

Dec. 8, 1931.

E. P. WETMORE

1,835,547

PACKAGING MACHINE

Filed Sept. 2, 1925

15 Sheets-Sheet 1

FIG. 1.

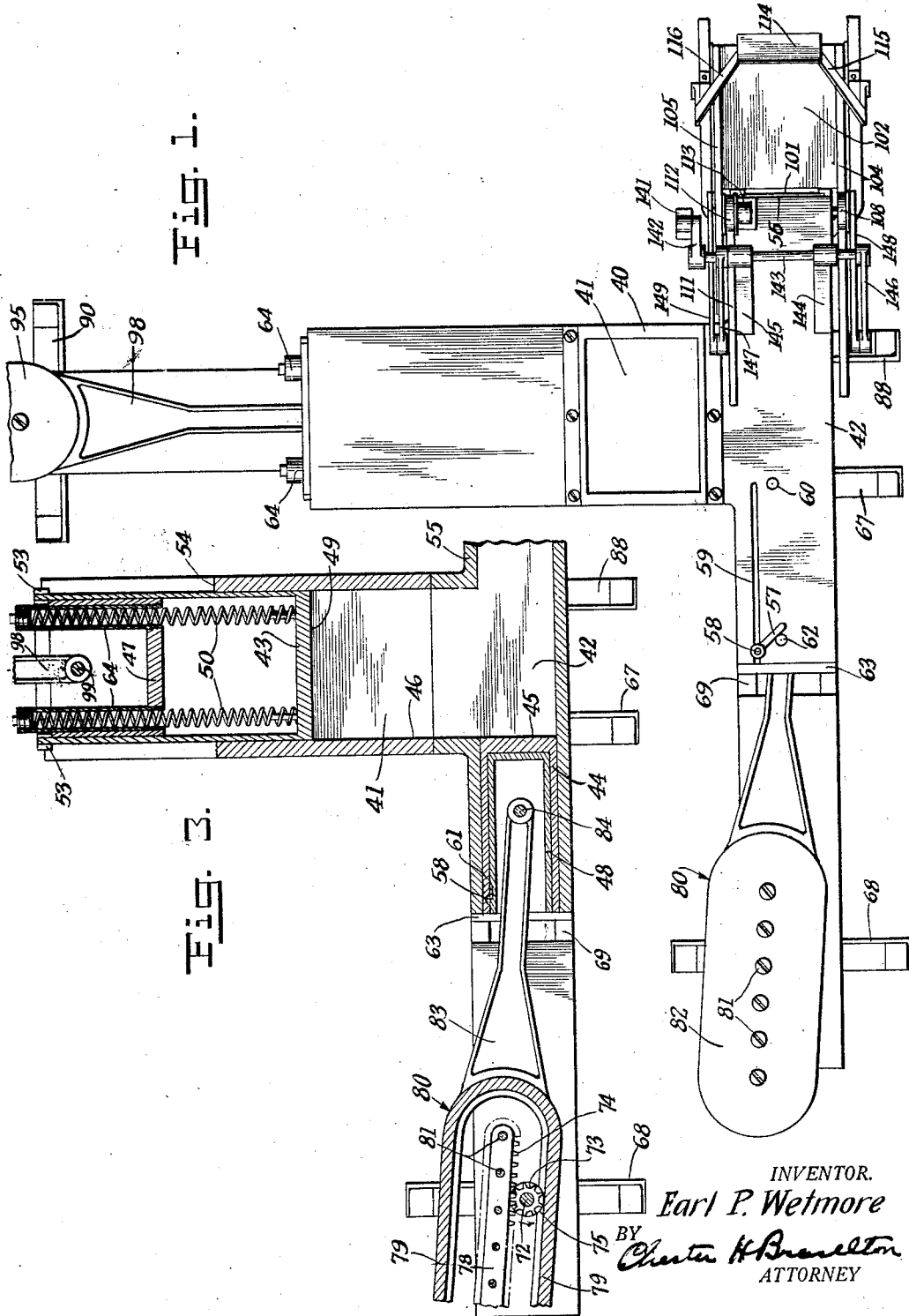


FIG. 3.

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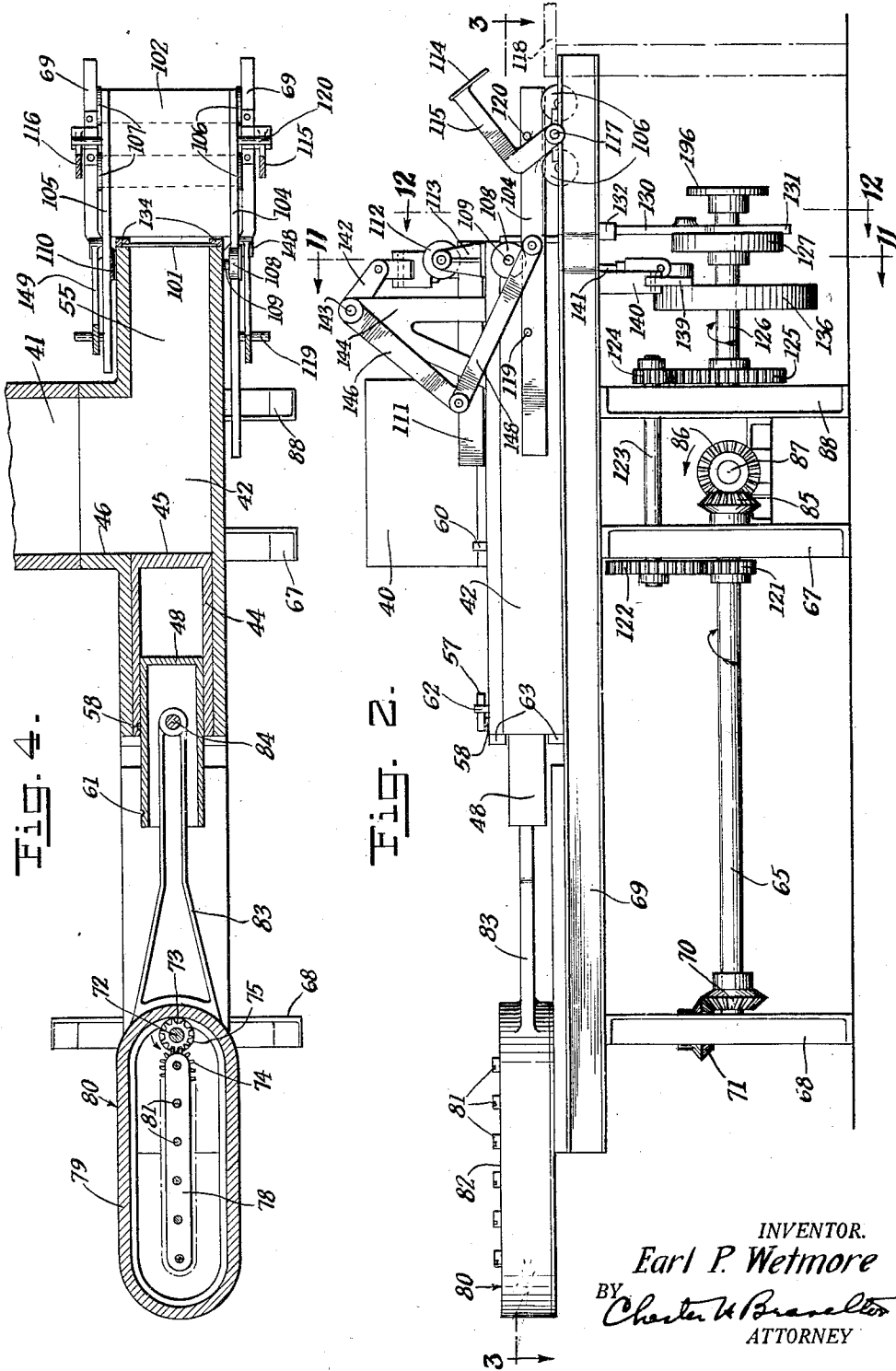
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15 Sheets—Sheet 2



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15 Sheets-Sheet 3

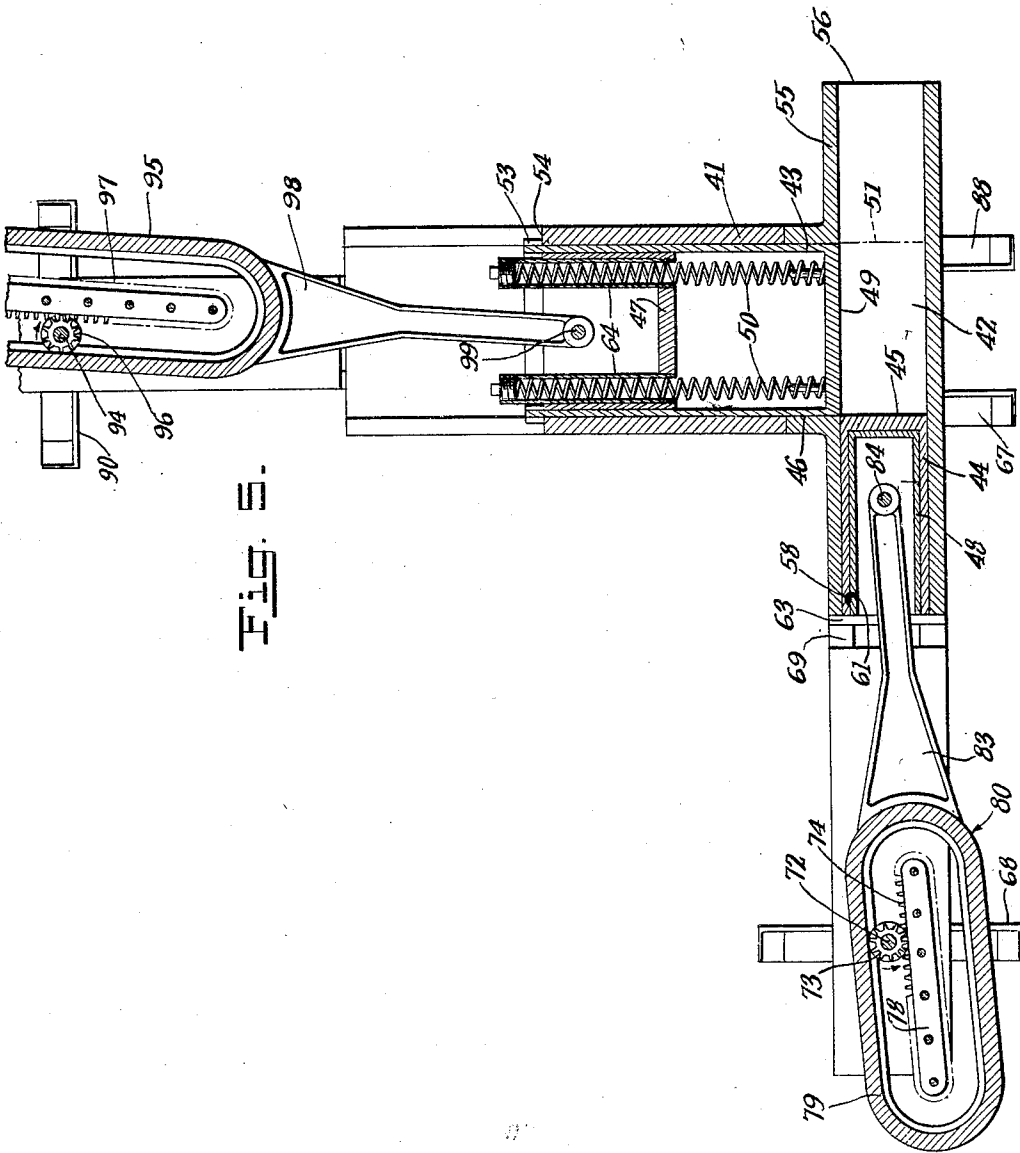


Fig. 5.

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PACKAGING MACHINE

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15 Sheets-Sheet 4

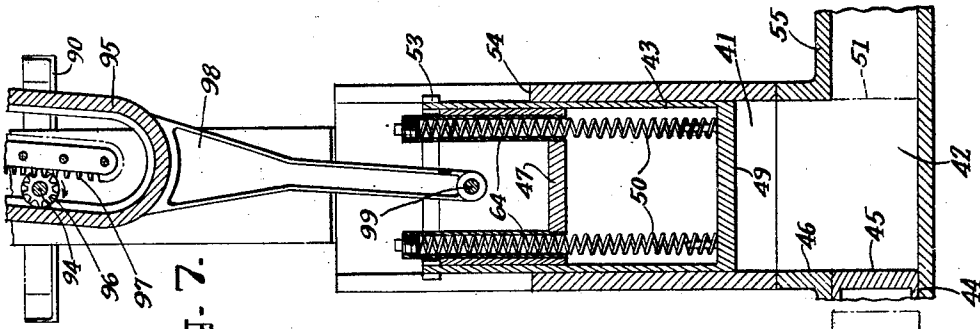


Fig. 7.

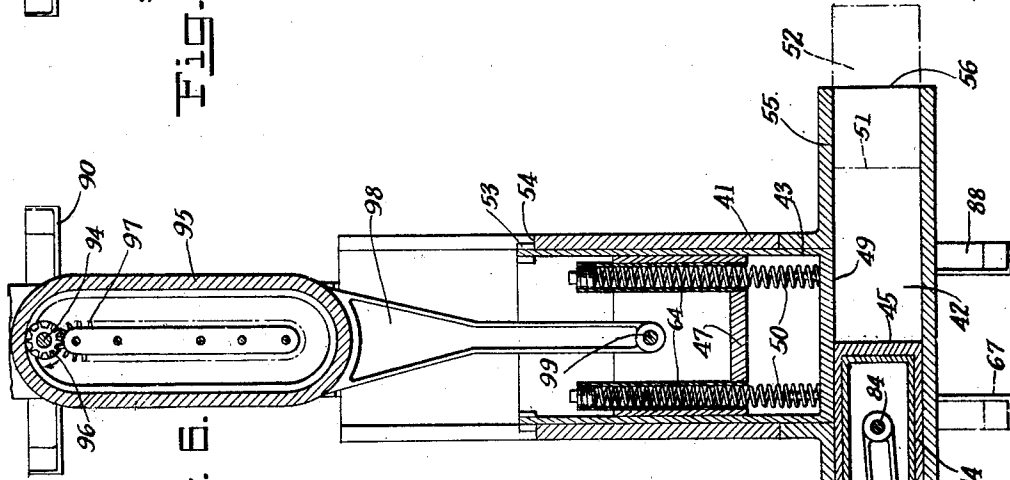


Fig. 6.

