

H. R. HEYL.
MACHINE FOR FORMING CONICAL TUBES.
APPLICATION FILED DEC. 15, 1909.

Patented Apr. 29, 1913.

4 SHEETS—SHEET 1.

1,060,455.

Fig. 1.

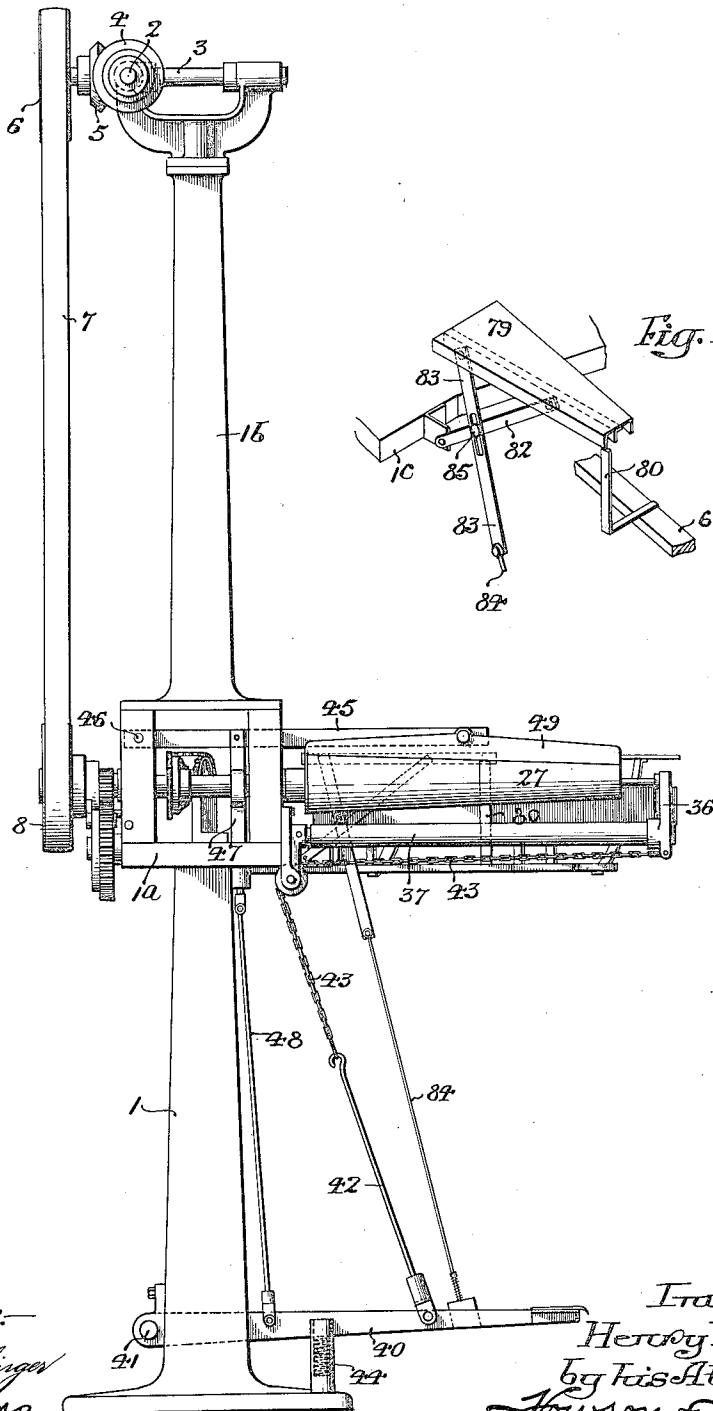
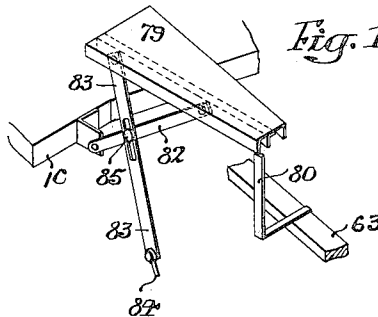


Fig. 12.



