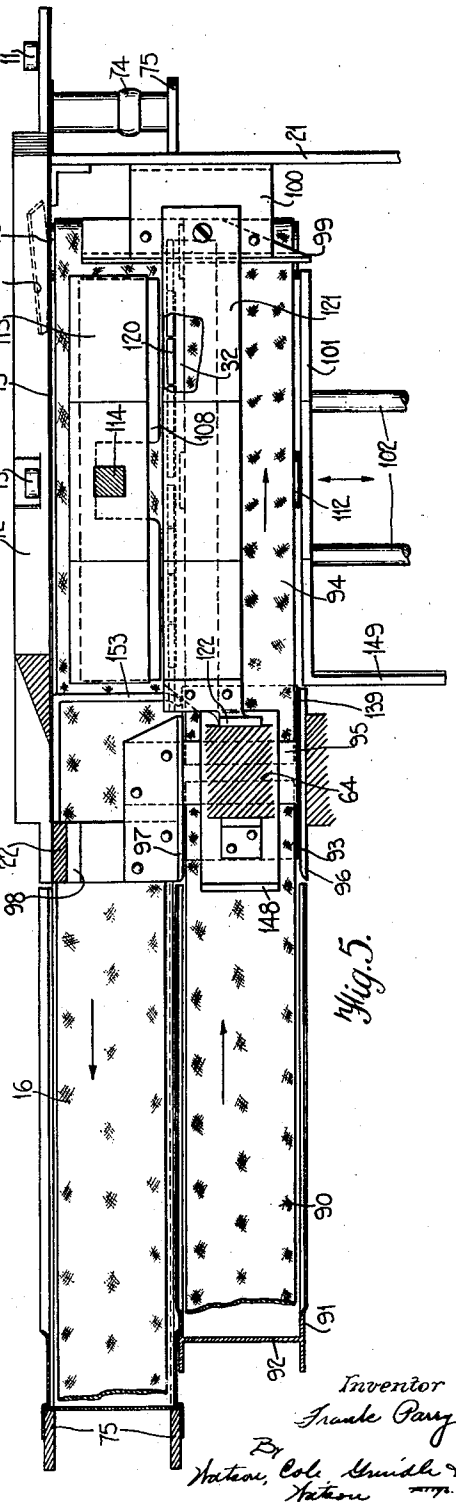


Fig. 5.

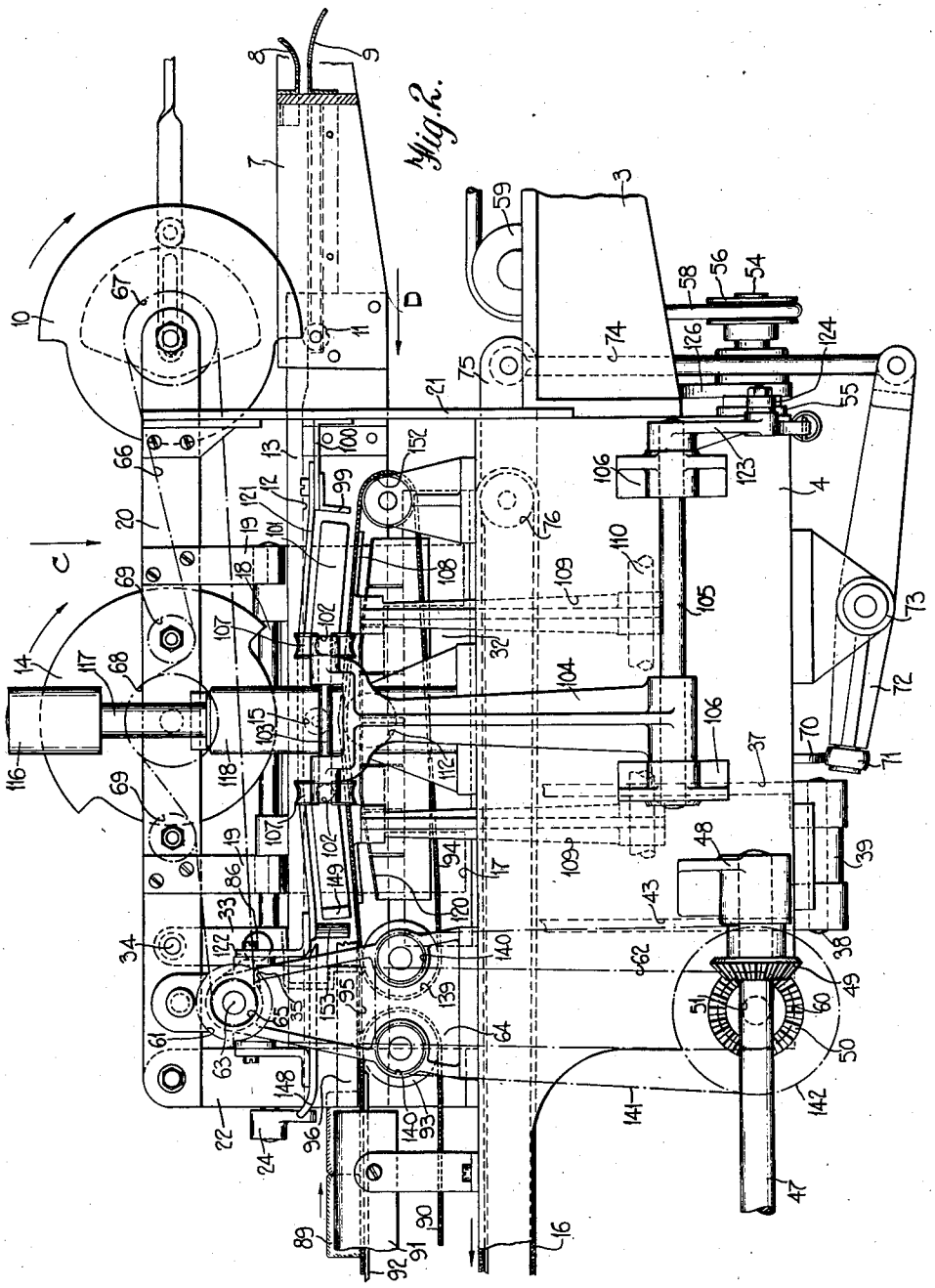
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PACKING MACHINE