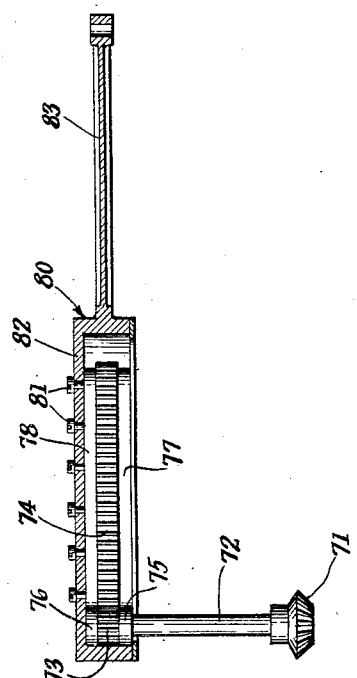
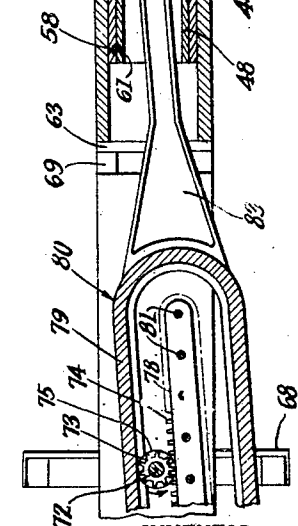


Fig. 10.



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PACKAGING MACHINE

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15 Sheets-Sheet 6

FIG. 12.

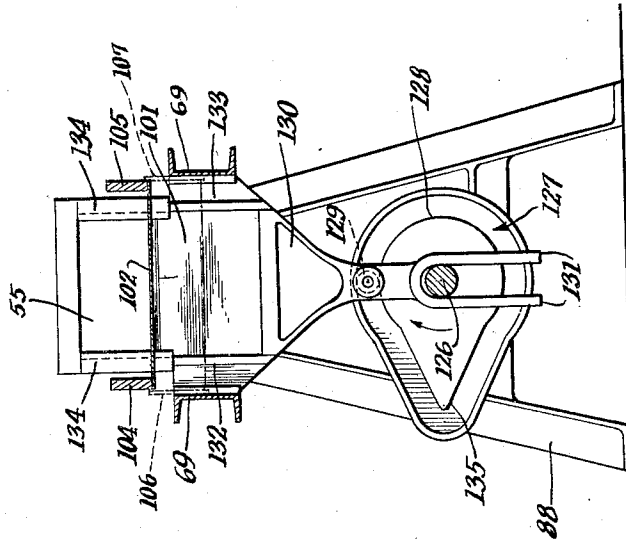
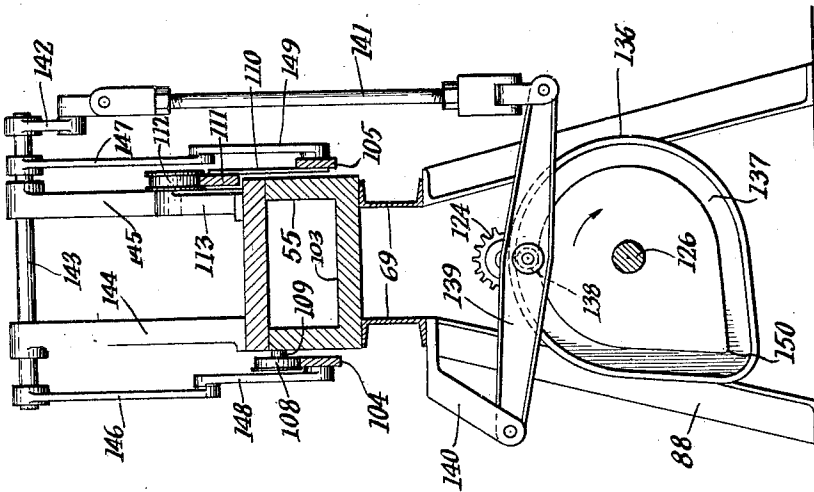


FIG. 11.



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15 Sheets—Sheet 7

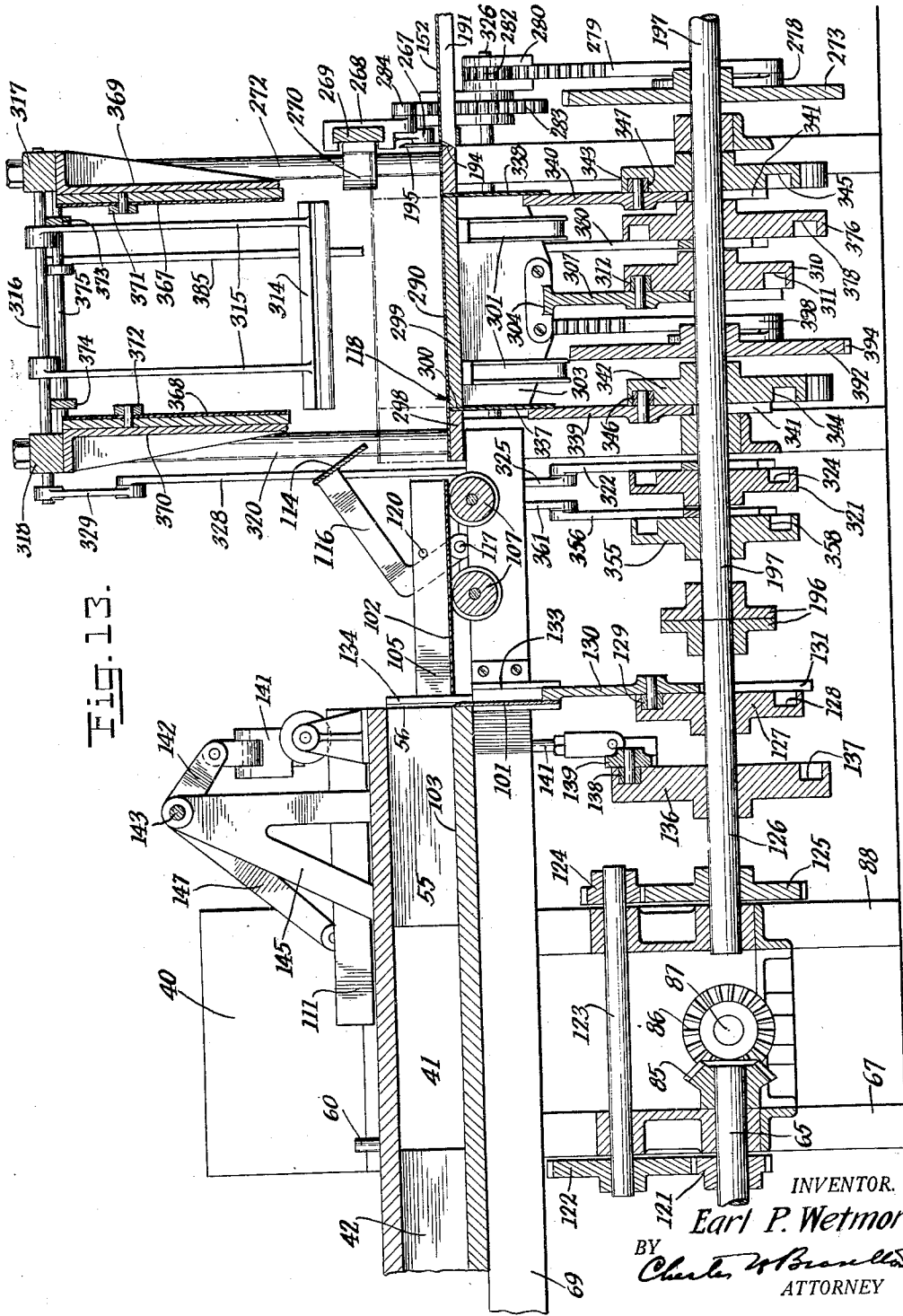


FIG. 13.

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1,835,547

PACKAGING MACHINE

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15 Sheets-Sheet 8

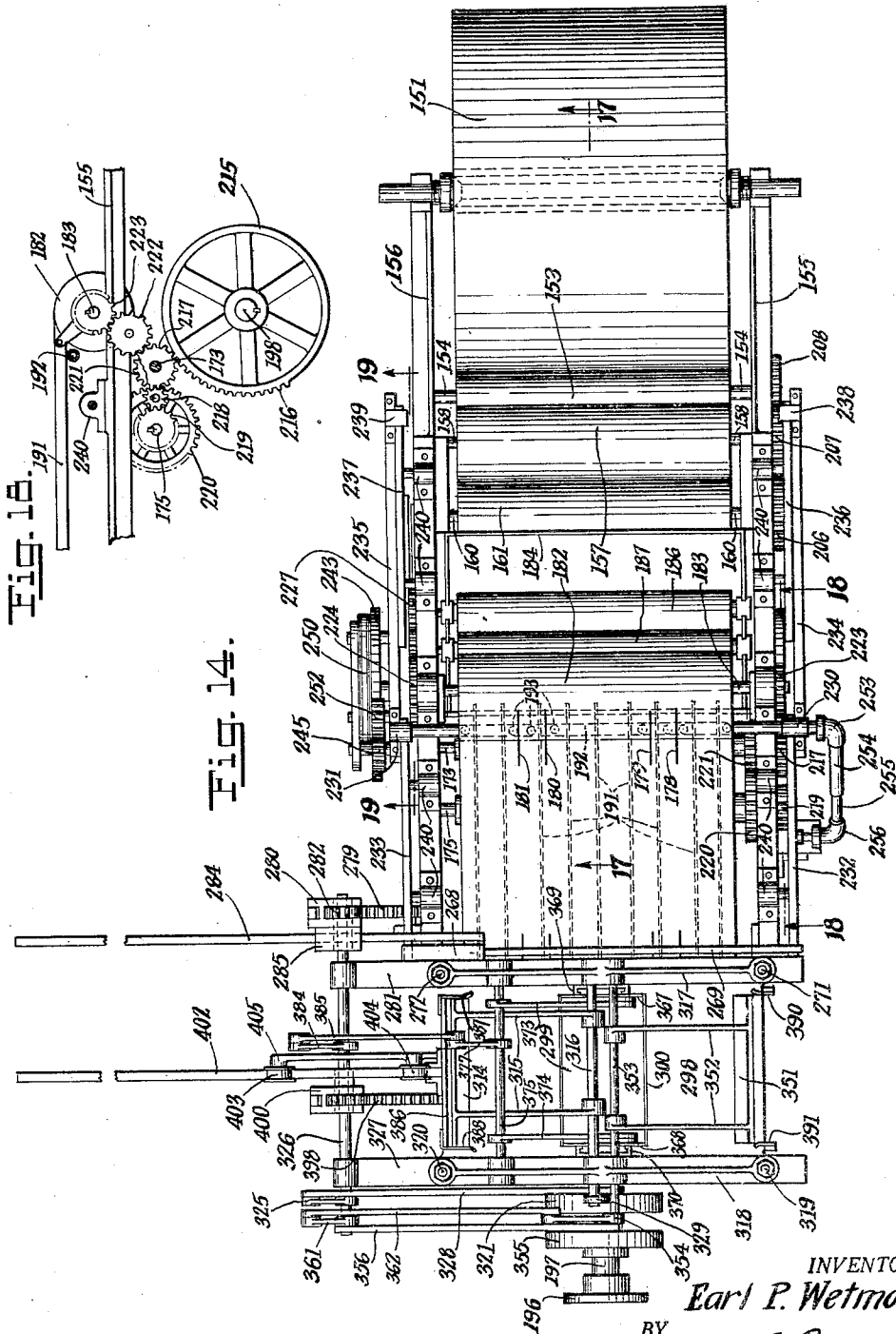


FIG. 16.

FIG. 14.