Witnesses:
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Inventor:
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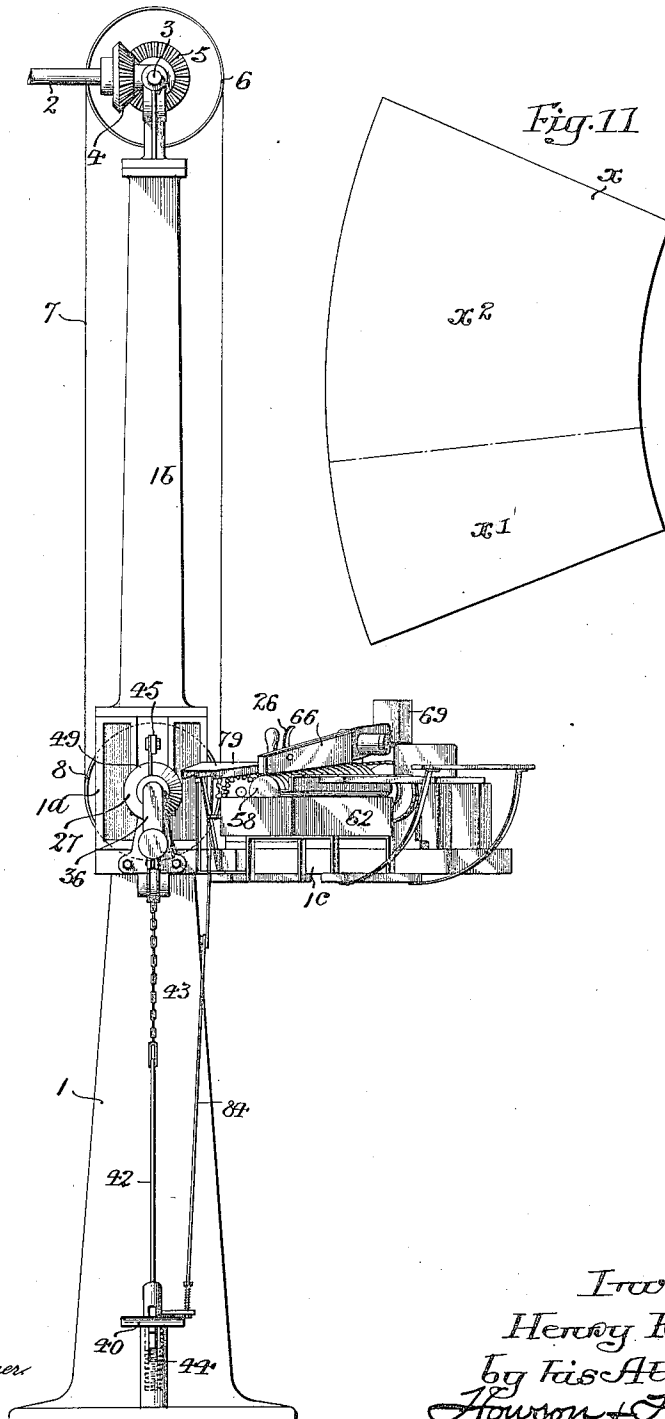
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1,060,455.

Fig. 2.