Filed March 22, 1939 4 Sheets-Sheet 2

Fig. 2.



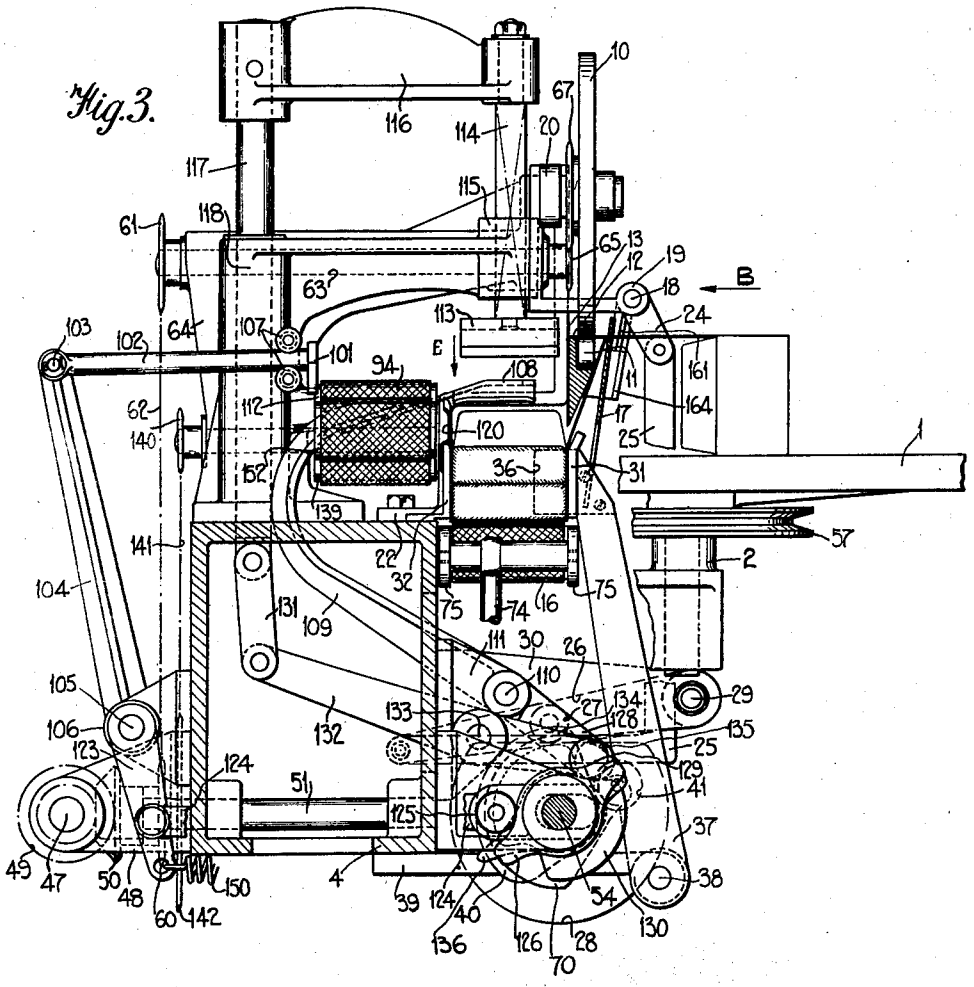
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PACKING MACHINE

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Fig. 3.