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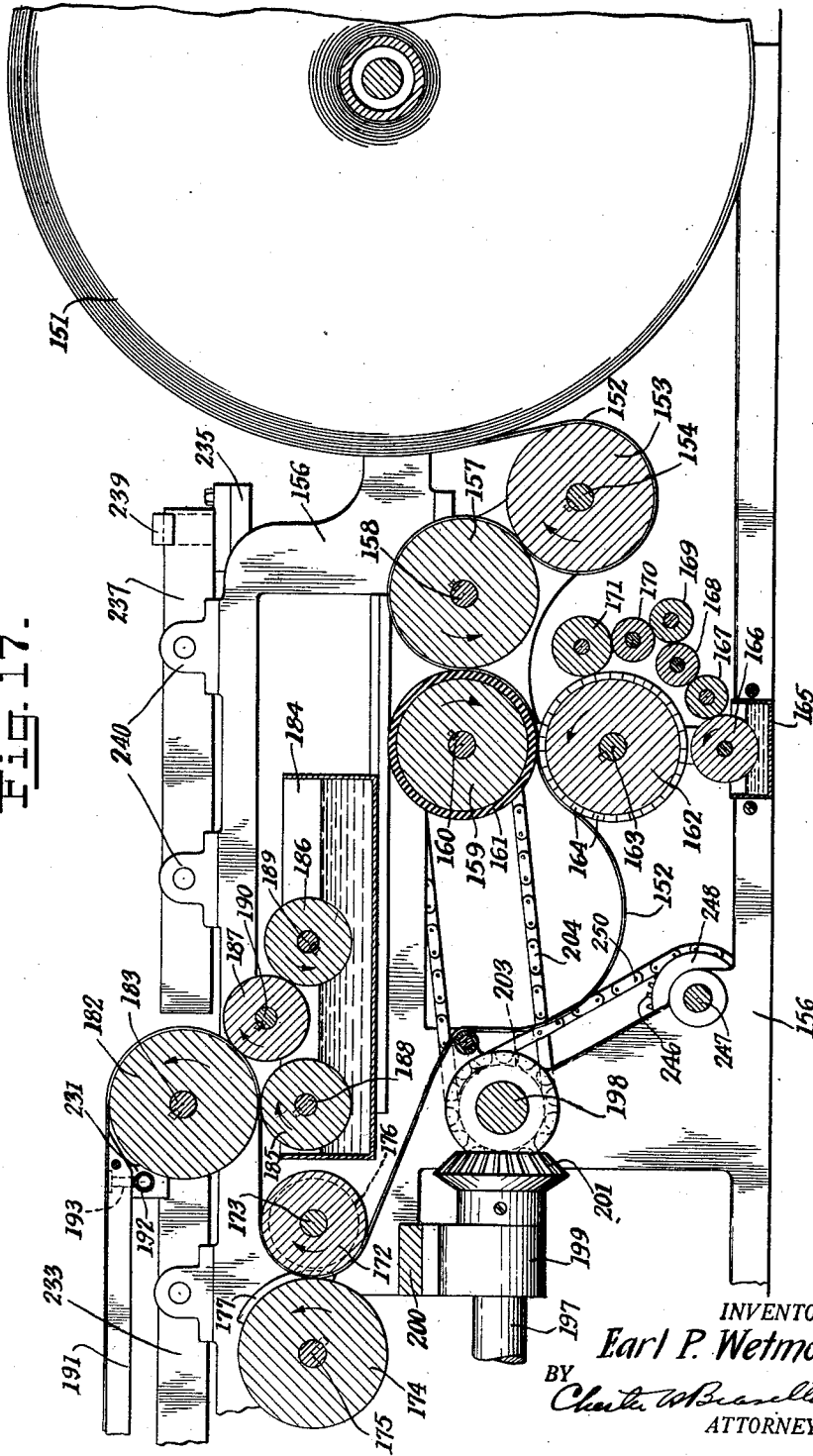
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PACKAGING MACHINE

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15 Sheets-Sheet 10

Fig. 17.



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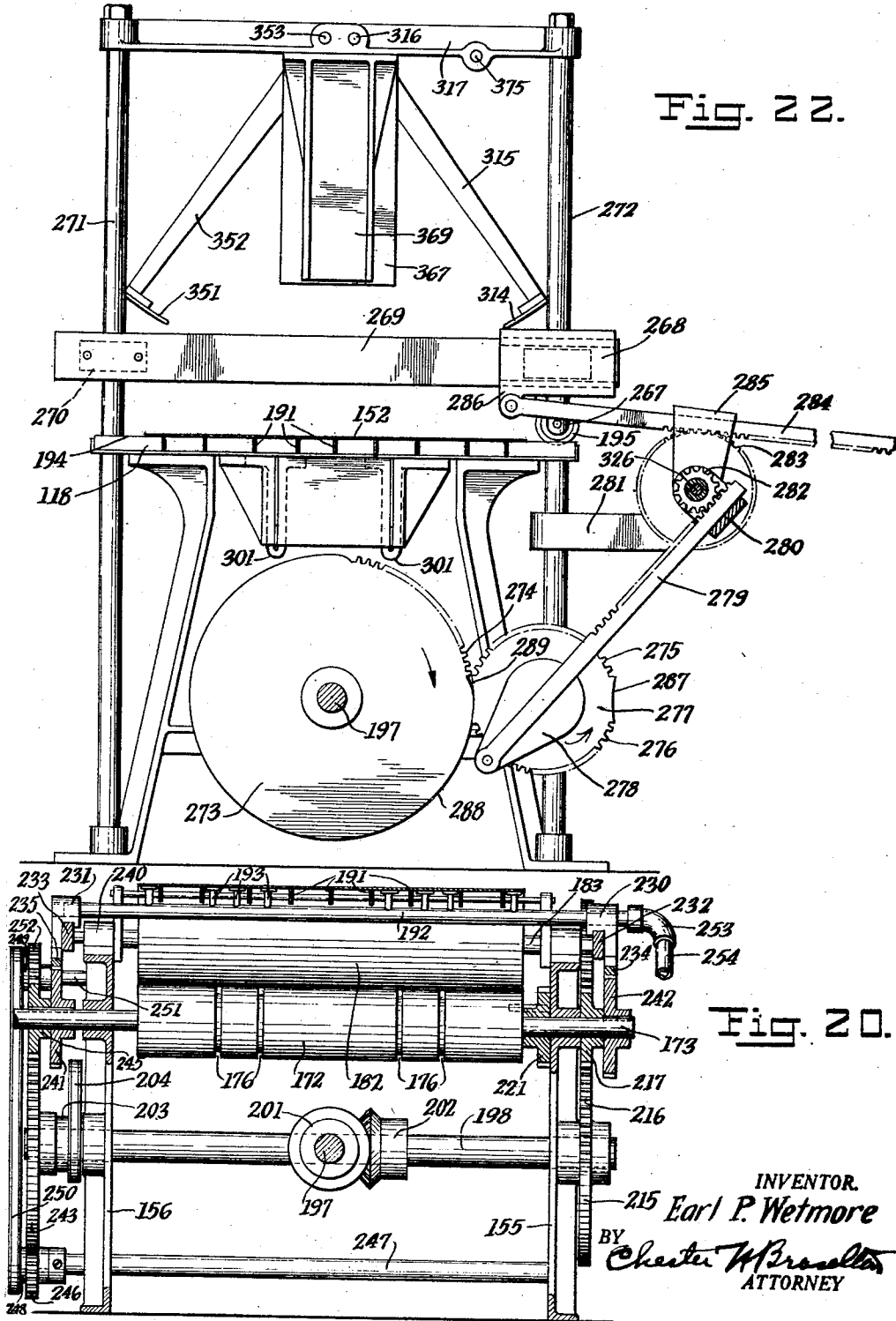
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Dec. 8, 1931.

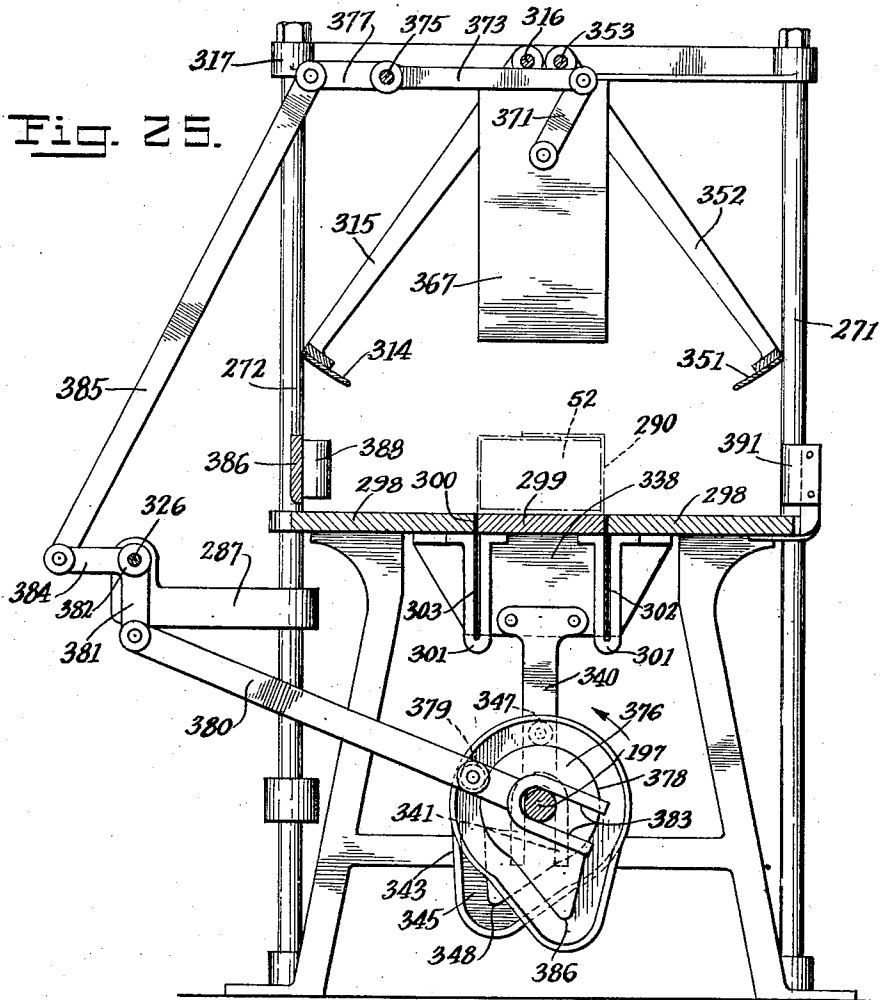
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PACKAGING MACHINE

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Fig. 25.



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1,835,547

PACKAGING MACHINE

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15 Sheets-Sheet 15

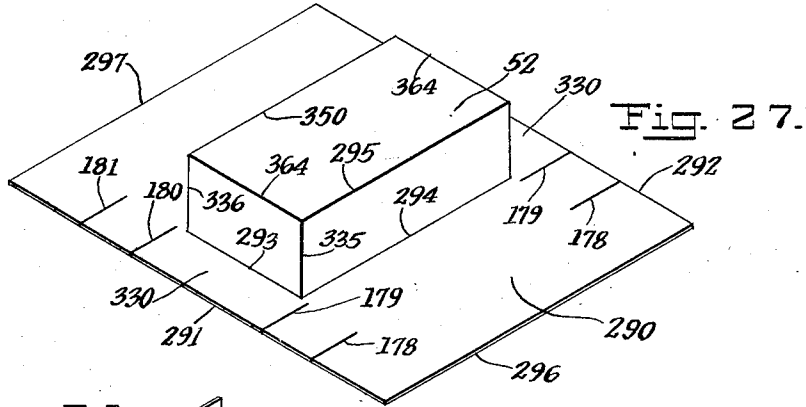


Fig. 28.

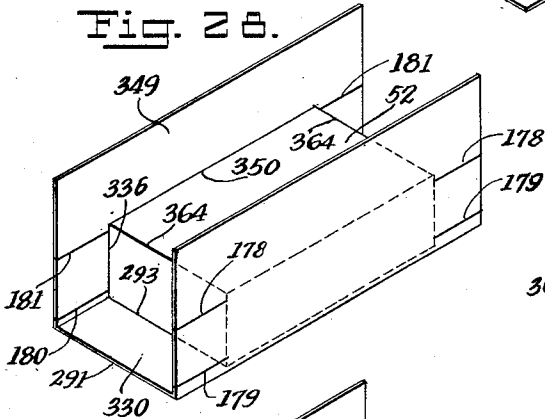


Fig. 29.

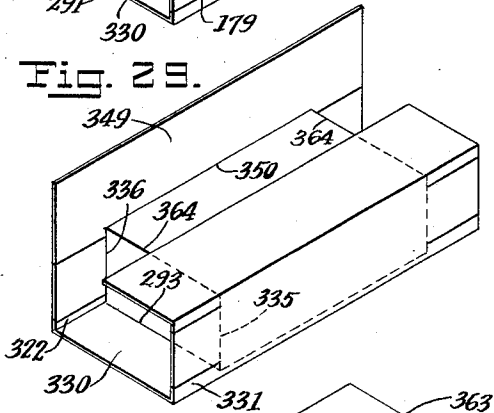


Fig. 30.

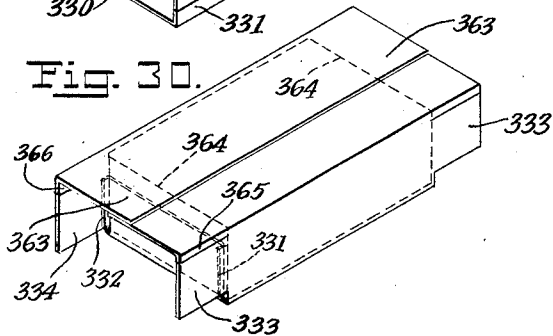


Fig. 31.

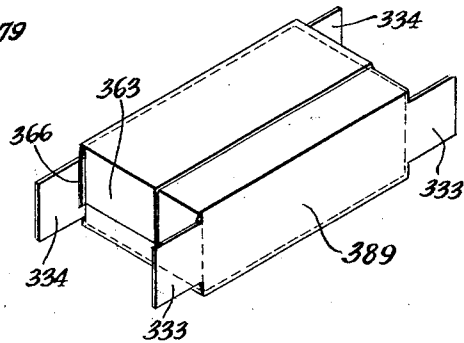
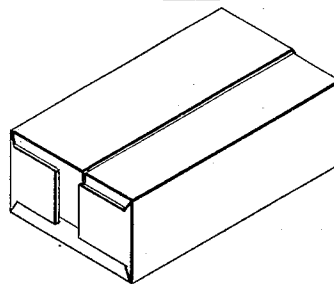


Fig. 32.



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UNITED STATES PATENT OFFICE

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PACKAGING MACHINE

Application filed September 2, 1925. Serial No. 54,024.

My present invention relates to a method and apparatus for wrapping materials, and more particularly, to a method and apparatus for forming bulk materials into rectangular or brick formed masses and then wrapping these bricks with paper, or other suitable wrapping material, to form separate packages, capable of being readily handled. More specifically, the invention relates to a method and apparatus for forming into bricks and wrapping, plastic materials, such as the composite fuel pastes formed of coal or other solid fuel and a liquid fuel binder. The invention also relates to a form of wrapped package.