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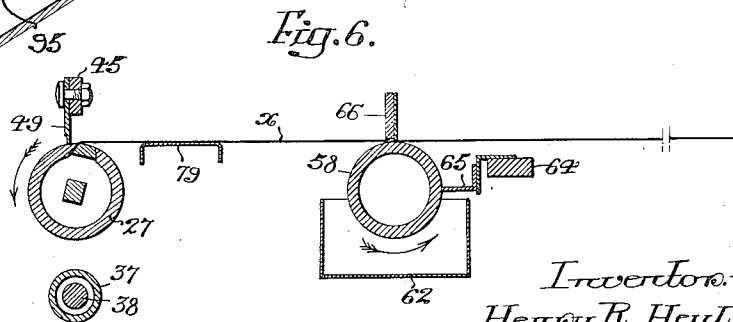
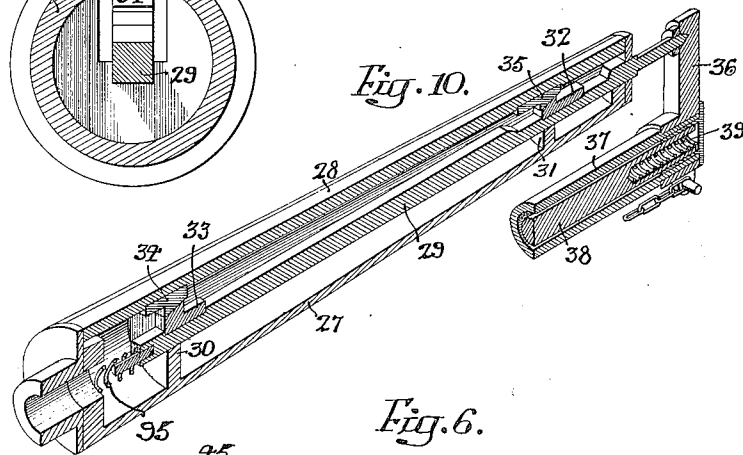
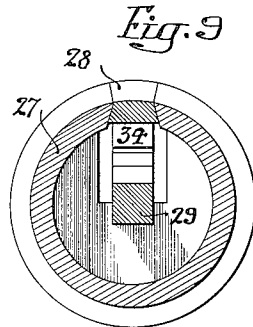
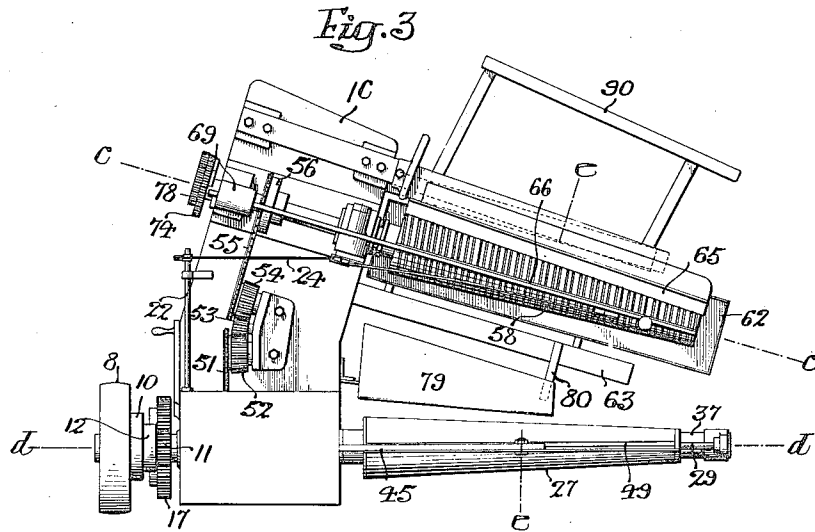
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

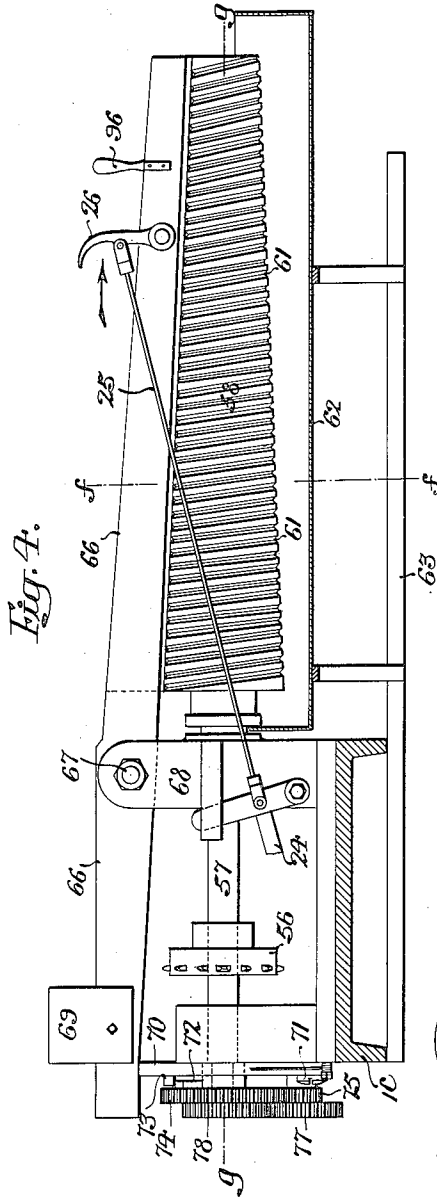
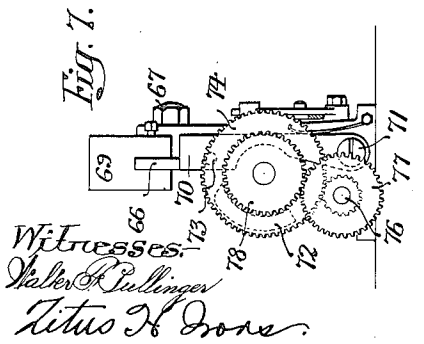


