E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

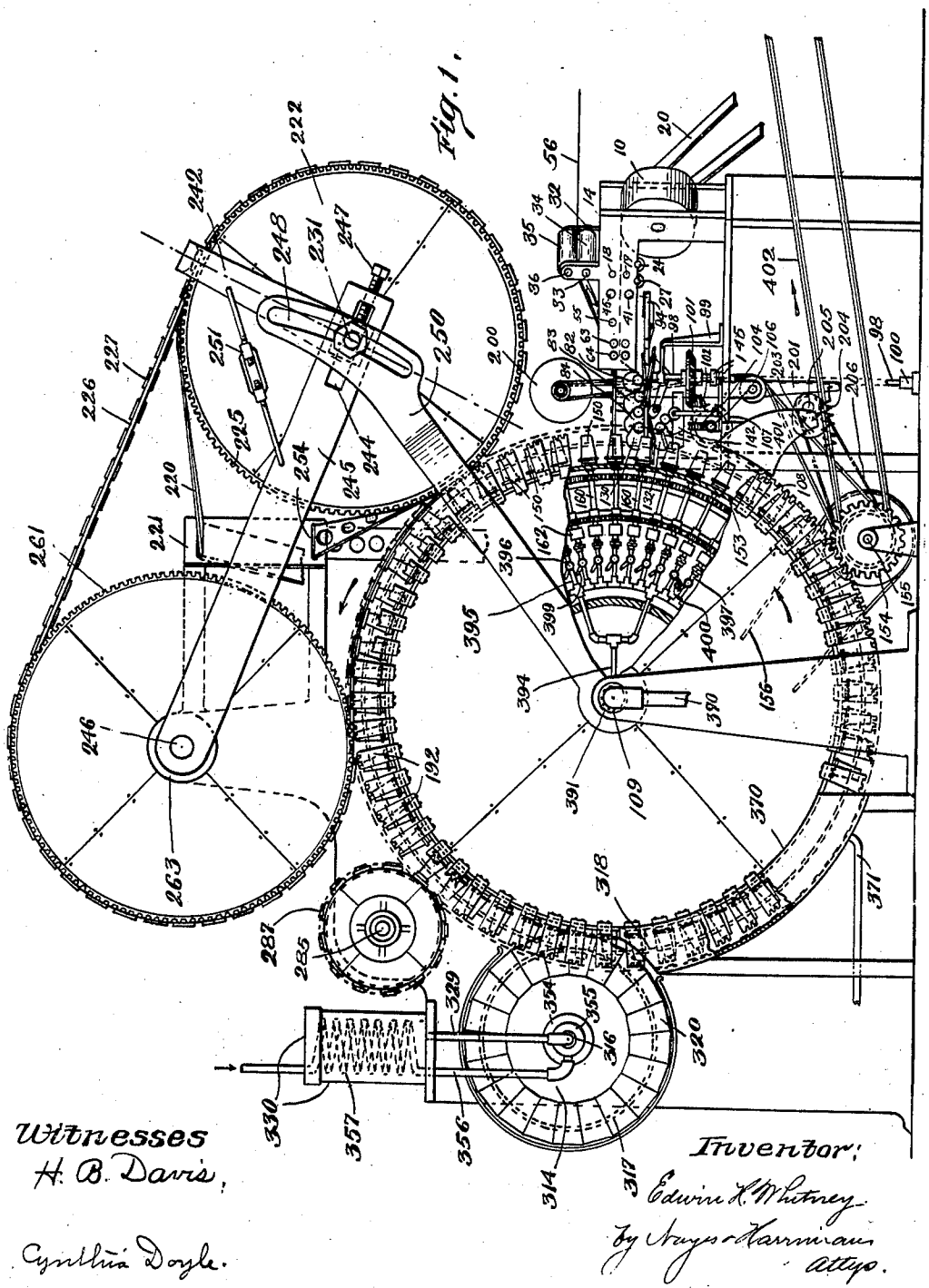
APPLICATION FILED APR. 25, 1912.

1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 1.

Fig. 1.



Witnesses
H. B. Davis,
Cynthia Doyle.

Inventor:
Edwin H. Whitney
By Sayre & Harriman
attys.

E. H. WHITNEY.

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APPLICATION FILED APR. 25, 1912.

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13 SHEETS—SHEET 2.