Composite fuels of the type mentioned above, in the handling of which the invention is particularly described by way of example, are difficult to handle in bulk inasmuch as they are too stiff to flow readily or to be pumped in the manner of liquids, while being too sticky and plastic to be conveniently and neatly handled with shovels or other conveying mechanism or tools in the manner of solid or granular materials. These characteristics, therefore, impose difficulties and limitations on the distribution and use of the fuel, particularly for domestic consumption.

An object of my present invention is to provide a method and an apparatus for forming fuels of this type, or other material of similar characteristics, into bricks and enclosing or wrapping the bricks in a suitable wrapper.

Fuels of the above type, and frequently other materials to which the invention may be applied, whether of plastic or other form, are handled in enormous quantities and are of relatively low price, and, it is, therefore necessary to reduce the cost of packaging to the lowest possible figure and to avoid, as much as possible, manual operations and the use of special or expensive forms of wrappers.

Another object of the invention is, therefore, to provide a method and an apparatus by which paper or other wrapping material may be drawn from a roll and cut and

wrapped about the material in simple and automatic operations.

A further object of the invention is to provide a package which will present smooth, even, exterior surfaces and which will provide a secure and impervious enclosure for retaining the wrapped material.

Still further objects of the invention are to provide a machine which will draw paper from a supply roll in a continuous manner and feed lengths therefrom at intermittent intervals to a position to receive material to be wrapped, to provide a method of cutting and of folding paper about material to be packaged in such a manner as to enable it to be easily and smoothly wrapped, to provide an adhesive applying mechanism which will strengthen the wrapper and enable the wrapping operations to be facilitated, to provide a simple and effective knife operating mechanism for severing sheets to be wrapped from a length delivered from the supply roll, to provide wrapping mechanism for completely wrapping and enclosing the material while the material is held stationary, to provide a mechanism in which compact, uniform bricks may be formed from plastic material, and to provide mechanism for carrying and accurately positioning bricks of plastic material to be wrapped.

With these, and other objects in view, which may be more fully understood and appreciated from the following description, the invention comprises the method and apparatus described and set forth in the following specification and claims.

The various features of the invention are illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view of a mechanism for forming plastic material into bricks and conveying the bricks into a position to be wrapped;

Figure 2 is a side view of the mechanism of Figure 1;

Figure 3 is a horizontal, sectional view of a portion of the mechanism taken on line 3—3 of Figure 2, showing brick forming plungers in one of their positions in the forming of the bricks;

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Figure 4 is a horizontal, sectional view of a portion of the mechanism taken on line 3—3 of Figure 2, showing the brick forming plungers in another of their positions in forming the bricks;

Figure 5 is a similar horizontal sectional view of a portion of the brick forming mechanism taken on line 3—3 of Figure 2, showing the plungers in another of their positions;

Figure 6 is a similar horizontal sectional view of a portion of the brick forming mechanism taken on line 3—3 of Figure 2, showing the plungers in another of their positions;

Figure 7 is a similar horizontal sectional view of a different portion of the brick forming mechanism taken on line 3—3 of Figure 2 and showing a plunger in the position of Figure 4;

Figure 8 is a similar horizontal sectional view of the brick forming mechanism taken on line 3—3 of Figure 2, showing the plungers in still another of the positions of their cycle of operations.

Figure 9 is an end view of the brick forming mechanism;

Figure 10 is a vertical sectional view of a plunger operating arm and actuating or driving mechanism therefor;

Figure 11 is a vertical, cross-sectional view of the mechanism taken on line 11—11 of Figure 2;

Figure 12 is a vertical, cross-sectional view of the mechanism, taken on line 12—12 of Figure 2;

Figure 13 is a vertical sectional view of the delivery end of the brick forming and carrying mechanism and the adjacent end of a wrapping mechanism to which bricks of the fuel are delivered, the section being taken on approximately the center line of the machines;

Figure 14 is a plan view of a machine for taking wrapping paper from a roll, applying glue to one of its surfaces, and wrapping it about material to form a package;

Figure 15 is a side view of the machine shown in Figure 14;

Figure 16 is a side view of a portion of the machine taken from the opposite side from that of Figure 15;

Figure 17 is a longitudinal, vertical, sectional view of the machine taken on line 17—17 of Figure 14;

Figure 18 is a vertical, sectional view of a portion of the driving gears of the machine taken on line 18—18 of Figure 14;

Figure 19 is a vertical, sectional view of a portion of the driving gears of the machine taken on line 19—19 of Figure 14;

Figure 20 is a vertical, cross-sectional view of the machine taken on line 20—20 of Figure 15;

Figure 21 is a cross-sectional view of the machine taken on line 21—21 of Figure 15;

Figure 22 is a cross-sectional view of the machine taken on line 22—22 of Figure 15;

Figure 23 is a cross-sectional view of the machine taken on line 23—23 of Figure 15;

Figure 24 is a cross-sectional view taken on line 24—24 of Fig. 15;

Figure 25 is a cross-sectional view of the machine taken on line 25—25 of Figure 15;

Figure 26 is a detail view of a guide member of the machine taken on line 26—26 of Figure 23;

Figure 27 is a perspective view of a sheet of wrapping paper cut and slit preparatory to folding and of a brick suitably placed thereon for folding;

Figure 28 is a perspective view of the sheet and brick after the first folding operation has been performed and the paper bent upwardly adjacent the sides of the brick;

Figure 29 is a perspective view of the brick and wrapping paper after the second folding operation has been performed and one of the upwardly projecting portions of the paper has been folded downwardly on the top face of the brick;

Figure 30 is a similar perspective view of the brick and paper after the other upright portion has been folded downwardly on the top face of the brick;

Figure 31 is a view of the brick and paper after the portions of the paper projecting from the top and bottom faces of the brick have been folded over the ends of the brick; and

Figure 32 is a view of the brick and paper after the folding operations have been completed.

In my present invention, a continuous sheet of paper or other suitable wrapping material is drawn from a supply roll through sets of rollers, in which one face of the paper may be suitably printed, and an adhesive, such as glue, or casein, may be applied to the opposite face of the paper. During this passage between the rollers, the sheet is also slit in a manner to enable it to be conveniently folded or wrapped about the material to be packaged in later operations. The face of the paper to which the adhesive has been applied is then brought uppermost and a length of paper, sufficient to wrap and enclose a brick of the material to be wrapped, is carried forward at suitable intervals, cut to the requisite dimensions, and brought to a position to receive the material. A brick of the material is then placed on the paper in a suitable position for wrapping and the sheet of paper is then folded upwardly against the sides of the brick, and then over the top face of the brick, one edge being overlapped by the other edge, and entirely covering the sides and top of the brick. The slits previously formed in the paper are so positioned that they extend in pairs from the end edges of the sides of the brick to the adjacent ends of the wrapping

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sheet and between, and slightly spaced from, the upper and lower folded edges of the sheet. The top and bottom portions of the sheet projecting over the ends of the brick of material are then bent downwardly and upwardly, respectively, over the end faces of the brick, the positions of the slits being such as to enable the projecting ends to be easily bent or folded and to completely cover the ends. Tabs are accordingly left projecting from the sides of the wrapper which are then bent over the ends of the bricks, thus securing and tightly enclosing the bricks. The coating of casein or glue or other equivalent adhesive serves to secure the wrapper in position and also renders the paper or other wrapping material stronger and impervious to the liquid content of the wrapped material.

The material to be wrapped may be formed into the shape of bricks, or other shapes suitable for wrapping, in any manner suited to the properties and characteristics of the material to be wrapped. In the application of the invention to the packing of plastic fuel compositions illustrated in the following description, in which the fuel composition has sufficient stiffness and rigidity to maintain its shape during the wrapping operations, a mass of the fuel is pressed by means of a plunger or other suitable means into a mold, or chamber, of the dimensions of the brick and is then forced through one end of the mold, which is left open for this purpose. The bricks, thus formed, are then individually and separately carried, in succession, to the successive wrapping sheets positioned to receive them and are accurately deposited thereon in proper position for the wrapping operations. When the wrapping operations have been completed for one brick of material, the brick is removed from the machine, a succeeding sheet of paper, properly cut and coated, is brought into proper position for wrapping, a succeeding brick of material deposited thereon, and the wrapping operations are repeated.

Referring more particularly to the accompanying drawings, a supply of the plastic fuel to be wrapped is charged from any desired source through a hopper 40 into a horizontal chamber or conduit 41, preferably of rectangular cross-section, which opens at one end into a molding chamber or passage 42 of rectangular cross-section and of dimensions equal to the cross-sectional dimensions of the bricks to be formed and wrapped. The chamber or passage 42 serves as a form or mold for forming the bricks to be wrapped and the passage 41 serves as a supply passage for filling the forming passage 42 with fuel and holding the fuel in shape while the brick is being formed.

For this purpose, a plunger 43 is mounted in the passage 41 to reciprocate therein and fitting the passage with sufficient tightness to

prevent the leakage of fuel therepast, and a plunger 44 is similarly mounted to reciprocate in the forming passage 42. The reciprocations of these plungers are so timed that the plunger 43 withdraws to permit the passage 41 to fill with fuel, forces the charge of fuel into the passage 42, holds it in the passage 42 under pressure while the plunger 44 reciprocates across the opening between the passages to cut out and force from the passage a brick of the desired size. The plunger 44 then withdraws until its pushing face 45 is in alignment with the adjacent face 46 of the passage 41 and remains in this position while the plunger 43 withdraws, to enable the passage 41 to again fill, and forces a new charge of fuel into the forming passage 42. To obtain the requisite movement and holding at rest of the plunger 43, the plunger 43 is actuated by a driving plunger 47, which, in a part of its cycle of movement drives the plunger 43 and in the remaining portion of its cycle of movement moves independently of the plunger 43 and permits the plunger 43 to remain at rest. Similarly, the plunger 44 is actuated by a plunger 48, which, in a portion of its cycle of movement, drives the plunger 44, and, in the remainder of the cycle, permits the plunger 44 to remain at rest.

In the positions shown in Figure 3, the plunger 43 is at its greatest distance from the passage 42, its driving face 49 being at a sufficient distance therefrom to enable a sufficient charge of fuel to be supplied through the hopper 40 to form a brick, and as the plunger 47 moves forwardly towards the passage 42, it presses the plunger 43 through springs 50, confined between the plungers, and drives it to the position shown in Figure 6, the plunger 44 remaining at rest while the actuating plunger 48 is withdrawn to the position shown in Figure 4. The movement of the plungers 43 and 47 continues to the position shown in Figure 5, the plunger 44 remaining at rest while the plunger 48 returns to a position to drive the plunger 44. During this movement of the plunger 47, it has forced a charge of fuel from the supply conduit 41 into a space in the mold passage 42, formed between the walls of the conduit, the face 45 of plunger 44 and the rear face, indicated by broken line 51, of a previously formed brick 52, this space being of somewhat larger dimensions than the brick to be formed. When the positions of Figure 5 are reached, the further movement of the plunger 43 is prevented by a stop 53 on the plunger 43 which then reaches and is stopped by the edge 54 of the wall of the conduit 41. Further movement of the plunger 47 therefore merely serves to compress the springs 50.

The further movement of the other plunger 48 serves to drive the molding plunger 44 to the position shown in Figure 6, while the

plunger 47 reaches its limit of movement, and to drive the plunger 44 to the position shown in Figure 8 while the plunger 47 is withdrawing to the position shown in Figure 8 during which movement the springs 50 are permitted to expand. As the plungers 44 and 48 move to the position of Figure 8 the material forced into the molding passage 42 by the preceding movement of the plunger 43 is forced into an extension 55 of the chamber 42 pushing the previously formed brick 52 through an opening 56 in position to be carried to the wrapping machine.

As the plungers 44 and 48 approach the positions shown in Figure 8, an arm 57, rigidly mounted on a projecting portion of a locking pin 58, carried by the plunger 44 and projecting through a slot 59 in the conduit 42, strikes a pin 60, projecting upwardly from the surface of the chamber 42, and is rotated. The portion of the pin 58 within the plunger 44 is of semi-cylindrical or eccentric shape so that, as it turns, it enters a recess 61 in the plunger 48 and thus locks the plungers 44 and 48 to each other. The plungers remain locked in this manner until they reach the positions shown in Figure 3, whereupon the arm 57 contacts with a projecting pin 62 at the end of the conduit and is rotated to unlocking position, thus enabling the plunger 48 to continue its movement while the further movement of the plunger 44 is prevented by a stop 63. During this movement of the plungers 44 and 48, the plungers 43 and 47 have also returned to the positions shown in Figure 3 and the cycle is repeated.

It is to be noted that, should more than sufficient fuel be forced by the plunger 43 than is required to form a brick, the springs 50 will enable the plunger 43 to stop short of its full stroke without injury. The next movement of the plunger 44 will, in any event form a brick of the required size. The springs 50 are preferably held in position by suitable wells 64 in the plunger 47 in which the springs are mounted.

The plungers 47 and 48 are driven through their cycles of movement from a main drive shaft 65 positioned lengthwise beneath the molding chamber 42 and journaled in suitable bearings 66 carried by a pair of upright supports 67 and 68 which also serve to support a frame 69 on which the chamber 42 is mounted. The shaft 65 may be driven from any suitable source of power and may drive the plungers 47 and 48 through any power transmitting mechanism that will give the requisite movement to the plungers.