Fig. 4.

Fig. 7.



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Fig. 13



Fig. 5.

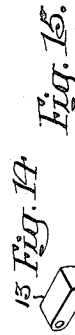


Fig. 17

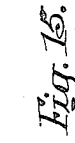


Fig. 15.

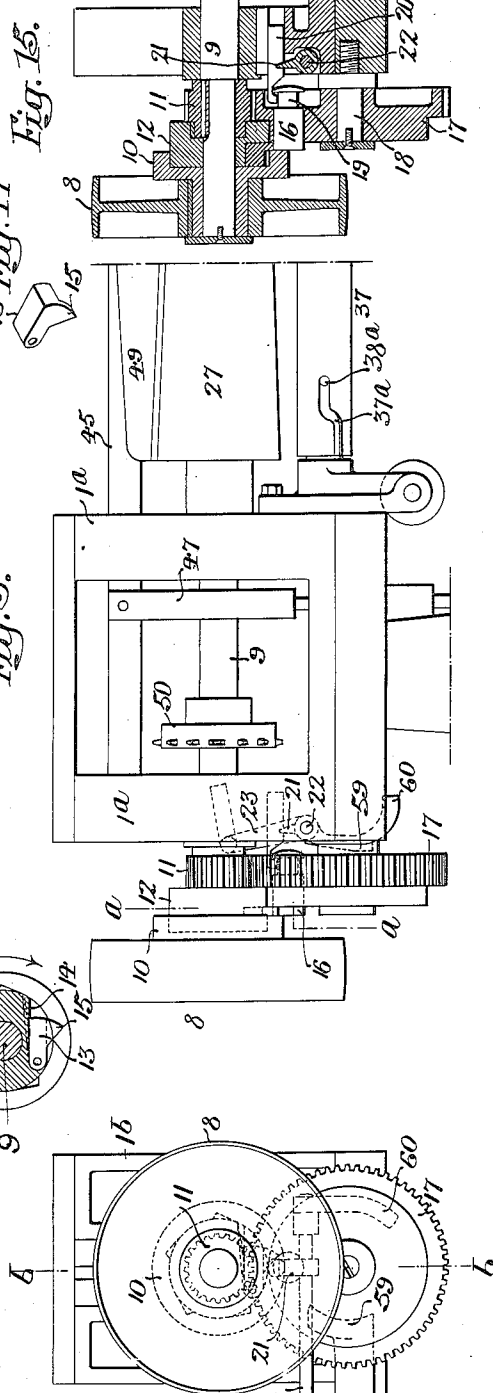


Fig. 8.

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UNITED STATES PATENT OFFICE.

HENRY R. HEYL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE AMERICAN PAPER BOTTLE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

MACHINE FOR FORMING CONICAL TUBES.

1,060,455.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed December 15, 1909. Serial No. 533,189.

To all whom it may concern:

Be it known that I, HENRY R. HEYL, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Machines for Forming Conical Tubes, of which the following is a specification.

One object of my invention is to provide a machine for forming conical tubes from a sheet of paper of the proper shape, which is pasted prior to being rolled upon a form.

A further object of the invention is to so apply paste that it shall be limited to those portions of the paper within the edges of the outside lap of the sheet.