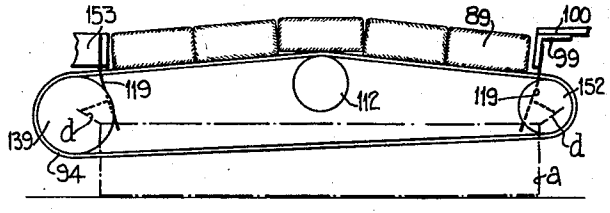


Fig. 7.

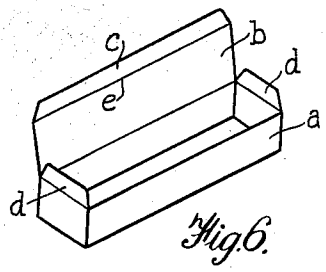


Fig. 6.

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PACKING MACHINE

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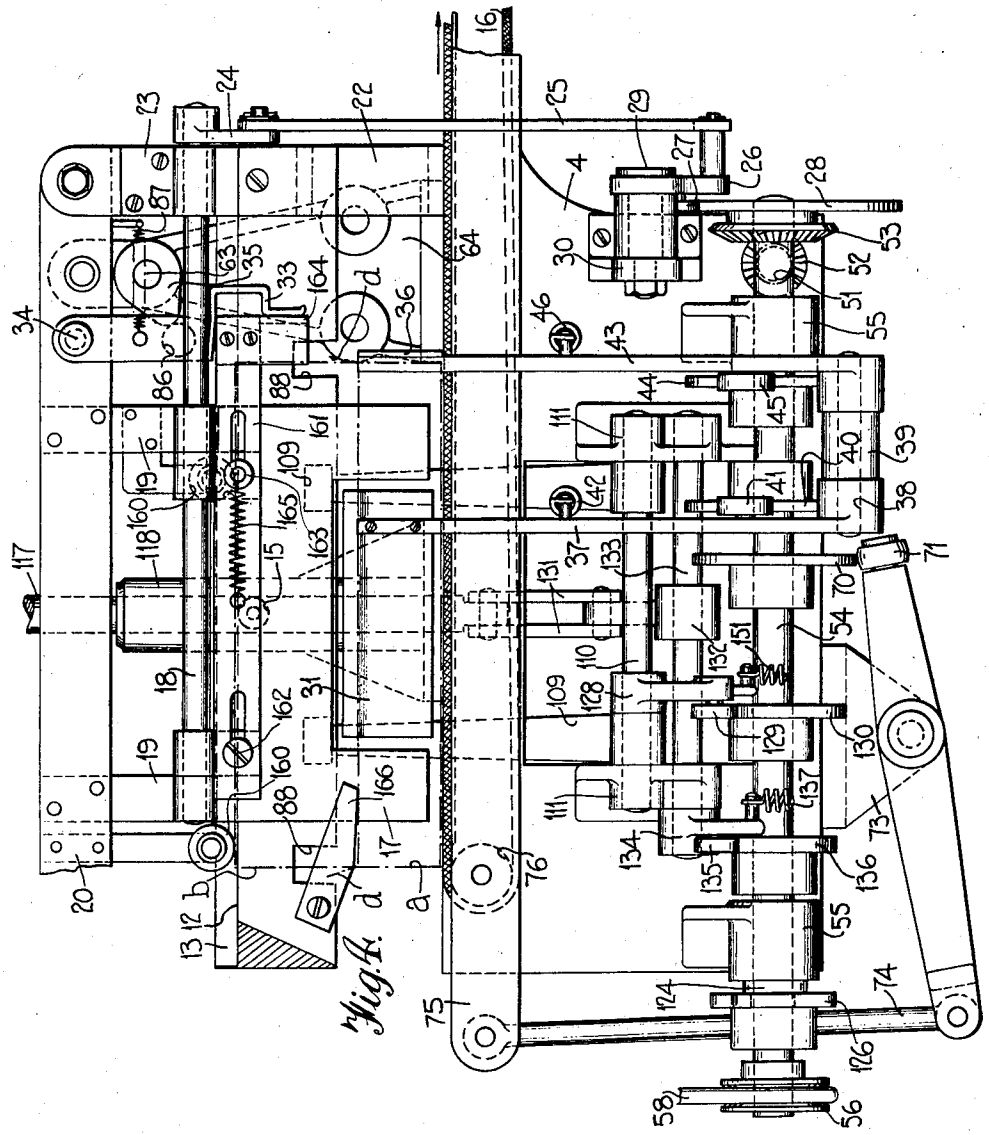


Fig. 4.