In driving the plunger 48, the movement of the shaft 65 is preferably transmitted through bevel gears 70 and 71 to a vertical shaft 72, which is journaled in fixed position on the frame 69. Rigidly mounted on the upper end of the shaft 72 is a pinion 73, which meshes with a double rack 74,

and on each face of the pinion 73 are rollers 75 and 76, see Figure 10, which roll on guide rails 77 and 78, respectively, on each side of the rack 74, and in close proximity or contact with the inner surface of the side walls 79 of a container box or casing 80, in which the rack is mounted, and thus serve to hold the rack and pinion in proper meshing relation. The rack 74 is mounted within the box or casing 80 by means of bolts 81 securing it to the top 82 of the casing. The casing 80 is connected to the plunger 48 by means of a connecting rod 83 rigidly mounted at one end to the casing and pivotally connected at its other end to the plunger 48 by means of a wrist pin 84. This connection enables the casing 80 and rack 74 to swing or rock slightly about the wrist pin 84 as a pivot but prevents them from being rotated about the shaft 72 and pinion 73 by the rotation of the pinion. As the pinion 73 rotates, therefore, it pushes the rack 74 and casing 80 first in one direction, then swings the end of the rack about to the other side of the pinion, pushes the rack in the opposite direction, and upon reaching the opposite end of the rack swings it to its original position. The reciprocating movement thus given to the rack 74 and casing 80 is transmitted through the connecting rod 83 to the plunger 48.

In driving the plunger 47, motion is transmitted from the shaft 65 through a bevel gear 85 at the opposite end of the shaft 65 to a bevel gear 86 mounted on a shaft 87 extending at a right angle to the shaft 65 beneath the passage 41 and journaled in a suitable bearing carried between the support 67 and a support 88 and, at its other end, journaled in a bearing mounted on an upright support 90 of a frame 91 on which the passage 41 is mounted. The rotary movement of the shaft 87 is transmitted through bevel gears 92 and 93, Figure 9, to an upright shaft 94, which projects upwardly through the frame 91. The upper end of the shaft 94 projects into a rack box or casing 95 and is provided with a pinion 96 which meshes with a double rack 97 mounted within the casing 95 and similar in form and function to the rack 74. The shaft 94 and pinion 96 are also provided with guide rollers and the rack 97 with guide tracks similar to those of the pinion 73 and rack 74, respectively. The casing 95 is connected to the plunger 47 by means of a connecting rod 98 rigidly mounted at one end on the casing and connected at its other end to the plunger 47 by means of a wrist pin 99.

The relation of the pitch circle of the pinion 73 to the pitch line of the rack 74 is the same as that of the pinion 96 to the rack 97, in the present instance, the circumferences of the pitch circles being one fifth the length of the rack pitch line, so that the

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racks and their plungers make a complete reciprocating cycle and form and expel a brick for each six revolutions of the actuating pinions and of the shaft 65. Accordingly, when the racks are once set in their proper phase relation, they continue to reciprocate in the sequence required to form the bricks and expel them through the extension 55 and opening 56 in position to be carried to the wrapping mechanism.

The extension 55 is of the same length as that of a brick so that when a brick, such as the brick 52, is pushed through the opening 56 by a succeeding brick, the advancing face of the newly formed brick will reach the opening 56 on the completion of its movement, and the adjacent rear face of the expelled brick 52 is severed therefrom by a knife blade 101 which moves vertically upwardly in close contact with the edge of the opening 56. The brick thus expelled and severed is received on a horizontal carrying plate 102, the upper surface of which is even or slightly lower than the lower face 103 of the extension 55. The plate 102 is supported by and between a pair of reciprocating horizontal bars 104 and 105 on opposite sides of the extension 55, which reciprocate at intervals to place the plate 102 in position to receive the expelled brick and then carry it to the wrapping machine.

The bars 104 and 105 are supported immediately in front of the opening 56 by pairs of supporting rollers 106 and 107, respectively, on which the full weight of the brick is supported as it is delivered by the brick forming apparatus. As the carrying plate 102 and its brick pass forwardly of the supporting rollers, the rear ends of the bars are held from tilting upwardly, and are held in position, by means of rollers on which the upward thrust of the rear ends of the bars is received. The upward thrust of the bar 104, which is on the opposite side of the molding chamber 42 from the feed conduit 41, is received directly on a roller 108 mounted on a stub shaft 109 projecting from the face of the chamber 42.

Because of the nearness of the conduit 41 on the other side of the molding chamber 42, the bar 105 cannot be made long enough to be supported directly in this manner. It is therefore connected by means of upwardly extending arms 110 to a horizontal, reciprocating, supporting bar 111 positioned above the passage 42 and bearing upwardly against a roller wheel 112 journaled in a lug 113 projecting upwardly from the top of the passage 42.

As the carriage plate 102 moves forwardly with its supported brick it passes beneath a transverse plate 114 supported at a height above the moving brick by means of a pair of arms 115 and 116 supported at their lower ends on pivots 117 mounted on the frame 69

of the apparatus. When the carrying plate 102 reaches its foremost position above a table 118 of a wrapping machine and a little in advance of the position it is to occupy in the wrapping operations, a pin 119 projecting outwardly from the bar 104 pushes the rear edge of the arms 115 and causes it to fall forwardly until the plate 114 rests on the carrying plate 102. In this position, the forward face of the plate 114 is in line with the position which the rear face of the brick should occupy in the wrapping operations. As the plate 102 moves rearwardly, therefore, the plate 114 stops the brick in its proper position and holds it until the plate 102 has been entirely withdrawn, leaving the brick supported on the table 118 in proper position for wrapping. When the plate 102 reaches its rearmost position a pin 120, projecting from the bar 104, pushes the arm 115 rearwardly, raising the plate 114 to its original position.

Inasmuch as the knife blade 101 and the carriage plate 102 are moved in a definite relation to the operations of the brick forming operations, it is desirable to have them driven from the drive shaft 65, but as they make but one cycle of operation for each six rotations of the shaft 65, the speed of the shaft 65 is reduced one sixth in its transmission to a drive shaft for the knife and carriage mechanism. To this end, a gear 121 is rigidly mounted on the shaft 65 to mesh with a larger gear 122 rigidly mounted on a rotatable shaft 123 supported parallel to the shaft 65 in bearings formed in the uprights 67 and 88. On the other end of the shaft 123 is mounted a smaller gear 124 which meshes with a larger gear 125 rigidly mounted on a drive shaft 126 for the operation of the knife blade 101 and carrying plate 102. Through the gears 121, 122, 124 and 125, the speed of the mechanism is so reduced that the shaft 126 rotates at one sixth the speed of the shaft 65 and thus makes one revolution for each cycle of brick forming operations, and thus for each brick.

The knife blade 101 is actuated directly from the shaft 126 by means of a cam 127 having in one face a cam groove 128 in which works a roller 129. The roller 129 is mounted in fixed position on a vertically reciprocable arm 130 widened at its upper end to enable the knife blade 101 to be mounted and guided thereon. To hold the arm 130 in upright position, it is bifurcated at its lower end portion as at 131 and straddles the shaft 126 and at its upper end its side edges reciprocate in guides 132 and 133 mounted in the frame 69 on opposite sides of the forming passage extension 55. The knife blade 101 is also provided with guides 134, Figure 12, mounted on the end of the extension 55. The cam groove 128 is circular and centered on the shaft 126 for

a large part of its circumference but in the remaining portion extends from the circular curvature to form a sharp projection as at 135; which upon moving to the uppermost position lifts the roller 129 and its arm 130 and the knife 101. The cam 127 is mounted at such an angular position on the shaft 126 that this lifting movement begins immediately on the completion of the ejection of a brick from the opening 56.

The carrying plate 102 is also actuated from the shaft 126 by means of a cam 136 mounted on the shaft 126 and having a cam groove 137 in which works a roller 138 from which the carrying plate moving mechanism is operated. The roller 138 is mounted on a lever 139 pivoted at one end in a bracket 140 mounted on the frame 69 and as the roller is moved by the cam groove 137, it tilts the lever 139 swinging the free end of the lever upwardly and downwardly. The movement of the lever 139 is transmitted through a link 141 pivoted to the free end of the lever, to a crank arm 142, to the other end of which the link is connected. The crank arm 142 is rigidly mounted on a rock shaft 143 mounted transversely above the extension 55 of the passage 42 by means of a pair of uprights 144 and 145. A pair of crank arms 146 and 147 are also rigidly mounted on the rock shaft 143 to extend downwardly towards the bars 104 and 105, these crank arms forming with the arm 142 a bell crank lever. The free ends of the arms 146 and 147 are connected to the bars 104 and 105, respectively, by means of links 148 and 149.

The cam groove 137 has a circular curvature centered on the axis of the shaft 126 for a large portion of its circumference but at a portion of its circumference has a sharp outward bend as at 150. When the portion 150 of the cam groove 137 rotates through its uppermost path of travel, it lifts and lowers the roller 138 and with it the end of the lever 139. The upward movement of the end of the lever 139 lifts the link 141 and the end of the rocker arm 142, rotating the shaft 143 and swinging the ends of the arms 146 and 147, and the links 148 and 149 and bars 104 and 105 forwardly and thus carrying the carrying plate 102 to its forward position. As the peak of the bend of cam groove portion 150 passes the vertical, the roller 138 is lowered and the arms and links and the carrying plate 102 are returned to their original positions. The cams 127 and 136 are so set that the upward movement of the knife blade 101 is completed immediately before the movement of the carriage plate 102 begins, the cams being set for these purposes as indicated in Figures 11 and 12 with the peak of cam groove bend 135 in alignment with the beginning of the cam groove bend 150 or in the form shown, with the peaks of the cam grooves at an angle of 45°

to each other and the bends of the grooves within an angle of 90°.

Immediately prior to the depositing of a brick on the wrapping table 118, a sheet of paper cut and prepared for the wrapping of the brick is placed on the table in position to be folded or wrapped about the brick. A length of wrapping paper for this purpose is drawn from a supply roll 151, Figs. 14, 15 and 17, mounted at the opposite end of the wrapping machine. From the roll 151, a continuous sheet 152 of the wrapping paper passes downwardly around a rotatable roll 153, Figure 17, rigidly mounted on a rotating supporting shaft 154, journaled at its ends in side frames 155 and 156 of the machine. Thence, the sheet passes upwardly between the roll 153 and a roll 157 which is mounted on a rotatable shaft 158 to grip the paper between the rolls. The paper then passes around the roll 157 and between the roll 157 and a roll 159 mounted on a shaft 160 and having a surface layer 161 of rubber or other resilient material adapted to serve as a platen for a printing roller 162 mounted immediately beneath the roll 159 and suitably supported on a rotating shaft 163 journaled in the side frames of the machine. The sheet 152 of paper passes between the rolls 159 and 162, which is provided with suitable type 164 to print any desired matter on the under surface of the sheet. Printing ink may be supplied to the type 164 from a supply tank 165 by means of a set of inking and distributing rolls 166, 167, 168, 169, 170 and 171, or other suitable means.

The rolls 153, 157, 159 and 162 are rotated continuously and at such a speed that during the time interval in which a brick is formed and deposited on the wrapping table, a sufficient length of paper is advanced to wrap one brick.

From the rolls 159 and 162, the sheet of paper 152 passes around an intermittently rotated roll 172 loosely mounted on shaft 173 journaled in the side frames 155 and 156 of the machine and spaced sufficiently from the rolls 159 and 162 to permit a sufficient length of paper to be taken up by the intermittent movement of the roll 172. The paper 152 passes between the roll 172 and a contacting roll 174 rigidly mounted on an intermittently rotated shaft 175 and is thus brought to a position in which the printed face is uppermost. The roll 172 is provided with two pairs of spaced, circumferential grooves 176, Fig. 20, and the roll 174 is provided with four knife blades 177 extending about a portion of its periphery and adapted to enter the grooves 176 and cut two pairs of slits 178 and 179, and 180 and 181, in the paper 152.

From the roll 172, the paper is drawn about an intermittently rotated roll 182, mounted on a shaft 183 journaled in the side frames of the machine, the printed face of the

paper being brought into contact with the surface of the roll and leaving the unprinted face exposed for the application of a coating of adhesive. Adhesive is applied to the exposed, unprinted surface from a supply tank 184 by means of a roll 185 dipping into the tank 184 and contacting with the exposed surface of the paper and by a pair of succeeding rolls 186 and 187, one roll 186 dipping into the adhesive in the tank 184 and carrying a film of adhesive into contact with the surface of the roll 187, from which the adhesive is taken and distributed over the surface of the paper 152. The rolls 185, 186 and 187 are mounted on shafts 188, 189 and 190, journaled in the sides of the tank 184 and the tank 184 may be supported in the frame of the machine in any suitable manner.

As the paper 152 travels about roll 182, it is brought to a horizontal position with the printed surface underneath and the freshly coated surface uppermost and thus in position that when a brick of material to be wrapped is placed on the sheet and the sheet folded upwardly about the brick, the surface coated with adhesive is brought inwardly in position to glue the wrapper in holding position and leave the printed surface exposed. The rolls 172, 174 and 182 are driven intermittently in such a manner that in the interval between the removal of a wrapped package from the wrapping table 118 and the deposit of a new brick thereon, a length of paper sufficient for the wrapping of a brick is advanced through these rolls. This length of paper is received on longitudinally positioned, spaced supporting rails 191, extending between the roll 182 and the wrapping table 118, and remains on these rails during the application of a preceding length to the wrapping operations. When the rolls 172, 174 and 182 advance a succeeding length of paper, the paper on the rails 191 is gripped adjacent the roll 182 by suction applied from a transverse pipe 192 having a series of rubber tipped nipples 193 extending between the rails 191 in position to touch the lower surface of the paper. During the rotation of the roll 182, the pipe 192 moves lengthwise of the rails 191 towards the table 118 carrying the length of paper onto the table 118 in position for the wrapping operations.

When the paper is positioned on the table 118 in proper position for folding or wrapping, the edge 194, Fig. 13, of the table is in alignment with the mid points of the slits 178, 179, 180 and 181 of the paper 152. Immediately after the paper has been properly placed on the table 118, a circular knife blade 195 is moved across the edge 194 of the table, which acts as a lower cutting blade, and severs the length of paper on the table 118 from that on the rails 191, so that the severed portion may be folded or wrapped about the brick deposited on the severed sheet.

The suction on the pipe 192 is then broken, releasing the paper, and the pipe 192 returns to its original position.