I also desire to provide a machine of simple and substantial construction for making conical tubes, which shall be easily and rapidly operated.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which:--

Figure 1, is a side view of a machine constructed according to my invention; Fig. 2, is a front elevation; Fig. 3, is a plan; Figs. 4 and 5 are respectively vertical sections on the lines $c-c$ and $d-d$ Fig. 3; Fig. 6, is a diagrammatic section on the line $e-e$ Fig. 3; Fig. 7, is an end elevation of the parts shown in Fig. 4; Fig. 8, is an end elevation of the parts shown in Fig. 5; Fig. 9, is an enlarged section on the line $f-f$ Fig. 4; Fig. 10, is a sectional perspective on the line $g-g$ Fig. 4; Fig. 11, is a plan of the paper blank used to form a conical tube; Fig. 12, is a perspective view of the paper supporting table and its operating means; Fig. 13, is a vertical section on the line $a-a$, Fig. 5; Fig. 14, is a perspective view of the pawl, and Fig. 15, is a vertical section on the line $b-b$ Fig. 8.

The machine invented by me is especially adapted for making conical tubes of paper for use in the manufacture of paper bottles; the tubes being subsequently cut into proper lengths to form bottles of different capacities.

Assuming that a three ply tube is to be formed, the sheet of paper is cut to the shape illustrated in Fig. 11 at x , and the mechanism hereafter described applies paste to the portion x^2 , to the exclusion of the part x^1 of said blank, so that there is no paste exposed

either on the inside or outside of the finished tube. After the paste has been applied the tube is rolled from the blank and is then transferred from my machine to a presser whereby the seams are held until the paste sets.

In the above drawings, 1 is the main supporting standard or frame of the machine, on the top of which is carried an open framework 1^a and a table-like structure 1^c ; said frame work also carrying a second vertical standard 1^b . On the top of this latter are bearings for two shafts 2 and 3, the first of which is continuously driven from any suitable source of power and has fixed to it a beveled gear 4 connected with a second gear 5 fixed to said shaft 3, upon which is also fixed a pulley 6. By means of a belt 7 this pulley is operatively connected to a second pulley 8 loosely supported on a shaft 9 and keyed to an internally toothed ratchet 10. A pinion 11 is keyed to said shaft and has fixed to it a sleeve 12 recessed on one side for the reception of a pawl 13; the arrangement being such that a portion of the sleeve and the main part of the pawl extend into the hollow ratchet 10, said pawl being free to move outwardly under the action of a spring 14 to engage the internal teeth of said ratchet and couple together the shaft 9 and the pulley 8. It will be noted from Figs. 13, 14 and 15 that the pawl has a projecting lug capable of being engaged by a longitudinally slidable pin 16 mounted in the web of a gear 17 which is carried on a standard 18 and meshes with the teeth of the pinion 11. When in its outer position the pin is capable of engaging the lug 15 of the pawl 13 so as to move it inwardly toward the shaft 9 out of engagement with the teeth of the ratchet 10. For moving said pin inwardly out of the path of the pawl, I provide it with a head 19 which is engaged by a hook 20 slidably mounted in a suitable recess in the frame 1^a of the machine. This hook is engaged by a finger 21 mounted on a short shaft 22 to which is fixed an arm 23 connected through links 24 and 25 to an operating handle 26.

The shaft 9 is journaled in suitable bearings on the portion 1^a of the frame and projects at the side thereof opposite that having the pulley wheel 8; there being mounted

on this projecting end a conical mandrel 27 whose detail construction is well illustrated in Fig. 10. As shown, said mandrel is hollow and is longitudinally slotted for the reception of a clamping strip 28 extending throughout its length and provided with any suitable means whereby it may be moved radially for the purpose of catching and holding one edge of the paper blank between itself and one edge of the slot in which it operates. While many devices may be employed for this purpose, I preferably employ the means shown in Fig. 10 which consists of a longitudinally slidable bar 29 guided in suitable openings provided in transverse webs 30 and 31 of the mandrel and carrying wedge shaped blocks 32 and 33 designed to act upon the inclined faces of other blocks 34 and 35 fixed to the inside surface of the strip 28. The bar 29 projects beyond the small end of the mandrel where it is detachably engaged by an arm 36 fixed to a tubular supporting member 37 slidable upon a guide bar 38. This bar 29 is separable from the arm 36 and is normally pressed toward the same by a spring 95 confined between its inner end and the shaft 9. In addition there is a second spring 39 confined between the outer end of the guide bar 38 and the end of the tubular support 37. A treadle 40, pivoted at 41 to the main frame 1, is connected by a link 42 and a chain 43 with the outer end of the arm 36, so that by depressing said treadle against the action of a spring 44, the tubular structure 37 may be moved inwardly on its guide rod 38 against the action of the spring 39, thereby moving the bar 29 longitudinally against the action of its spring 95 and causing the wedge shaped blocks 32 and 33 to co-act with the blocks 34 and 35 to force outwardly the clamping strip 28.