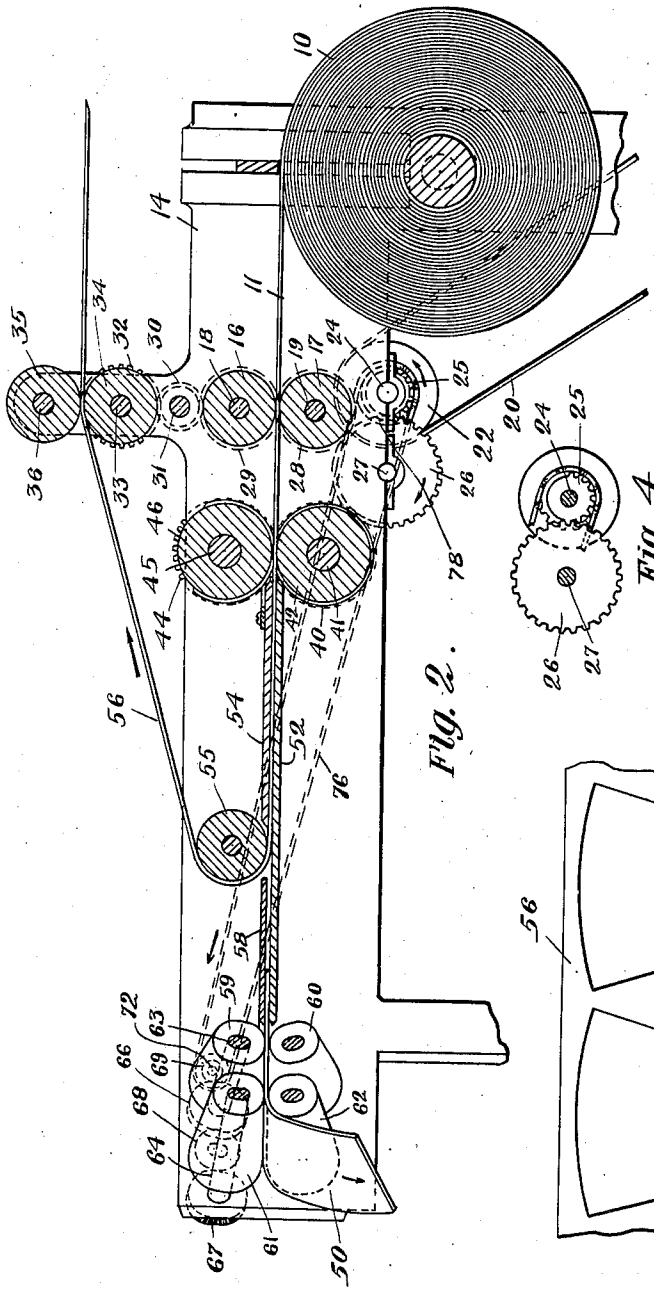


Fig. 2.

Fig. 5.

Fig. 3.

Fig. 4.

Witnesses:

H. B. Davis.

Cynthia Doyle.

Inventor:

Edwin H. Whitney,

by Noyes & Harriman.