The various continuous and intermittent movements of the rolls and carrying and reciprocating parts described above are driven from the shaft 126 of the brick forming and carrying machine so that they are in their proper relation to each other and to the formation and placing of the brick of material to be wrapped. Power is, for this purpose, transmitted from the shaft 126 through a flange coupling 196 to a shaft 197 in alignment with the shaft 126 and extending lengthwise beneath the table 118 and the sheet conveying mechanism to a transverse shaft 198 positioned beneath the adhesive supply tank 184. The shaft 197 is journaled near its end in a bearing 199 depending from a cross beam 200 between the side frames 155 and 156 and on its end is mounted a bevel gear 201 which meshes with and drives a bevel gear 202 rigidly mounted on the transverse shaft 198. The transverse shaft 198 is thus continuously driven from the shaft 197 and makes the same number of revolutions or one revolution for each brick that is formed and wrapped.

The transverse shaft 198 extends through and is suitably journaled in the side frames 155 and 156 and on the portion projecting to the left of Figure 20 is mounted a sprocket wheel 203, which serves to drive the continuously rotating rolls 153, 157, 159 and 162. For this purpose, power is transmitted from the continuously rotating sprocket wheel 203 through a sprocket chain 204 to a sprocket wheel 205 rigidly mounted on the shaft 160 carrying the platen roll 159. From the shaft 160, the shafts 158 and 154 are continuously driven through a gear wheel 206 rigidly mounted on the opposite or right end of the shaft 160 and meshing with a gear 207 rigidly mounted on the shaft 158, and, in turn, meshing with a gear 208 rigidly mounted on the shaft 154. The continuous, uniform movement of the rolls 157 and 153 mounted on the shafts 158 and 154, respectively, is thus insured. Similarly, the shaft 163 and roll 162 are driven in the proper direction and at the proper speed by means of a gear 209 mounted on the shaft 163 and meshing with the gear 206. From the gear 209, the ink applying and distributing rolls 171, 170, 169, 168 and 167, are driven by gears 210, 211, 212, 213, and 214, respectively, which mesh, respectively, with the gear 209 and then in succession.

The roll 174 is of the same diameter as the rolls 153, 157 and 159, making one complete revolution with the feeding of a length of paper sufficient for the wrapping of one brick, but is rotated intermittently, making a complete revolution, to feed and insert the paper during the intermission between the

removal of a wrapped brick and the deposit of a succeeding brick for wrapping, during a part of the revolution of the shaft 198 and then remaining stationary during the wrapping of the brick. For the driving of this roll the shaft 198 is provided on its outer right end with a wheel 215 having gear teeth 216 on a part only of its circumference. In the rotation of the wheel 215, the teeth 216 mesh with and drive a gear 217 loosely mounted on the shaft 173, on which the roll 172 is also loosely mounted, and the gear 217, in turn, meshes and drives a gear 218 mounted on a stud shaft or otherwise on the frame 156. The gear 218, in turn, meshes with and drives a gear 219, rigidly mounted on the shaft 175 on which the slitting roll 174 is also rigidly mounted. The slitting roll is thus given a complete revolution during that portion of the rotation of the wheel 215 when the teeth 216 mesh with the gear 217 and remains stationary during the remainder of the rotation of the wheel 215. From the shaft 175 the roll 172 is rotated on its supporting shaft 173 through a gear 220 rigidly mounted on the shaft 175 and meshing with a gear 221 secured to the roll 172. The intermittently driven gear 217 also meshes with and drives a gear 222, which, in turn, meshes with and drives a gear 223 rigidly keyed to the shaft 183 on which the roll 182 is also rigidly mounted. On the farther end of the shaft 183 is mounted a gear 224 which meshes with and drives gears 225 and 226 mounted on the shafts 188 and 190, respectively, on which the adhesive applying rolls 185 and 186 are mounted and the gear 226, in turn, meshes with and drives a gear 227 rigidly mounted on the shaft 189 on which the adhesive roll 186 is mounted.

Through the above described transmission mechanism, the various rolls are so driven from the continuously rotating drive shaft 197 as to print the paper, coat it with adhesive, slit it and deliver it from the roll 182 at suitable intervals and in suitable lengths to be caught and carried over the rails 191 by the suction nipples 193 of the transverse pipe 192. For each advance of a wrapping length of the paper, the pipe 192 moves from a position near the roll 182 to a position adjacent the table 118, pauses in the latter position until the knife 195 has severed the length of paper on the table 118, and then returns to its original position to await another cycle of movements.

In this movement of the transverse pipe 192, the pipe is carried by a pair of brackets 230 and 231, sliding on rails 232 and 233, respectively, on opposite sides of the machine, and mounted on, and serving to support, from the rails 232 and 233, respectively, the adjacent ends of racks 234 and 235. The other ends of the racks are supported from rails 236 and 237, respectively, by means of brack-

ets 238 and 239, respectively. The rails 232, 233, 236 and 237 are mounted and supported on lugs 240 mounted on the tops of the side frames 155 and 156. The lower edges of the racks 234 and 235 are toothed and mesh with and are driven by pinions 241 and 242 rigidly mounted on the shaft 173, on which the roll 172 and gear 217 are loosely mounted, the movement of the roll 172 and gear 217 being accordingly independent of the movement of the shaft 173. The shaft 173 and pinions 241 and 242 are alternately rotated in opposite directions by suitable transmission mechanism driven from the transverse shaft 198 to give the racks 234 and 235 and through them the pipe 192 the requisite reciprocations and periods of rest.

To drive the shaft 173 and pinions 241 and 242 in a direction to carry the racks 234 and 235 and the pipe 192 towards the table 118, a driving wheel 243 is rigidly mounted on the end of the shaft 198 opposite that on which the wheel 215 is mounted, and is provided in a portion of its periphery with gear teeth 244 meshing with and driving a gear wheel 245 rigidly mounted on the shaft 173 on which the rack driving pinions 241 and 242 are also rigidly mounted. The teeth 244 extend through one quarter of the periphery of a wheel 243, or an arc of 90°, and are so positioned that they move into engagement with the gear 245 and begin to rotate the gear as the roll 182 begins to rotate. The wheel 243, gear 245, and pinions 241 and 242 on the shaft 173, are also so proportioned that during the 90° rotation of the wheel 243 the racks 234 and 235 are given a linear movement equal to the circumferential movement of the roll 182 and thus the pipe 192 moves at the same time and same rate of speed as the paper leaving the roll 182 and thus serves to hold the paper taut on the roll. When the wheel 243 has rotated beyond the 90° arc, the gear 245 is no longer engaged therewith and remains stationary and is free to return to its original position while the wheel 243 rotates throughout the remaining 270° of its rotation.

Upon completing a half revolution from the starting point, the teeth 244 of the wheel 243 serve to drive the transmission mechanism for rotating the gear wheel 245 and pinions 242 and 243 in a reverse direction and returning the racks 234 and 235 and pipe 192 to their original positions. To this end, the teeth 244, upon entering the third quarter of their revolution, engage and mesh with a gear 246 mounted on a stud shaft 247 diametrically opposite the wheel 243 from the gear 245. The gear 246 is mounted to turn with a sprocket 248 which drives a sprocket wheel 249 on the opposite side of the wheel 243 and adjacent the gear 245, by means of a sprocket chain 250 trained about the sprocket wheels 248 and 249. The sprocket 249 is

mounted on a stud shaft 251 to turn with a gear 252, also mounted thereon and meshing with the gear 245. As the wheel 243 rotates through the third quarter of its revolution in mesh with the gear 246 and, through the sprockets 248 and 249, and the chain 250, drives the gear 252, it rotates the gear 245, in mesh with the gear 252, and the shaft 173, a complete revolution in the reverse direction. This rotation of the shaft 173 in the reverse direction also rotates the pinions 241 and 242 mounted thereon and carries the racks 234 and 235 and the suction pipe 192 back to their starting positions, the gears 245, 246, and 252 preferably being of the same diameters and the sprockets 248 and 249 also being of the same diameters. Upon reaching their original positions, the gears and the racks and pipe 192 remain at rest during the fourth quarter turn of the wheel 243 until the teeth again engage and mesh with the gear 245.

During the first 180° of the rotation of the wheel 243, a partial vacuum is created in the pipe 192 so that sufficient suction may be applied through the nipples 193 to the paper 152 resting on the rails 191 to grip the paper during its movement towards the table 118 and to hold it in position while being cut by the knife 195. During the second half of the revolution of the wheel 243, the suction through the pipe 192 is released to enable the pipe 192 to return without gripping the paper. To obtain this partial vacuum, the end of the pipe 192 supported in the bracket 231 is closed and the other end extends through the bracket 230 and is provided with an elbow 253 and a downwardly extending pipe 254, which telescopes in with a pipe 255 which is in communication with a vacuum pump not shown. The pipe 255 communicates with the vacuum source through an elbow 256 mounted on a pipe 257 so that it may swing on a horizontal axis as the pipe 192 is carried back and forth in its path of travel. The pipe 257 is in turn connected to a valve 258 which serves to cut and open communication to a pipe 259 leading to the vacuum source at the proper intervals and between these intervals to open the pipe 257 to the atmosphere to obtain the requisite gripping effects through the pipe 192.

The operation of the valve is controlled by means of an eccentric 260 mounted on the shaft 197 in such a manner that during one half of the revolution of the shaft 197 a thrust towards the opening direction is given through an eccentric strap 261 and eccentric rod 262 to the valve and during the other half of the revolution, the valve is opened to the atmosphere to release the vacuum in the pipes leading to the transverse pipe 192. Any suitable type of valve may be employed for this purpose, the valve being illustrated diagrammatically as comprising a casing 263 to which the pipes 257 and 259 communicate at

points off-set in the length of the casing and a hollow piston 264 connected to the eccentric rod 262 in such a position that when the eccentric 260 is in opening position communication is provided between the pipes 257 and 259 through a hollow chamber 265 in the piston 264 and when the eccentric 260 is in released position, communication between the pipes 257 and 259 is closed by the piston 264 and the pipe 257 communicates with an open end of the valve casing 263.

As the pipe 192 draws a length of paper onto the rails 191 it pushes the length of paper previously on the rails 191 onto the folding table 118 until the median points of the slits 178, 179, 180 and 181 are immediately above the edge 194 of the table 118, which serves as a lower cutting edge for the knife 195. The paper is then held in this position while the knife 195 moves along the edge 194 to cut the paper. The knife 195 is carried and guided in its movement across the paper by a bracket 267 depending from a slide box 268, which is grooved to slide on and be guided on a transverse guide bar 269 mounted at a suitable height above the edge of the table 118. The guide bar 269 may be mounted and secured by means of clamps 270 at each end to a pair of posts 271 and 272 mounted on the table supports.

In the cutting of the paper, the knife 195 is carried once across the edge 194 of the table 118 from one side to the other during the quarter turn of the shaft 197 in which the paper is held stationary by the pipe 192 and remains at rest on that side during the wrapping of the brick and the placing of a new length of paper for wrapping. Thereupon, during a succeeding rotation of the shaft 197, the knife 195 returns to its original side of the table, thus making one movement across the table with each rotation of the shaft 197 or making one complete back and forth movement with two complete revolutions of the shaft 197.

The knife is driven in these movements in definite relation to the rotation of the shaft 197 from a wheel 273 mounted on the shaft 197 and provided with gear teeth 274 adapted to mesh with teeth 275 or 276 of a driven gear 277 forming a part of the transmission mechanism of the knife operating mechanism. The wheel 273 is so mounted on the shaft 197 that the teeth 274 come into engagement with the teeth 275 of the wheel 277 as the wheels 215 and 243 of the paper feeding machine enter the second quarter of their revolutions and just after the roll 174 has rotated and the pipe 192 moved across the rails 191 to advance a length of paper. During the next quarter revolution of the shaft 197, and while the paper 152 is being held stationary on the table 118 by the pipe 192, the teeth 274 mesh with the teeth 275 and serve to drive the wheel 277 through a half revolu-

tion. Rigidly mounted on the gear 277 is a crank arm 278, to the end of which is pivoted an end of a rack bar 279. The other end of the rack bar 279 is guided in a guide 280, carried on a bracket 281, projecting from the pillar 272 beneath the table 118, and the rack bar is so positioned by the guide 280 that it is given a thrust from one extreme position to the other by the crank arm 278 as the gear 277 is given a half rotation. The teeth of the rack 279 mesh with a pinion 282 loosely mounted on the shaft 326 and rigidly connected to a larger pinion 283, which is thus rotated by the movement of the rack 279. The pinion 283 in turn meshes with, and serves to drive, a rack bar 284 which is guided in meshing position with the gear 283 by means of a guide 285 and the end of which is pivotally secured to a lug 286 on the cutter blade carrying box 268.

During the quarter turn of the wheel 273 in which the teeth 274 mesh with the teeth 275 of the pinion 277, therefore, the pinion 277 and crank 278 are given a half turn from the position shown in Figure 22, thrusting a rack bar 279 upwardly and outwardly. The pinions 282 and 283 are accordingly rotated counterclockwise and the rack bar 284 and slide box 268 and knife 195 are thrust to the left across the table 118 and along the edge 194 to cut the paper.

When the wheel 273 has completed a quarter turn and the pinion 277 has completed a half revolution, a portion 287 of the periphery of the pinion 277, which is untoothed and curved concavely comes into contact with an untoothed portion 288 of the periphery of the wheel 273 which extends throughout the remaining three quarters of the wheel 273. The pinion 277 is thus held at rest during the remainder of the rotation of the wheel 273, during which period the length of paper previously delivered to the table 118 has been wrapped around a brick and a new length has been shoved on the table.