From Fig. 5, it will be noted that there is on the inner end of the rod 38 a pin 38^a placed to operate in a slot 37^a in the structure 37, whereby this latter may be caused to make a quarter revolution after it has been moved longitudinally a predetermined distance.

A presser bar 49 is loosely pivoted to a supporting arm 45 so that its edge extends substantially parallel with the top line of the surface of the mandrel 27 in contact with or immediately adjacent to the same, and said arm is pivoted to the frame 1^a at 46, being connected by a yoke 47 and a link 48 with the treadle 40. Owing to the action of the spring 44 this link 48 and the yoke 47 will normally maintain the arm 45 in such a position that the presser bar is out of contact with the surface of the mandrel.

In the present instance there is fixed to the shaft 9 a sprocket wheel 50, which as shown in Fig. 3, is connected through a chain 51, beveled gears 52, 53 and 54, and a

second chain 55, to a sprocket wheel 56 fixed to a shaft 57 which carries the pasting roll 58.

Since the tubes to be made by the machine are conical in form and therefore require a blank of the shape shown at *x* in Fig. 11, the line of the shaft 57 extends at an angle to the line of the shaft 9, and for this reason the arrangement of gearing shown in Fig. 3 is rendered necessary. As it is desired that the tubes shall have their walls formed of three thicknesses of paper, it is necessary that the shaft 9 shall make three complete revolutions in forming each tube. With this idea in view, the gear 17 has three times as many teeth as the pinion 11 and is provided with a cam (shown in dotted lines at 59, Fig. 5,) which, after said gear has made a full revolution, engages an arm 60 fixed to the spindle 22 so as to move this latter in such direction as to cause the pin 16 to be thrown into the path of the lug 15 of the pawl 13. As a result of this engagement, the pawl is moved away from the internal tooth of the ratchet, thus releasing the pinion 11 from the driving pulley 8 and permitting the shafts 9 and 57 to come to rest.

The pasting roll 58 is conical in form and has in its surface spiral grooves 61 running from one end to the other and capable of retaining paste or other suitable adhesive which is gathered from a pan or receptacle 62 carried by a supporting structure 63 mounted on the frame of the machine. At one side of the paste receptacle I mount an arm 64 carrying a scraper 65 so placed as to engage the surface of the pasting roll 58 and remove from it practically all of the paste except that within the grooves.

As shown in Fig. 4, I provide a presser lever 66 pivoted at 67 to a suitable standard 68 and placed so that one of its arms extends substantially parallel with and immediately adjacent to the top surface of the pasting roll 58. The other arm of this lever extends rearwardly from the bracket 68 and carries a counterbalance weight 69 of such proportions that it is sufficient to move the first arm away from the surface of the roll 58. This weighted arm, however, is normally supported in its lower position so that the other arm of the lever is immediately adjacent to but above the surface of the roll 58, by means of an arm 70 pivoted to the frame of the machine at 71 and placed so that a pin 73 thereon may be acted on by a cam 72 carried on a gear wheel 74. This latter is loose on the shaft 57 and meshes with a pinion 75 keyed to a spindle 76 to which is also keyed a gear 77; there being a gear 78 fixed to the shaft 57 and meshing with this second gear. The arrangement is such that after two revolutions of the said shaft, the pin 73 is engaged by the cam 72 so that the arm 70 is moved from under the

end of the presser lever 66, thus permitting the weight 69 to turn the same on its pivot and move its long arm away from the pasting roll. For convenience of operation I preferably pivot the hand lever 26 to this presser lever 66.