attys

E. H. WHITNEY.

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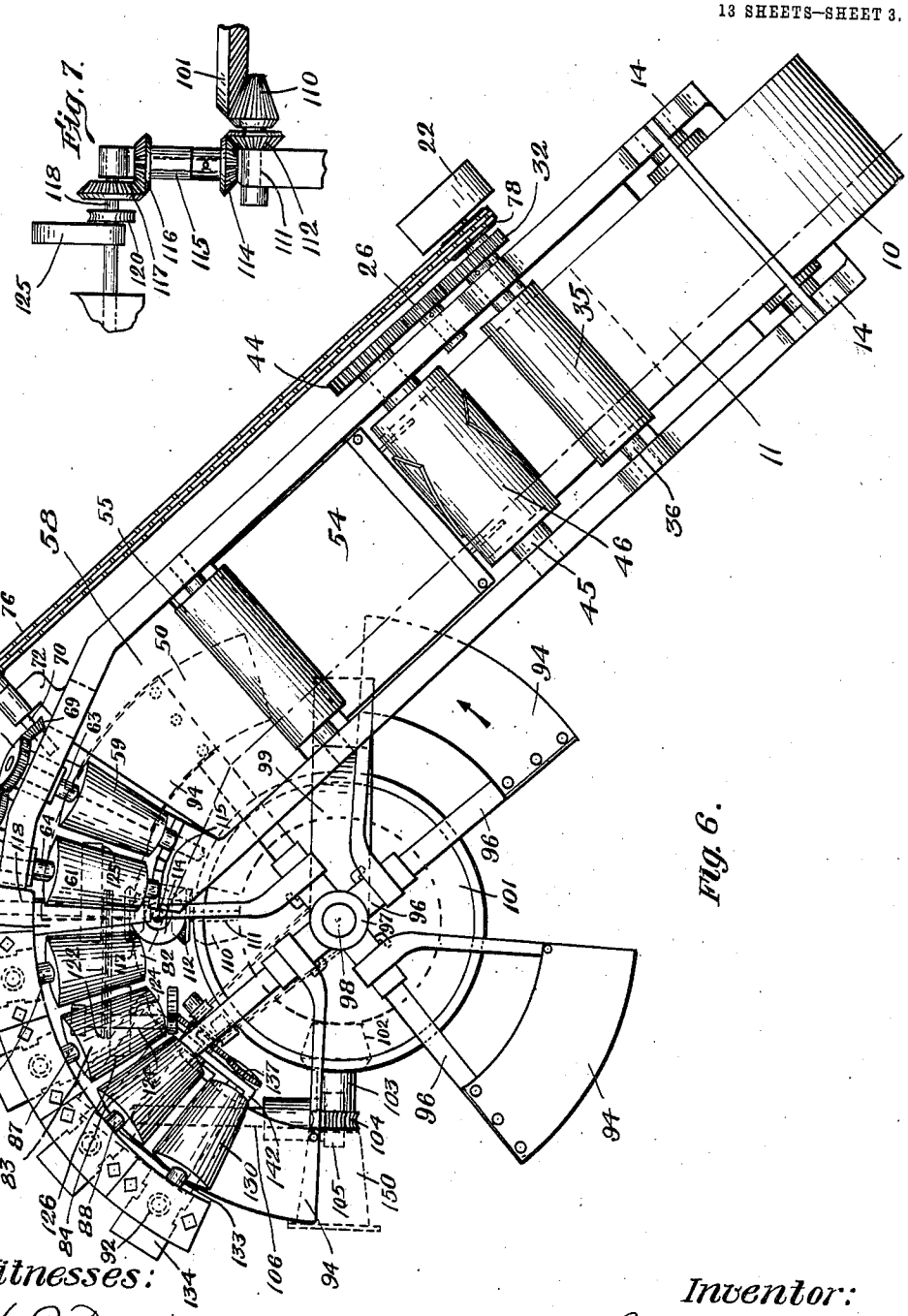


Fig. 6.

Fig. 7.

Witnesses:

H. B. Davis

Cynthia Doyle.

Inventor:

Edwin H. Whitney

by Mayo & Harriman

attys.

E. H. WHITNEY.

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Patented Dec. 30, 1913.

13 SHEETS—SHEET 4.

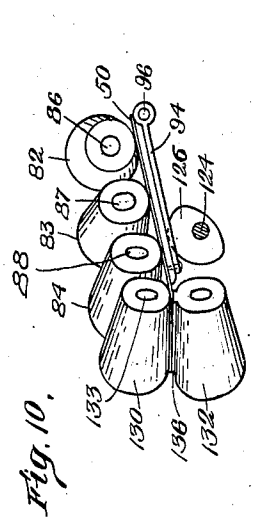


Fig. 10.

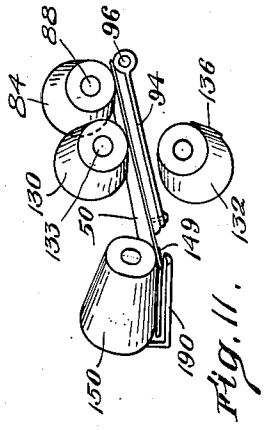


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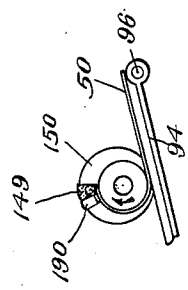


Fig. 12.