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Patented Aug. 6, 1940 2,210,378

UNITED STATES PATENT OFFICE

2,210,378

PACKING MACHINE

Frank Parry, Deptford, London, England, assignor to Molins Machine Company, Limited, Deptford, London, England

Application March 22, 1939, Serial No. 263,563
In Great Britain April 6, 1938

9 Claims. (Cl. 226—14)

This invention is for improvements in or relating to packing machines, and in particular to apparatus for inserting transversely to the length thereof a row of articles, hereinafter referred to as "a row," into a box through an opening in the box, which opening is substantially equal to the overall length of the row. Such apparatus will be referred to below and in the appended claims as "apparatus of the kind referred to."

The term "row" means a succession of two or more contiguous substantially rectangular articles.

The term "length" or "lengthwise" where used in connection with a row means that dimension of the row which is measured along the succession of articles comprising the row.

In apparatus of the kind referred to difficulty has heretofore been experienced in inserting a row into a box, due to the fact that the overall length of the row is substantially equal to the length of the opening in the box through which opening the row is moved into the box. It is an object of the invention to provide a method of and apparatus for inserting a row into a box, whereby this difficulty is avoided or greatly minimised. This object is achieved by arranging a row so that the outer end faces of the row converge towards each other (e. g. by arching the row) and moving the row into the box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

Other objects will hereinafter be described and set forth in the claims appended to the specification.

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

Figure 1 is a front elevation, drawn to a small scale, of a box filling machine and shows portions of an apparatus for feeding boxes into a filling position.

Figure 2 is a view of a portion of Figure 1 drawn to an enlarged scale and shows in more detail the box filling devices.

Figure 3 is a view, partly in section, of Figure 1 taken in the direction of the arrow A and is drawn to an enlarged scale, certain parts being omitted for the sake of clarity.

Figure 4 is a view taken in the direction of the arrow B, Figure 3, certain parts being shown broken away or omitted for the sake of clarity.

Figure 5 is a view of certain parts taken in the direction of the arrow C, Figure 2, and shows the disposition of feeding and supporting elements for the articles and also the disposition of the pusher elements employed.

Figure 6 is a perspective view of a box into which two superimposed rows are to be inserted.

Figure 7 is a diagrammatic elevation illustrating the arching of a row of articles and its insertion into a box.

Like reference numerals refer to like parts throughout the specification and drawings.

The boxes may be fed to the filling position in any desired manner, but preferably the boxes are fed to the filling position by the box feeding mechanism described below. The apparatus described herein for feeding the boxes to the filling position forms no part of the present invention but is described and claimed in United States application, Serial No. 263,562, filed March 22, 1939.

Referring to the drawings, boxes which are to be filled are arranged fanwise on a horizontal rotatable disc 1 as described in the specification referred to in the preceding paragraph.

The disc 1 is rotatably mounted in a bearing 2 which is fixed to a bracket 3 which latter is fixed to the end face of a bed 4 of the box filling machine. A guard 5 carried on supports 6 is mounted adjacent to the rim of the disc and serves to prevent the boxes being thrown too far outwardly by centrifugal force during rotation of the disc 1. The guard 5 is preferably arranged to be vibrated as described in United States application, Serial No. 263,562, filed March 22, 1939.

Referring to Figure 6, it will be seen that the box consists of a body *a* having a lid *b* which has a closure flap *c* while the ends of the box are also provided with small flaps *d*.

The flap *c* of a box carried by the disc 1 is caused by the rotation of the disc to engage a stop or locating device which consists of a fixed plate 7 to which is secured a pair of converging guide plates 8 and 9 arranged substantially in the form of a V. This V may be seen more clearly from Figure 2 where the guides are sectioned to show their shape.

The closure flap *c* of the box is disposed between the peripheries of a rotatable segmental disc 10 and a roller 11. The segmental disc 10 is positively rotated in the direction indicated in Figure 2 and co-operates with the roller 11 to move the box lengthwise and thus remove it from the disc 1.

To permit the closure flap *c* to be positioned between the segmental disc 10 and the roller 11 the periphery of the disc 10 is cut away as shown in Figure 2 and the rotation of the disc is so

timed that the cut-away portion of the disc passes the roller 11 during the time that the closure flap *c* of a box is being moved so as to be located between the roller 11 and the disc 10.