In order to support the paper blank as it passes from the pasting roll to the forming mandrel, I provide a table 79, which in the present instance is trapezoidal in form, and in order that this may not receive paste from the blank during the forming operation, I provide means whereby it is depressed after the machine has started its operation. In Figs. 1 and 12 I have illustrated the preferred apparatus for accomplishing this end and this consists of a rod or bar 80 rigidly mounted on the main frame, adjacent the outer or narrow end of the table. This same end of the table is also connected to the frame by means of an inclined link 82, while to the opposite end of the table I pivot a second link 83 connected through a rod 84 with the treadle 40. This link 83 is preferably slotted adjacent to the link 82 and is frictionally connected to it by means of a bolt 85.

Under operating conditions a series of paper blanks of the form shown at *x* in Fig. 11 is prepared and one of them is introduced into the machine so that it occupies the position shown in Fig. 6; its front or most advanced edge extending parallel with the clamping bar 28 and its body extending across the table 79, and over a suitably supported bar 90. It will be understood that the shaft 2 is connected to any suitable driving motor so that the pulley 8 is driven from said shaft through the beveled gears 4 and 5, the shaft 3, pulley 6, and belt 7. The advance edge of the paper blank is now inserted between the clamping strip 28 of the mandrel 27 and one of the edges of the slot in which said strip operates and the treadle 40 is depressed by the operator. This causes the tubular structure 37 to be moved longitudinally upon the rod 38, and through the arm 36, causes the bar 29 to be also moved longitudinally, thereby sliding the wedge shaped blocks 32 and 33 upon the blocks 34 and 35 and forcing outwardly the clamping strip 28, with the result that said advance end of the blank is tightly held to the mandrel. The depression of the treadle also pulls down on the link 84 and the bar 83, thus causing the table 79 to be depressed, and at the same time pushing down the rod 48, with its yoke 47, thus drawing the presser 49 into contact with the top surface of the mandrel 27. If now, the operating lever 26 be moved in the direction of the arrow Fig. 4, the pin 16 is drawn out of engagement with the pawl 13 so that this latter falls, under the action of gravity, into engagement with one of the teeth of the

ratchet, and operatively couples the pulley 8 and pinion 11. Owing to the peculiar construction and proportions of gearing hitherto described, the shaft 9 as well as the shaft 57, is given three complete revolutions and is then thrown out of operative connection with the pulley 8 by reason of the fact that the cam 59 upon the gear 17 engages the arm 60 and through the shaft 22, finger 21, and hook 20, moves the pin 16 into such a position that it engages the lug 15 of the pawl 13, raising it out of engagement with the ratchet 10 and thereby disconnecting the pinion 11 from said pulley 8. In the meantime, however, the revolution of the mandrel 27 has wound upon it the paper blank *x* and it is to be noted that the distance between said mandrel and the pasting roll 58 is such that the body of paper lying between these two parts forms the first layer wrapped on the mandrel. The remaining two layers of paper, unlike this first layer, are each coated on one side with paste, for just before the machine starts its action, the operator presses down the long arm of the lever 66 by means of a handle 96 so that it forces the paper under it into intimate contact with the surface of the pasting roll; it being noted that the lever is retained in this position by reason of the fact that a suitably placed spring forces the lever 70 under its weighted arm. After two revolutions of the pasting roll have been made, the lever 70 is automatically moved from under this weighted arm by reason of the engagement of the pin 73 by the cam 72, thereby permitting the weight 69 to raise the long end of said arm so that this latter does not come in contact with the sticky surface of the pasting roll. The pasting roll in its revolutions gathers paste from the receptacle 62, and as before noted, this is all scraped off except what enters the spiral grooves 61. As the paper passes between the long arm of the lever 66 and said pasting roll, it thus receives a series of parallel and inclined lines of paste, and the delivery to the mandrel of this prepared paper is in no way interfered with since the table 79 is depressed as above described. All wrinkles are removed from the blank as it is wound upon the mandrel and the various layers are pressed into contact with each other by the presser 49, so that when the various parts of the machine finally come to rest, the rear edge of the paper blank is left projecting immediately to the rear of said presser. The release of the treadle 40 permits the spring 44 to raise it to its normal position, thereby forcing upwardly the rod 48 and the lever 45 adjacent thereto and raising the presser 49 from engagement with the paper roll formed on the mandrel. The raising of the treadle also permits the spring 39 to force outwardly the tubular structure 37 which, after moving