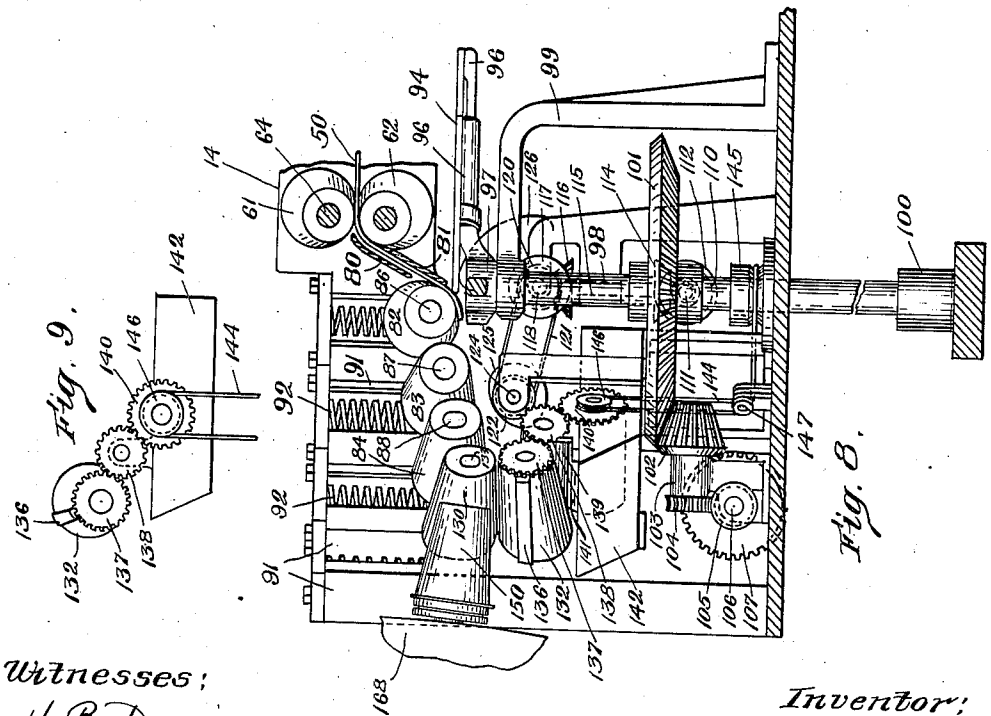


Fig. 9.

Fig. 8.

Witnesses;
H. B. Davis.

Cynthia Doyle.

Inventor;
Edwin H. Whitney.
by Hayes & Harriman
Attys.

E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

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13 SHEETS—SHEET 6.