The co-operating disc 10 and roller 11 feed the box lengthwise in the direction of the arrow D (Figure 2), so that the underside of the closure flap *c* is moved into engagement with a narrow support 12 disposed in a horizontal plane parallel to the plane of the rotatable disc.

As will be seen from Figures 3 or 4, the support 12 consists of a bar of triangular section having an extension 13 projecting above the flap engaging surface and against which the closure flap of the box is located.

Above the support 12 there is provided another positively rotated segmental disc 14 which co-operates with a roller 15. The disc 14 and roller 15 are spaced apart from the disc 10 and roller 11 in the direction of the length of the box and the box is moved by the discs 10, 14 co-operating with the rollers 11, 15 substantially into a box filling position (see dot and dash lines indicating a box in this position in Figure 4).

When the box has reached this position, the closure flap *c* is retained in engagement with the support 12 and the body of the box together with the lid is caused to turn about the score line *e* so that the body *a* is moved through substantially 90° to the position shown in section in Figure 3 at which position the bottom of the box rests on a platform which, in the example shown, consists of a travelling band or belt 16.

While the box is in this position a row may be moved downwardly in the direction of the arrow E into the box. It will also be seen from Figure 3 that the lid *b* is inclined away from the open end of the box towards the closure flap so as not to impede the downward movement of a row into the box.

In order to assist in locating the box in its proper position on the platform 16 there are provided various stops and movable flaps which act in the following manner.

The closure flap *c* is gripped between the disc 14 and the roller 15 until the feeding movement stops and until the box is moved completely off the rotatable disc 1 it is in the horizontal position as shown in full lines in Figure 3. The weight of the box, once it is moved completely off the disc 1, tends to turn the lid and the body of the box about the score line *e* and this movement of the body and lid is assisted by an oscillating flap 17. In order to retain the closure flap *c* in position on the support 12 after the disc 14 and roller 15 cease to grip the flap, small freely rotatable rollers 160 are mounted above the support 12 and co-operate therewith frictionally to engage the closure flap and to retain the closure flap in position while the body portion of the box is being turned about the score line *e*. The flap 17 is fixed to a spindle 18 which is supported in bearings 19 depending from a support bar 20 which also carries the spindles of the segmental discs 10 and 14. The support bar 20 is carried by a plate 21 fixed to one end of the bed 4 and a bracket 22 fixed to the upper surface of such bed. The spindle 18 is also supported in a bearing 23 fixed to the bracket 22 and carries at its outer end a lever 24 to which is connected a link 25 which is bent as shown in Figure 3 so that it has a right angled extension. The end of the extension is pivoted to a cam lever 26 carrying a roller 27 which engages with a cam 28 and the other end of the lever 26 is pivoted at 29 to a bracket 30 fixed to the bed 4. As the cam 28, which is driven as hereafter described, is rotated the flap 17 is caused to oscillate through approximately 90°, thus causing the box body and lid to be positively bent about the front edge of the triangular bar and brought into position above the belt 16. The support 12 is slotted at 88 (see Figure 4) to clear the box flaps *d* during this movement.

An oscillating pusher element 31 is provided to engage the box body and push it into position above the belt 16, the side of the box opposite that engaged by the pusher element being pressed against an angle stop 32, see Figure 3.

The method of operating the pusher element 31 will be described later.

As it is desirable to locate the box accurately in the filling position, the disc 14 and roller 15 are arranged to move the leading end of the box slightly past the filling position and the box is then moved rearwardly towards the filling position. This rearward movement is effected by an adjusting stop comprising a member 33 which is pivoted at 34 to the support bar 20 and which is moved by a cam 35 and an angle piece 164 which is mounted on a bar 161 slidably carried on the plate 17. The bar 161 (see Figure 4) is carried on guide pins 162 and 163 attached to the hinge pieces of the plate 17 and is urged towards the member 33 by a spring 165. The cam 35 engages a roller 36 and a spring 37 returns the member 33. The member 33 is caused to engage with the angle piece 164 and the latter engages the leading edge of the box lid and pushes it back slightly beyond its correct position, after which a front locating plate or stop 36 moves into the path of the box which is then carried along by the movement of the belt 16, which latter travels in the direction indicated, until it is stopped by said stop 36 when the box is in its proper position for receiving the row. The angle piece 164 swings with the plate 17 and is therefore moved out of the path of a box when the latter is moved by the belt 16 away from the filling position. Rearward movement of a box by the angle piece 164 and member 33 causes the leading flap *d* to be engaged by a leaf spring guide 119 which causes the flap *d* to be moved away from the open end of the box into a position such as that indicated in Figure 4 so that the flap does not interfere with the subsequent filling of the box. The flap *d* at the rear end of the box is also moved into a position so as not to interfere with the filling of the box and this movement is also effected by downwardly projecting elements one of which comprises a tapered guide 166 which drags the rear flap *d* backwardly as the box is being swung downwardly towards the filling position by the plate 17. When the box is in the filling position the rear flap *d* is not engaged by the guide 166 but by a further leaf spring guide 119.