When the revolution of the wheel 273 has been completed and the wheel has returned to its original position the teeth 274 engage the teeth 276 of the pinion 277 and during the quarter turn of the next rotation of the wheel 273, which follows immediately, the pinion 277 and crank arm 278 are rotated back to their original positions, the rack 279 is drawn downwardly and inwardly to its original position, the pinions 282 and 283 are rotated clockwise and the rack 284, slide box 268 and knife 195 are drawn to the right across the table 118 to their original positions, serving in their movement to cut a succeeding length of paper placed on the table 118.

Upon the completion of the quarter turn of the wheel 273 and a corresponding half revolution of the pinion 277, a portion 289 on the wheel 277 diametrically opposite and

reversely curved to the portion 287 of the pinion is brought into contact with the untoothed portion 288 of the wheel 273, as shown in Figure 22, and holds the pinion 277 from further movement. Through the above mechanism, therefore, the cutting of the paper is obtained with a maximum simplicity of movement and mechanism.

The sequence of operations of the above described mechanism is such that a length of paper sufficient for a wrapper is advanced through the paper feeding and gluing machine and shoved onto the table 118, then while the paper is held in position, a brick 52, previously formed in the brick pressing mechanism, is carried and deposited in the proper position on the paper on the table 118 while the knife 195 is moving along the edge 194 of the table to sever the paper on the table from the paper on the rails 191 and thus form a sheet 290 accurately positioned on the table 118 and beneath the brick 52 for the folding operations.

The relative positions of the brick 52 and sheet of wrapper 290 is indicated in Figure 27. In the cutting of the sheet 152 into the wrapper sheets 290, a front edge 291 and a rear edge 292 are formed and as the sheet is cut on the mid points of the slits 178 and 181, each wrapper sheet 290 has four halves of these slits extending longitudinally toward each other from the end edges 291 and 292. The lengths of the sheets 290 and of the slits 178 and 181, are such that the distance between the inner ends of the slits is more than the length of a brick to be wrapped. The brick is so positioned centrally on the sheet 290 for wrapping that the end edges 293 of the bricks lie in alignment with the inner ends of the slits 178—181 and with its side edges 294 within the longitudinal lines of the inner slits 179 and 180. The slits 179 and 180 are spaced apart slightly more than the width of the brick so that when the paper 290 is folded upwardly on the side edges 294 of the brick against the side faces of the brick, as indicated in Figure 28, the slits 179 and 180 lie horizontally at a slight distance above the edges 294 of the brick. The spacing of the slits 178 and 179 and 180 and 181, respectively, from each other is such that the upper slits 178 and 181 lie horizontally at a slight distance below the upper side edges 295 of the brick, the spacing of the slits 178 and 181 from the slits 179 and 180, respectively being, for this purpose, slightly less than the height of the brick. The side edges 296 and 297 of the sheet 290 are those of the original sheet of paper drawn from the roll 151, a roll of the proper width being selected for the brick.

The sheet 290 with the brick 52 positioned thereon as shown in Figure 27, is then ready for the wrapping operations with the brick and the slits 178—181 extending lengthwise

of the machine and of the shaft 197. The paper is then folded upwardly about and over the brick by folding mechanism driven in the requisite or proper sequence from the shaft

upwardly against the sides of the brick, one of the upstanding sides of the paper, which projects above the top face of the brick, is folded over and downwardly on the upper side edge 295 of the brick, to the position shown in Figure 29. For this purpose, a horizontal plate 314, suspended by means of a pair of arms 315 from a rock shaft 316 mounted longitudinally and centrally of the brick 52, is swung crosswise over the top of the brick with just sufficient clearance for the thickness of the wrapping paper and thus sweeps the upstanding portion of the wrapper downwardly onto the upper face of the brick. The rock shaft is supported by and between a cross beam 317 mounted on the upper ends of the pillars 271 and 272 and a cross beam 318 supported on the upper ends of a pair of pillars 319 and 320, projecting at the other end of the table 118. The rock shaft 316 projects beyond the beam 318 and to this projecting end is imparted an actuating movement driven from the main shaft 197 in proper sequence to the other folding operations.

In folding the sheet 290 upwardly against the sides of the brick, the paper is pushed upwardly by means of vertical plates which slide vertically upwardly from beneath the table 118 in close proximity or contact with the faces of the brick. To provide slots for the movement of these folding plates, the table 118 is formed with an outer border portion 298 and a central supporting plate 299 of a shape and area identical with the bottom face of the brick 52 to be wrapped, a peripheral space 300 being left between the outer and inner portions 298 and 299, respectively, for the upwardly sliding of the folding plates. The inner plate 299 is supported from the outer plate 298 by means of U-shaped yokes 301 of sufficient depth to receive the folding plates in their lowermost position. The positioning of the brick 52 on the plate 299 is such that the side and end surfaces of the brick coincide with the edges of the plate 299.

The rock shaft 316 is driven from a cam 321 rigidly mounted on the drive shaft 197 and of a construction similar to that of the cam 310. Reciprocating motion is imparted from the cam 321 to a reciprocating rod 322 by means of a roller mounted on the rod and working in a cam groove 324 of the proper form, the rod being guided at its free end by means of the usual forked construction straddling the shaft 197. At its other end, the rod 322 is pivotally connected to the lower arm of a bell crank lever 325 pivoted on a rod 326 supported on a bracket 327 extending from the pillar 320, and on the bracket 281, extending from the pillar 272. The upper arm of the bell crank lever 325 is connected by means of a link 328 to a rock arm 329 depending from and rigidly connected to the rock shaft 316. Through the above described linkages and levers, motion is transmitted at the proper time and in proper sequence from the cam 321 to the rock shaft 316 to swing the arms 315 and plate 314 over the upper surface of the brick 52 and fold the wrapper 290 to the position shown in Figure 29.

The first of the folding operations comprises folding the sheet 290 upwardly on the edges 294 against the sides of the brick to the position shown in Figure 28. This is accomplished by means of a pair of spaced, vertically sliding, vertical plates 302 and 303, supported on a yoke 304 beneath the plate 299 and extending vertically upwardly therefrom through the opening or space 300 to the top surface of the plate 299, the inner faces of the plates 302 and 303 lying in planes spaced sufficiently from the side faces of the brick 52 to permit a thickness of the wrapper paper therebetween. The plates 302 and 303 are guided in their vertical movements by means of guide brackets 305 and 306 and by means of a stem 307 depending downwardly from the yoke 304 and divided at its lower end into forks 308 and 309 which straddle the shaft 197. The vertical movements are imparted to the yoke 304 and plates 302 and 303 by means of a cam 310 rigidly mounted on the shaft 197 and having a cam groove 311 in which works a cam roller 312 fixed to the stem 307 of the yoke 304. The greater portion of the cam groove 311 is of a circular curvature centered on the axis of the shaft 197 and when the roller 312 is in this portion of the groove, the plates 302 and 304 are held in lowered positions. The groove 311 is, however, bent sharply outwardly in a portion of its circumference as at 313 and when this portion rotates to the vertical position, the roller 312, stem 307 and plates 302 and 303 are raised, folding the paper 290 upwardly on the edges 294 to the positions shown in Figure 28.

The folding of the wrapper up to this stage has left portions 330 of the wrapper lying on the table 118 projecting past the end edges 293 of the brick 52. In the next folding operation, these portions are bent upwardly along the edge 293 and brought against the end face of the brick to the position they occupy in Figure 30. Prior to this folding operation, there extended upwardly from each side edge of the portion 330, and integral therewith, a narrow vertical strip 331 and 332, respectively, the upper edges of which were determined by the slits 179 and 180, respectively. As the portions 330 are bent upwardly, the strips 331 and 332 are also

Immediately upon the folding of the paper

carried upwardly and fold with their inner faces, which have been coated with glue or casein or other suitable adhesive, against the inner faces, similarly coated, of the portions 333 and 334 of wrapper left projecting between the slits 178 and 179 and 180 and 181, respectively, and thus hermetically sealing the wrapper along the vertical end edges 335 and 336 of the brick.

This folding operation is accomplished by the vertical movement of a pair of vertical plates 337 and 338, having their upper edges projecting into the peripheral space 300 at the end edges of the brick 52 and supported and guided in their vertical movement by downwardly depending supporting rods 339 and 340, the lower ends of which are bifurcated as at 341 to straddle and be guided on the shaft 197. Vertical movement is imparted to the rods 339 and 340 by a pair of cams 342 and 343 rigidly mounted on the main drive shaft 197 and having appropriate cam grooves 344 and 345, respectively, of suitable shape, in which work rollers 346 and 347, respectively, mounted on the rods 339 and 340. The cam grooves 344 and 345 have a circular curvature centered on the axis of the shaft 197 which hold the rollers 346 and 347 and their respective rods 339 and 340 in their lowermost positions during the greater part of their rotation and have an outwardly bent or extended section 348, Figure 25, which, when rotated through the vertical position, raise their respective rollers and supporting stems to slide the plates 337 and 338 upwardly through the space 300 to perform the folding operations. The plates 337 and 338 in their upward sliding movement have just sufficient clearance from the end of the brick 52 to accommodate the thickness of the wrapper and press the wrapper tightly against the end face of the brick.

The partly wrapped brick now has a portion of wrapper 349 projecting upwardly above the upper side edge 350 of the brick opposite the edge 295, as shown in Figure 29. In the next folding operation, the portion 349 is folded downwardly about the edge 350 to lie flat on the upper face of the brick, the edge portion of the portion 349 overlapping the edge portion of the wrapper previously folded on the top of the brick and being hermetically sealed thereto by the adhesive with which the inner face of the wrapper portion 349 has been coated in the gluing machine.

This folding operation is accomplished by means of a plate 351 supported similarly to the plate 314 by means of a pair of arms 352 from the rock shaft 353 mounted parallel to and close to the rock shaft 316 in position to swing the plate 351 over the top of the brick with slight clearance just sufficient to press the wrapper tightly onto the top of the brick. The shaft 353 is mounted in the cross beams

317 and 318 and projects through the beam 318 to a slight distance past the end of the shaft 316. On the outer projecting end of the shaft 353 is rigidly mounted a rocker arm 354 through which a rocking movement is imparted to the shaft 353 at the proper intervals.

The rocker arm 354 is driven through suitable transmission mechanism from a cam 355 mounted on the main drive shaft 197 and of a construction similar to that of cam 321; which drives the rock shaft 316. A suitable reciprocating motion is imparted from the cam 355 to a reciprocating rod 356 parallel to the rod 322, by means of a roller 357 mounted on the rod 356 and working in a suitably shaped cam groove 358 on the cam 355; the rod 356 being guided at its free end by means of a bifurcated portion 359 straddling the shaft 197. The cam groove 358 has a circular curvature centered on the axis of the shaft 197 throughout the greater part of its periphery but has an outwardly projecting portion 360 which, on approaching and coming into alignment with the length of the rod 356, imparts a thrust to the rod 356. The movement thus given to the rod 356 is transmitted to an arm of a bell crank lever 361, to which the end of the rod 356 is pivoted, and which is pivoted on the rod 326. From the other arm of the bell crank lever, the rocking movement received from the rod 356 is transmitted through a link 362 to the rocker arm 354 and thus serves to rock the shaft 353 and swing the arms 352 and plate 351 over the top surface of the brick.

The wrapper has now been folded to the form shown in Figure 30, in which the top of the brick is covered by the overlapping folds of wrapper, portions 363 of which, however, project beyond the upper end edges 364 of the brick. From the side edges of the portions 363 integral strips 365 and 366 depend to the slits 178 and 181, respectively, in a manner similar to the upwardly projecting strips 331 and 332 of the bottom projecting portions 330. In the next folding operation, the top projecting portions 363 are bent downwardly about the end edges 364 of the brick to lie flat against the ends of the brick and overlap the upper ends of the end wrapping portions 330 bent upwardly from the bottom of the wrapper and thus completely cover and seal the ends of the brick. In the downward bending or folding of the portions 363, the inner faces of the strips 365 and 366, which are coated with adhesive, fold against the inner faces of the portions 333 and 334 and thus complete the sealing of the ends of the bricks.

The folding of the portions 363 downwardly against the ends of the brick is accomplished by the downward movement of vertical plates 367 and 368 which move in vertical guides 369 and 370 depending from

the cross beams 317 and 318 so positioned as to guide the plates 367 and 368 with their inner faces moving with slight clearance over the ends of the brick to be wrapped. The

5 plates 367 and 368 are suspended by means of links 371 and 372, Figures 23 and 25, respectively, from rocker arms 373 and 374, rigidly mounted on a rock shaft 375, which is
10 journaled on the cross beams 317 and 318 parallel to and spaced from the rock shafts 316 and 353. The position and rocking of the shaft 375 and arms 373 and 374 is controlled from the main drive shaft 197 through
15 a cam 376 rigidly mounted thereon and connected through suitable transmission mechanism to an arm 377 rigidly mounted on the shaft 375. For this purpose, a cam 376 is provided with a cam groove 378 in which works
20 a roller 379 secured on a reciprocating rod 380, the upper end of which is pivotally connected to a depending arm 381 of a bell crank lever 382, pivoted on the rod 326, the lower end of the rod 380 being bifurcated, as at
25 383 and straddling the shaft 197 to permit a longitudinal, guided movement of the rod. The other arm 384 of the bell crank lever 382 is connected by means of a link 385 to the arm
30 377 of the rock shaft 375. Through these links and levers, therefore, the rock shaft 375 and the arms 373 and 374 are held in position or rotated by the position or movement imparted to the rod 380 by the cam groove 378 and roller 379. The cam groove 378 throughout
35 the greater portion of its periphery has a circular curvature centered on the shaft 197 and, when the roller 379 is in this portion of the cam groove, it is held at a fixed distance from the shaft 197, in the position shown in
40 Figures 23 and 25, thus serving to hold the plates 367 and 368 in their uppermost, inactive positions.