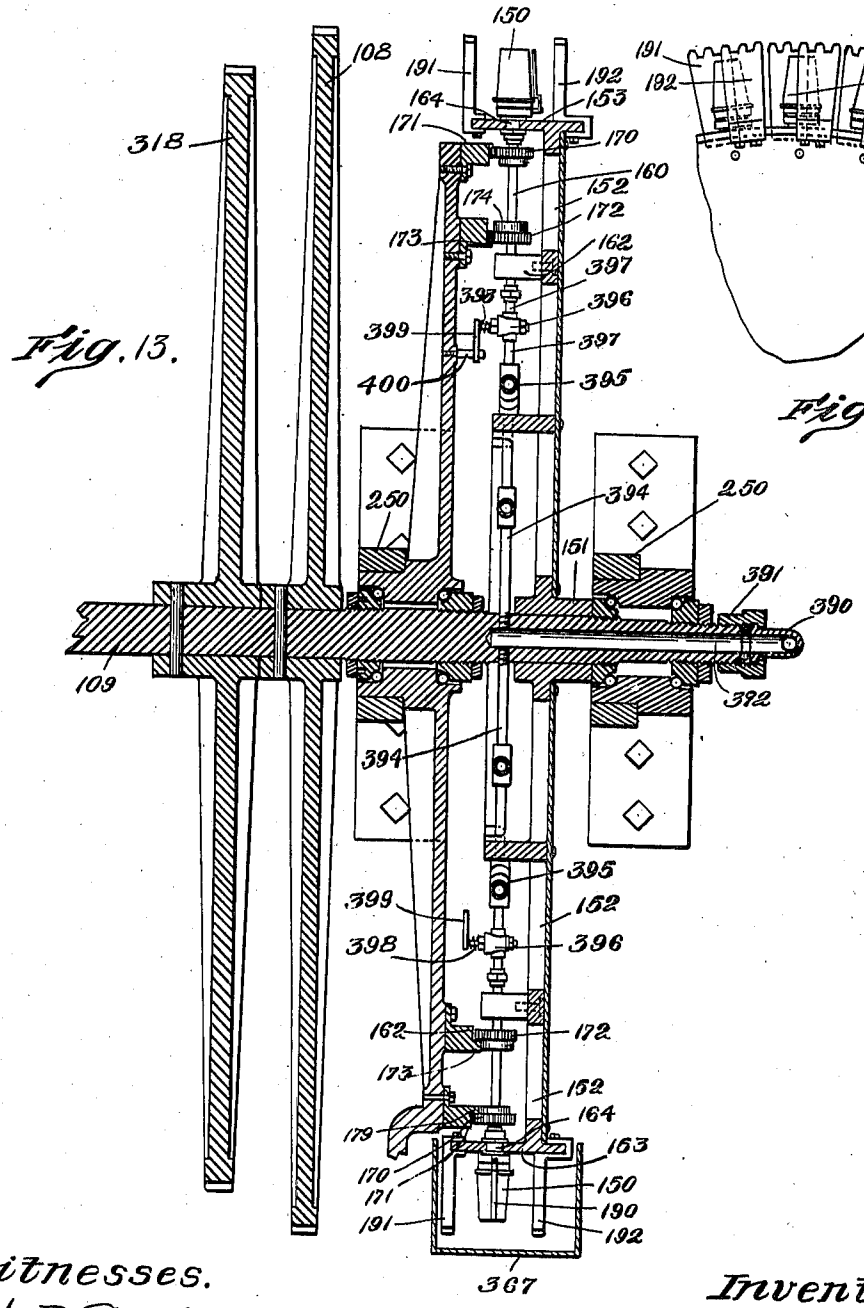


Fig. 13.

Fig. 14.

Witnesses.

H. B. Davis

Cynthia Doyle.

Inventor.

Edwin H. Whitney.

by Hayes & Harriman

Attys.

E. H. WHITNEY.

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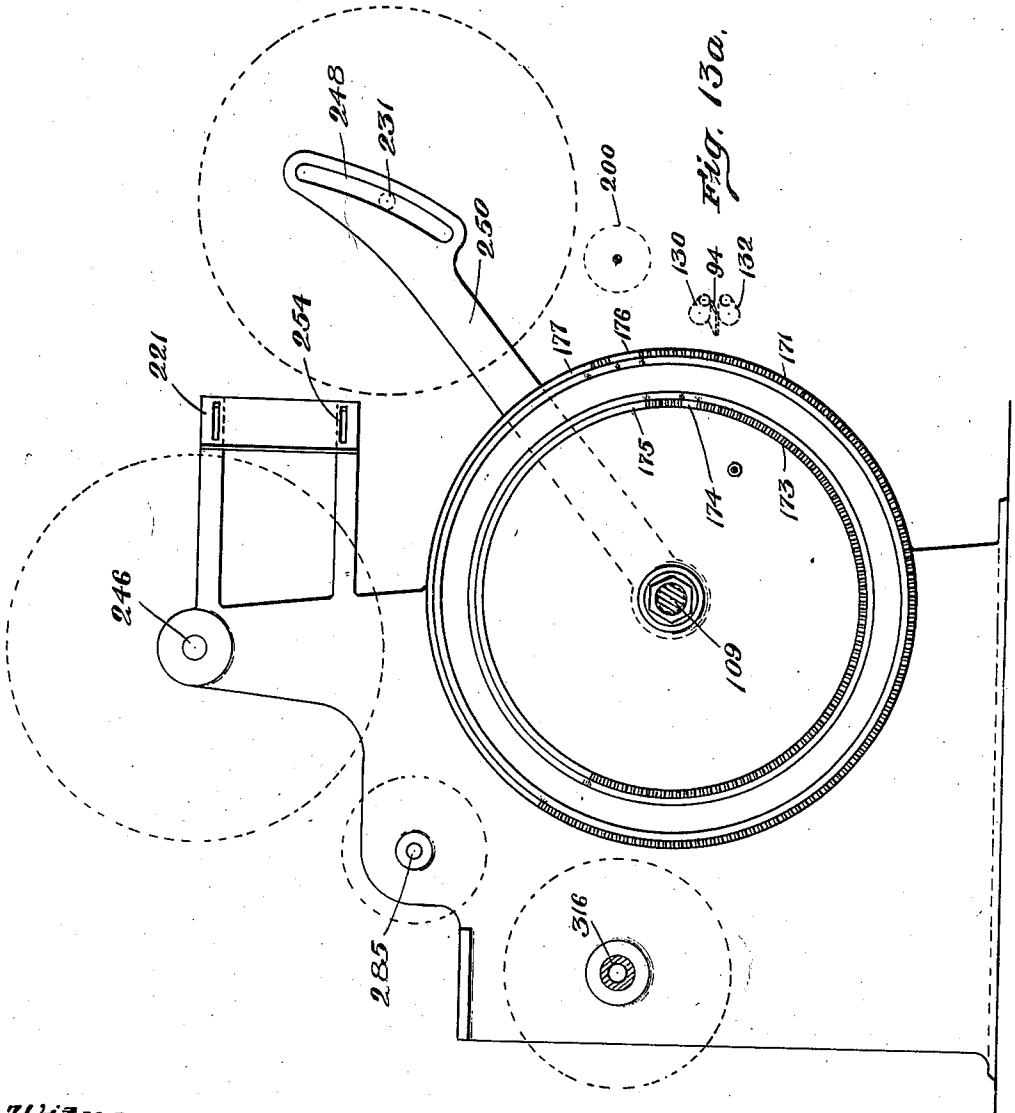