The pusher element 31 is fixed to a lever 37 which is in turn fixed to a spindle 38 mounted in a bearing 39 fixed to the base of the bed. A cam 40 driven in the manner hereinafter described engages a roller 41 mounted on the lever 37 and operates the pusher element 31 at the desired intervals in conjunction with a spring 42.

The stop 36 is similarly carried on a lever 43 (Figure 4) fixed to the spindle 38 and operated by a cam 44 which engages a roller 45 on the lever 43 and in conjunction with a spring 46 also operates the stop 36 at the desired intervals.

The machine is driven by a shaft 47, see Fig-

ure 1, which is rotated by any convenient source of power. The shaft 47 is supported in a bearing 48 attached to the back of the bed 4 and has a bevel gear wheel 49 at the end adjacent to such bearing, which bevel gear wheel engages with a further bevel gear 50 mounted on a cross shaft 51 supported in bearings in the bed 4. The other end of the shaft 51 has a bevel pinion 52 engaging a bevel gear wheel 53 fixed to a cam shaft 54 supported in bearings 55 fixed to the bed 4. An extension of the cam shaft 54 has a V-pulley 56 fixed to it which drives a pulley 57 fixed to the base of the disc 1 by a belt 58 which passes over jockey pulleys 59.

On the spindle 51 at a point near the bevel gear 50 is fixed a sprocket 60 which drives an upper sprocket 61 by means of a chain 62, the sprocket 61 being fixed to a spindle 63 which is mounted in a bearing bracket 64 fixed to the bed of the machine. The other end of the spindle 63 carries a small sprocket 65 which drives the segmental discs 10 and 14 by means of a chain 66 which passes over sprockets 67 and 68 fixed to the segmental discs, the chain also passing over jockeys 69, Figure 1. It will be observed from Figure 4 that the cam 35 is fixed to the spindle 63.

From Figure 4 it will also be seen that the cam shaft 54 carries the cams 40, 44 and 28. It also carries another cam 70 which engages with a roller 71 fixed to one end of a lever 72 pivoted at 73 to a bracket fixed to the bottom of the bed. The other end of the lever 72 is connected by a link 74 to plates 75 which form supports for the roller 76 around which the belt 16 passes. The remote ends of the frame 75 are pivoted at a point 77, see Figure 1, and as the cam 70 rotates, the belt 16 is lowered from the position shown for a distance sufficient to permit the body portion of the box freely to be swung into position above the belt before being engaged by the belt.

From the foregoing it will be understood that the box is now in the filling position shown in Figure 3 and the following description relates to the box filling apparatus which forms the subject matter of the present invention.

The articles 89 (Figure 2), which in the present case consists of packets of cigarettes, are brought into the box filling portion of the machine by an endless travelling band 90 which moves in the direction indicated in Figure 1.

As may be seen from Figure 5, the band 90 travels in a channel guide 91 which has a base 92 forming a support for the band and the band passes around a roller 93 at the end nearer to the box filling position. The articles on the band 90 are contiguous as shown in Figure 2, and continued movement of the band 90 feeds them on to an arched guide which comprises an endless band 94 which is continuously movable in a direction considered lengthwise of a row disposed thereon (see Figure 1), and which is supported by rollers 112, 139 and 152 (see Figure 7) so that its upper surface is arched. The arching of the row by the band 94 arranges the row so that the outer end faces of the row converge towards each other (see Figure 7).

A small bridge 95 is arranged to cover the gap between the bands 90 and 94 as shown in Figures 2 and 5 and side guides 96 and 97 are provided to control the packets during the transfer from one band to the other. The bridge 95 is supported by the guide 97 which is in turn supported by a bracket 98 fixed to the bracket 22 previously mentioned. A top guide 143 is also provided which is fixed to the bracket 64.