sufficiently to draw the arm 36 away from the end of the bar 29, is caused to make a quarter revolution on the bar 38 by reason of the action of the pin 38^a on the sides of the slot 37^a. The movement of said bar 29 under the action of the spring 95 withdraws the blocks 32 and 33 from the blocks 34 and 35 so as to permit of the movement of the clamping strip 28 into the mandrel, whereupon the finished paper roll, having been released by the above noted inward movement of the clamping strip 28, may be easily slipped off of the end of the mandrel. The table 79 having been raised to its original position when the treadle was released, the structure 37 is again returned to the position shown in Fig. 10 and the arm 36 brought into engagement with the end of the bar 29, thus placing the machine in condition for another cycle of operations.

I claim:—

1. The combination in a machine for forming conical tubes, of a paste container; a conical roller mounted to receive paste from said container; a conical mandrel extending at an angle to said roller; fixed bearings supporting the paste roller in a position to one side of and spaced away from said mandrel; with means for turning the mandrel to wind a paper blank thereon after it has received paste from the roller; the area of the space between the mandrel and roll being substantially equal to the size of a piece of material necessary to form one layer of the tube.

2. The combination of a paste container; a pasting roll mounted to receive paste from the container; a mandrel upon which a paper blank is wrapped to form a tube; mechanism carried by the mandrel for clamping the blank thereto; means for positively driving both the roll and the mandrel; a table between the roll and mandrel; and means for moving said table away from the path of movement of the blank under predetermined conditions.

3. The combination of a conical mandrel; means for driving said mandrel; a clamp for holding the edge of a paper blank to be wrapped upon the mandrel; a pasting roll located in advance of the mandrel; means for supplying paste to said roll; a presser mounted above the pasting roll for holding the paper in contact therewith; and a presser bar adjacent the mandrel for acting on the paper; as it is wrapped upon said mandrel; with means for normally holding said bar out of engagement with the mandrel.

4. The combination of a conical mandrel; means for driving said mandrel; a paper clamp carried by the mandrel; a presser for holding the paper to the mandrel as it is being wrapped thereon; a conical pasting

roll arranged in advance of the mandrel and at an angle thereto; means for applying paste to the said roll; a clutch mechanism through which the roll and the mandrel are driven; and means for releasing the clutch after said mandrel has made a predetermined number of revolutions.

5. The combination of a conical mandrel; a conical pasting roll; means for applying paste to said roll; a presser bar located above the pasting roll so as to act on paper thereon; means for driving the mandrel and roll; and mechanism for releasing the presser bar when the paper leaves the pasting roll.

6. The combination in a machine for forming conical tubes, of a conical mandrel; a conical pasting roll located in advance of the mandrel; means for supplying paste to said roll; and means movable at will for supporting a blank between the mandrel and the pasting roll.

7. The combination in a machine for forming tubes, of a mandrel; a pasting roll; means for supplying paste to said roll; means for driving the mandrel and the roll; a blank supporting structure between the mandrel and the roll; and means for depressing said structure at will.

8. The combination in a machine for making paper tubes; of a conical mandrel; mechanism within the mandrel for clamping the paper blank thereto; means for turning the mandrel; and an actuating device for the clamping means; said actuating device consisting of a longitudinally movable bar within the mandrel projecting at one end thereof; a longitudinally movable and rotatable structure capable of removably engaging the projecting end of said bar; and means for actuating said structure.

9. In a machine of the character described, a revoluble shaft, a mandrel revolved thereby, a revoluble roller, mechanism whereby said shaft revolves said roller, a cam revolved by said roller, a presser bar adapted for holding a sheet on said roller, and mechanism operated by said cam for controlling said bar.

10. The combination of a conical mandrel, a pasting roll, means for applying paste to said roll, a presser bar located above the pasting roll so as to act on paper thereon, means for driving the mandrel and roll, and mechanism for releasing the presser bar when the paper leaves the pasting roll.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HENRY R. HEYL.

Witnesses:

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WM. A. BARR.