A portion 386 of the cam groove, however, turns sharply outwardly from the center of the cam and when this portion of the cam
45 groove turns into alignment with the rod 380, it causes the rod 380 to slide outwardly from the center of the shaft, permitting the bell crank lever 382 and the rock shaft 375, through the connecting linkages, to rotate in
50 a direction to lower the folding plates 367 and 368. As the cam continues its rotation and the roller 379 enters the circular portion of the cam groove, the bell crank lever 382 and rock shaft 375 are rotated to their former
55 positions, thereby lifting the folding plates 367 and 368.

The wrapper has now been folded to the position shown in Figure 31, leaving at each
60 end of the brick the portions 333 and 334 projecting from the side walls of the wrapper in the form of tabs, the inner faces of which are coated with adhesive. To complete the wrapping of the brick, these tabs are folded
65 against the ends of the wrapper, thus providing a further seal and securing the ends of

the package more firmly. The folding of these tabs is accomplished as the package is pushed and conveyed from the table.

For this purpose, a brick removing pusher
70 plate 386 is provided at one side of the table 118 of a length equal to the length of the brick and having at its ends forwardly projecting plates 387 and 388, which as the plate
75 386 is moved against one face 389 of the wrapped brick, slides over the ends of the brick and thus bends the tabs 333 tightly against the ends of the brick, the adhesive on the inner surfaces of the tabs serving to hold the tabs secured to the end of the brick. As the plate 386 moves across the table 118, it
80 shoves the brick between a pair of conveyor guide plates 390 and 391, spaced apart the length of the brick and thus folds and holds the other pair of tabs 334 tightly against the ends of the brick, thus completing the wrapping
85 of the brick and clearing the table for another wrapping operation.

The moving of the plate 386 is actuated through a suitable actuating mechanism from
90 a driving wheel 392 rigidly mounted on the main shaft 197. The periphery of the wheel 392 is circular and smooth at 393 throughout more than three quarters of its periphery and throughout the remaining portion is toothed
95 as at 394. In the period of the revolution of the wheel 392 in which the moving plate 386 is to be shoved across the table 118, the teeth 394 engage and mesh with teeth on a pinion 395, suitably mounted on a bracket
100 396 on the frame of the machine, the pinion 395 being given a complete revolution during the quarter turn of the wheel 392. A crank arm 397 is rigidly mounted on the pinion 395 and is accordingly also given a complete revolution. The movement of the crank arm 397
105 is transmitted through a rack bar 398, secured at one end to the crank arm 397, to a pinion 399 with which the rack is held in mesh by means of a guide 400, and serves to rotate the pinion first in an anti-clockwise direction and then reversely to its original position. The pinion 399 is mounted on the shaft 326 through a bushing on which is also mounted
110 a larger gear 401 fixed to and rotated by the pinion 399, and, in turn, meshing with and driving a rack bar 402 projecting rearwardly from the pusher plate 386. As the pinions 399 and 401 are rotated anti-clockwise, the plate 386 is accordingly moved forwardly across the table 118, and upon the return rotation
115 of the pinions 399 and 401, is withdrawn. The rack bar 402 is guided and supported between a pair of upper rollers 403 and a pair of lower rollers 404 mounted on a bracket 405 projecting from the table 118, the lower rollers
120 404 being grooved centrally at 406 for the passage of the teeth of the rack bar and having flanged outer peripheries 407 on which outer tracks 408 of the rack bar ride.

Through the above arrangement of the 130

folding mechanism, the various folding operations may be carried on in their proper sequence and relation and may be timed from the single main driving shaft 197. The particular division of the period of rotation of the shaft 197 among the various folding operations may be apportioned as circumstances may make desirable for any particular case. As an example, however, starting with the table 118 cleared and ready to receive the wrapper and brick for wrapping and with the shaft 197 in a corresponding position, during the first 90° rotation of the shaft, the sheet 152 is shoved onto the table. During the rotation of the shaft from 90° to 180° from its starting point, the teeth 274 of the wheel 273 mesh with and rotate the pinion 277 moving the cutter blade 195 across the table to form the wrapper sheet 290. During this period also a brick is deposited on the wrapper. During the next 45°, from 180° to 225° of the starting point, the projecting portion 313 of the cam groove 311 of cam 310 passes through the vertical position, folding the wrapper as in Figure 28. During the next 25° from 225° to 250° of the starting point, the projecting part 324 of the cam groove of cam 321 rotates past the rod 322, actuating the plate 314 to fold the wrapper to the form of Figure 29. During the next 30°, from 250° to 280° from the starting point, the projection 360 of the cam groove 358 moves past the rod 356, swings the shaft 353 and plate 351 to fold the other upright part of the wrapper over the top of the brick. During the next 15°, from 280° to 295° of the starting point, the peak 348 of the cam grooves 344 and 345 move through their vertical upper positions and lift the plates 337 and 338 and folding the wrapper to the position shown in Figure 30. During the next 30° of revolution, from 295° to 325° from the starting point the peak 386 of the cam groove 378 moves past the rod 380 and drops the plates 367 and 368 folding the wrapper to the position shown in Figure 31. During the remaining 35° of rotation, from 325° to 360° of the starting point, the teeth 394 of the wheel 392 mesh with the pinion 399 and drive the push plate 386 across the table 118. Some of these movements may begin before the others have been completed without interfering with each other and the interval allotted to the various operations may be proportioned otherwise than as given in the above instance, which is merely by way of example.

A brief résumé of the operation of the entire machine is as follows: A continuous sheet 152 of wrapping material is drawn from a supply roll 151 at one end of the machine between rolls 153, 157, 159, and printing roll 162, rotating continuously at constant speed, and is then drawn at intermittent intervals between the intermittently driven roll 172 and slitter roll 174 in which the slits 178, 179, 180

and 181 are formed in the sheet, and then around the intermittently driven roll 182, during which the exposed face of the paper is coated with adhesive applied from a supply tank 184 by the spreading rolls 185, 186 and 187 and the paper is then brought with its coated face uppermost and delivered onto the rails 191. The paper is intermittently carried lengthwise of the rails 191 to the table 118 by means of a reciprocating transverse suction pipe 192 and a wrapper section 290 severed by the knife 195 and left on the table 118 in position for wrapping. A quantity of material fed through the hopper 40 at the other end of the machine is then forced by the plunger 43 through the conduit 41 into the forming passage 42 and forced by the plunger 44 forwardly in the form of a brick through the extension 55 and opening 56 towards the wrapping table 118. The brick expelled from the opening 56 is received on the carrying plate 102, carried over the table 118 and as the carrying plate 102 returns is scraped off by the plate 114 onto the wrapping sheet 290, previously deposited on the table 118. The wrapper and brick are then in position for the wrapping operations briefly described in the preceding paragraph.

The wrapped package formed as described above is suited for a wide variety of materials, which, according to their properties may be formed and placed on the sheet on the wrapping table in a variety of ways. The invention is particularly valuable, however, for packaging fuel composition pastes. These pastes are now handled in bulk and because of their pasty consistency cannot be handled with the neatness required in handling when used for house or domestic consumption. When packaged as described above, however, the individual packages can be handled and conveyed easily and neatly and the packages present a clean paper surface and may be made of a size that may be easily picked up and carried and that may be placed on a furnace or stove grate to serve as a firing charge. The packages may when necessary be divided by driving a shovel through them and the halves burned separately. The cost of the packaging is low as no bags are required and, starting with sheet paper, the packages are readily formed without manual handling.

As changes of construction could be made within the scope of my invention, it is desired that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

1. Apparatus of the type described which comprises a wrapping table, means for slitting a continuous sheet of wrapping material

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at longitudinally spaced intervals with transversely spaced, longitudinal slits, means for coating one surface of said sheet, means for advancing at intermittent intervals and placing on said wrapping table with the coated surface uppermost, lengths of said sheet between the mid points of successive sets of slits, means for severing said sheet transversely on said mid points of said slits, means for placing a brick of material on said sheet on said table, means for folding said sheet upwardly about the sides and over the top of said brick, and means for folding the portions of said sheet between said slits over the ends of said brick.

2. Apparatus of the type described which comprises, a wrapping table, an intermittently rotated feed roll, a slitter roll having slitter knives spaced to form sets of transversely spaced, longitudinal, slits at longitudinally spaced intervals in a sheet passing to said feed roll, means for coating the exposed surface of said sheet on said feed roll, supporting rails extending between the upper edge of said feed roll and said wrapping table, means for gripping and moving a sheet delivered to said rails, means for synchronously and intermittently rotating said rolls and advancing said gripping means to advance a length of said sheet, equal to the distance between centers of said sets of slits, onto said wrapping table, means for cutting said sheet transversely on the mid points of said slits, means for placing a brick of material to be wrapped lengthwise on said sheet midway thereof, means for wrapping said sheet about the top and sides of said brick, and means for folding the end portions between said slits over the ends of said brick.

3. Apparatus of the type described which comprises a wrapping table having an inner plate, and an outer plate surrounding and slightly spaced from said inner plate, means slidable between said inner and outer plates to wrap paper upwardly about material on said inner plate, a slitter roll having spaced knives extending circumferentially on a portion of the circumference of the roll and a nonslitting portion equal to the length of said inner plate, and means for intermittently rotating said roll and moving said paper thereon and therefrom to bring the unslit portions thereof onto said inner plate of said table.

4. Apparatus of the type described which comprises, a wrapping table having an inner plate and an outer plate surrounding and slightly spaced from said inner plate, means slidable upwardly between said plates to wrap paper upwardly about material on said inner plate, means for longitudinally slitting paper at transversely spaced intervals and at longitudinal intervals equal to the length of said inner plate of said table, and means for moving said paper onto said table

to place said unslit intervals on said inner plate.

5. Apparatus of the type described which comprises a wrapping table having an inner plate and an outer plate surrounding and slightly spaced from said inner plate, means slidable upwardly between said plates to wrap paper upwardly about material on said inner plate, means for longitudinally slitting a continuous length of paper at transversely spaced intervals and at longitudinal intervals approximately equal to the length of said inner plate of said table, means for intermittently moving said paper onto said table to place said unslit intervals on said inner plate, and means for transversely cutting said paper across said slits.

6. Apparatus of the type described which comprises a wrapping table having an inner plate and an outer plate surrounding and slightly spaced from said inner plate, means slidable upwardly between said plates to wrap paper upwardly about material on said inner plate, means for longitudinally slitting a continuous length of paper at transversely spaced intervals and at longitudinal intervals greater than the length of said inner plate of said table, and means actuated from a common driving source in timed sequence for intermittently moving said paper onto said table to place said unslit intervals on said inner plate, cutting said paper transversely across said slits, and wrapping said paper upwardly about material placed on said inner plate of said table.

7. Apparatus of the type described which comprises a wrapping table having an inner area for supporting material to be wrapped, means movable upwardly at the edges of said inner area for wrapping paper upwardly about material placed on said inner area, means for longitudinally slitting paper at transversely spaced intervals and at longitudinal intervals between said slits more than the length of said inner area of said table, and means for moving said paper onto said table at intermittent intervals to place said unslit intervals of paper on said inner area.

8. Apparatus of the type described which comprises a wrapping table having an inner area for supporting material to be wrapped, means for longitudinally slitting paper at transversely spaced intervals and at longitudinal intervals between said slit portions more than the length of said inner area of said table, means for moving said paper onto said table at intermittent intervals to place said unslit intervals of paper on said inner area, means for forming and depositing a brick of material to be wrapped on said area of paper on the inner area of said table, and means movable upwardly of the side faces of said brick to fold said paper upwardly thereagainst.

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9. Apparatus of the type described which comprises a wrapping table having a central plate and an outer plate surrounding, slightly spaced from, and supporting said central plate in fixed position, a pair of vertical plates slidable upwardly at opposite sides of said central plate, a pair of vertical plates slidable upwardly at opposite ends of said central plate, a pair of plates mounted to swing sidewise over said central plate from opposite sides thereof at a fixed height thereabove, a pair of plates slidable downwardly towards the end edges of said central plate, a pusher plate movable sidewise across said table and having projecting end means aligned with the end surfaces of said center plate, an actuating shaft below said wrapping table, cams on said shaft for actuating said plates at successive intervals and transmission mechanism from said cams and their respective plates.

10. Apparatus of the type described which comprises a wrapping table having a central plate and an outer plate surrounding, slightly spaced from, and supporting said central plate in fixed position, a pair of vertical plates slidable upwardly at opposite sides of said central plate, a pair of vertical plates slidable upwardly at opposite ends of said central plate, a pair of plates mounted to swing sidewise over said central plate from opposite sides thereof at a fixed height thereabove, a pair of plates slidable downwardly towards the end edges of said central plate, a pusher plate movable sidewise across said table and having projecting end wings aligned with the end surfaces of said central plate, a receiving guide having plates aligned with the ends of said central plate, and a common driving source for actuating said plates and said pusher plate in succession.

11. Apparatus of the type described which comprises a wrapping table having a central plate and an outer surrounding plate slightly spaced from, and supporting said central plate in fixed position, means movable upwardly from the side edges of said central plate to fold a wrapper upwardly, means moving sidewise at a fixed distance above said central plate to fold a wrapper over said plate, means movable vertically downwardly and means movable vertically upwardly in timed succession for folding the ends of said wrapper at the ends of said plate, a pusher means for folding said wrapper sidewise at the ends of said central plate and removing a wrapped article therefrom, and a guide means for receiving said wrapped article and completing the folding thereof.

12. Apparatus of the type described which comprises a wrapping table having an area for supporting a brick of material to be wrapped, means for longitudinally slitting a continuous length of paper at transversely

spaced intervals and at longitudinal intervals between said slit portions more than the length of said supporting area of said table, means for applying adhesive to a surface of said paper, means for moving said paper on to said table at intermittent intervals to place said unslit intervals of paper on said supporting area with the adhesive uppermost, means for cutting the portion of said paper deposited on said table from the length of paper transversely of said slits, and means movable upwardly of the side faces of said brick to fold said paper upwardly against the said side faces.

In testimony whereof, I affix my signature.
EARL P. WETMORE.

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