The result of the feeding movement is that an arched row containing five contiguous packets is arranged on the band 94 as shown in Figure 7. The outer end face of the leading packet of a row is arrested by a stop 99 when the articles are fed on to the band 94 by the band 90, and the stop 99 also forms a guide as hereinafter described and is carried by a bracket 100 which is fixed to the plate 21. When the outer end face of the leading packet has come into contact with the stop 99 the packets on the belts 90 and 94 are arrested and the belts slip beneath them, thus ensuring the contiguity of the packets. The arched row shown in Figure 7 is then moved transversely to the direction in which it was fed on to the arched guide 94 by a transfer device comprising a reciprocating pusher 101 which is fixed to the ends of a pair of rods 102 which are pivoted at their opposite ends at 103 to a lever 104 which is fixed on a spindle 105. The spindle 105 is rotatably mounted in bearings 100 on the front face of the machine and operated as described later. The pusher 101 is also controlled by means of rollers 107 whose peripheries are of concave shape as shown in Figure 2 and embrace the rods 102. During the transverse movement of the row the outer end faces of the row are guided by the stop 99 and another guide 153 fixed to the member 12 (see Figure 5), while a right angled extension 149 of the pusher 101 prevents packets passing from the band 90 to the band 94 until the pusher 101 is back in the retracted position shown in Figure 5. The movement of the pusher 101 is such that the arched row is brought above a box located in the filling position, and in order to prevent the row from becoming displaced during this movement a movable support 108 which is arched in a manner similar to the row, is arranged to move with and beneath the row to support the same during the transverse movement of the row from the arched guide 94. The support 108 is carried on a pair of curved arms 109 which are fixed to a spindle 110 rotatably mounted in bearings 111 on the rear face of the machine and operated as described later. The general shape of the support 108 may be seen from Figure 5 and it will be noticed that it is cut away at the middle to afford clearance as it moves back into position beneath the belt 94 to clear the roller 112 which forms the centre of the belt arch.

The arched row is moved downwardly into the box, as indicated by the arrow E (Figure 3), by means of a reciprocating pusher 113 the article engaging surface of which is shaped substantially to conform with the shape of the upper surface of an arched row. This pusher is fixed to a square stem 114 which slides in a guide 115 and is connected at its upper part to a bridge piece 116 which is in turn fixed to a rod 117 vertically movable in a guide 118 and operated as hereinafter described. The guides 115 and 118 are formed in a single member, see Figure 3. The downward movement of the pusher 113 pushes the arched row between a pair of leaf spring guides 119, Figure 7, which are caused to move outwards, thus moving the flaps *d* of the box out of the path of the arched row and also form guides for the outer end faces of the row.

One vertical side of the downwardly moved arched row is engaged by spring members 120 which are fixed to the angle stop 32 while the opposite vertical side of the row is engaged by the rear face of the member 12.

It will be observed from Figure 3 that in the

present case the box is arranged to contain two superimposed rows of articles, and in consequence the operations above described are repeated before the box is moved from the filling position. This necessitates variation in the length of each alternate stroke of the pusher 113 which is provided for as described later. When inserting two superimposed rows into a box, the row first moved downwardly towards the box is supported by the spring guides 120 and the rear wall of the member 12, the spring guides 120 being arranged to press the packets against the member 12, until the second row is moved downwardly when the guides 120 yield and the extra length of the second stroke of the pusher element 113 causes both rows to be inserted into the box.

To assist in the formation of the arched row and also to assist in preventing the row from becoming displaced during its transverse movement from the band 94 to its position over the open box, a top guide 121 is provided and the top guide is fixed at one end to the bracket 100 and at the other end to a bracket 122 which is in turn fixed to the bracket 64.

The moving parts of the row arching and inserting apparatus are operated in the following manner.

Referring to Figure 2, the spindle 105 to which is secured the lever 104 which operates the pusher 101 is provided with a lever 123 to which is connected a cam rod 124 which passes across the end face of the machine bed and slides on the cam shaft 54, as shown in Figure 3. On the cam rod 124 is mounted a roller 125 which engages with a cam 126 which, as can be seen from Figure 3, has two lobes spaced 180° apart. A spring 150 effects the return movement. In consequence, for each rotation of the cam shaft the pusher is reciprocated twice, thus feeding two rows from the arched band 94 to the filling position.

The spindle 110, Figures 2 and 4, to which are connected the arms 109 carrying the support 108 has also fixed thereto a lever 128 which has at its free end a roller 129 which engages a cam 130 mounted on the cam shaft 54. This cam is provided with two depressions spaced at 180° as may be seen from Figure 3, and thus also operates the arched support 108 twice for each revolution of the cam shaft. A spring 151 effects the return movement.

The reciprocating rod 117 has two links 131 pivoted at its lower end which are in turn pivoted to a lever 132 fixed to a spindle 133 which is rotatably mounted in bearings 111 previously referred to. A lever 134 is also fixed to the spindle 133 and carries a cam roller 135 which engages with a cam 136, a spring 137 effecting the return movement. This cam, as may be seen from Figure 3, is provided with two rather sharp lobes at 180° apart, and it will be seen from the Figure that the lower lobe on the drawing is of greater radius than the upper one; as a consequence the pusher stroke of the pusher element 113 is longer in the former instance than in the latter instance, thus varying the pusher stroke as above mentioned.

In addition to the driving mechanism previously described, provision is made for driving the band 16 and the bands 90 and 94 as follows.

At the lower part of the bracket 64 are mounted rollers 93 and 139 which carry the bands 90 and 94 respectively, and the spindles of these rollers are provided with small sprockes 140, see Figures 2 and 3, around which passes a chain 141. The chain is driven by a sprocket 142, Figure 3, which is fixed to the cross-shaft 51. The belt 16 is driven by a large roller 143, Figure 1, the spindle of which carries a sprocket 144 which is driven by a chain 145 from a sprocket (not shown) but fixed to the back of a bevel wheel 146 which engages with another bevel 147 fixed to the main shaft 47.

When a box has been filled, the stop 36 is moved out of the path of the box, thus permitting the belt 16 to move the filled box in the same general direction as that in which the box when empty was fed to the filling position and away from the filling position.

By reason of the fact that a row is arched when it is inserted into a box, the arching being such that the outer end faces of the row converge towards each other so that the shortest distance between the converging outer end faces of the row is less than the length of the opening into the box, the converging outer end faces of the row provide a lead into the box, thus facilitating the insertion of a row into the box.

What I claim as my invention and desire to secure by Letters Patent is:

1. Apparatus of the kind referred to comprising an arched guide, means to move a row on to said guide so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, and means to move the arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

2. Apparatus of the kind referred to comprising an endless movable band, means to arch the upper run of said band in the direction of movement thereof, means to move a row on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, and means to move the arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

3. Apparatus of the kind referred to comprising an endless band continuously movable in one direction, means to arch the upper run of said band in the direction of movement thereof, means to move a row on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, and means to move the arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

4. Apparatus of the kind referred to comprising an endless band continuously movable in one direction, means to arch the upper run of said band in the direction of movement thereof, a conveyor to move a row lengthwise on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, a transfer device movable in a direction transverse to the direction of movement of said conveyor and also transverse to the direction in which the row is arched to move a row from said band, and means to move the transferred arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

5. Apparatus of the kind referred to compris-

ing an endless band continuously movable in one direction, means to arch the upper run of said band in the direction of movement thereof, a conveyer to move a row lengthwise on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, a transfer device movable in a direction transverse to the direction of movement of said conveyor and also transverse to the direction in which the row is arched to move a row from said band, a locating device to engage the leading end of a row on said band and to locate the row relatively to said transfer device, and means to move the transferred arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box.

6. Apparatus of the kind referred to comprising an endless band continuously movable in one direction, means to arch the upper run of said band in the direction of movement thereof, means to move a row on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, means to move the arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box, and an arched support movable between said band and said last named means to support the arched row during said transverse movement thereof.

7. Apparatus of the kind referred to comprising an endless band continuously movable in one direction, means to arch the upper run of said band in the direction of movement thereof, a conveyor to move a row lengthwise on to said upper run so that the lower surface of the row is engaged thereby and the row is arched so that the outer end faces of the row converge towards each other, a transfer device movable in a direction transverse to the direction of movement of said conveyor and also transverse to the direction in which the row is arched to move a row from said band, means to move the transferred arched row into a box with the end faces converging in the direction of movement so that the converging faces provide a lead into the box, and an arched support movable between said band and said last named means to support the arched row during said transverse movement thereof.

8. Apparatus of the kind described, an arched guide, means to move a row on to said guide so that the lower surface of the row is engaged thereby and the row is arched so that the end faces of the row converge towards each other, a transfer device to move an arched row from said guide in a direction transverse to the direction in which the row is arched, and a reciprocating pusher element to move a transferred arched row downwardly into a box, said pusher element having a row engaging surface which is shaped substantially to conform with the upper surface of the arched row.

9. Apparatus of the kind described, an arched guide, means to move a row on to said guide so that the lower surface of the row is engaged thereby and the row is arched so that the end faces of the row converge towards each other, a transfer device to move an arched row from said guide in a direction transverse to the direction in which the row is arched, a reciprocating pusher element to move a transferred arched row downwardly into a box, said pusher element having a row engaging surface which is shaped substantially to conform with the upper surface of the arched row, a box support, yielding supporting elements disposed between the box support and the pusher element to engage the vertical sides of a row and to support a row in position for insertion into a box, and means to increase the length of each alternate downward stroke of said pusher element whereby during the shorter downward movement of the pusher element a first row is moved into position to be engaged and supported by said yielding supporting elements and during the longer downward movement the first row together with a second row is inserted into a box.

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