Fig. 13a.

Witnesses:
H. B. Davis
Cynthia Doyle.

Inventor:
Edwin H. Whitney
by Sayre & Harriman
Attys.

E. H. WHITNEY.

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13 SHEETS—SHEET 7.

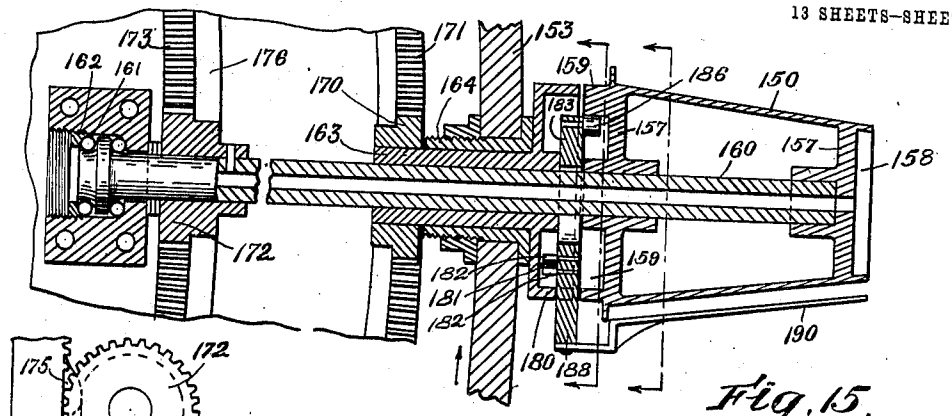


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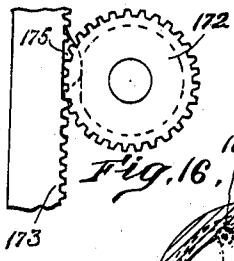


Fig. 16.

Fig. 17.

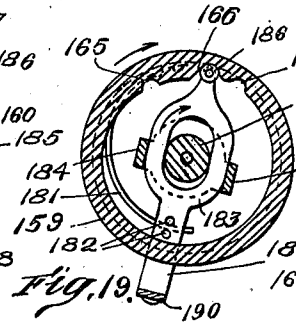


Fig. 19.

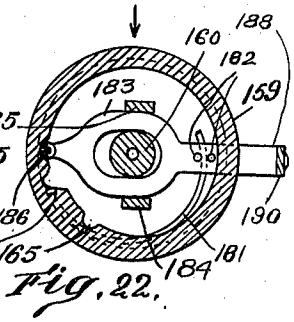


Fig. 22.

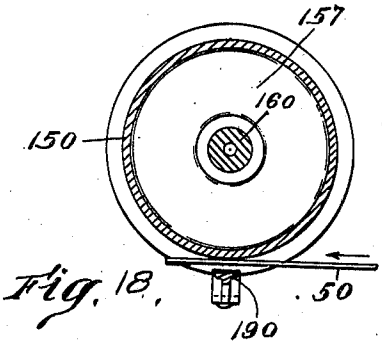


Fig. 18.

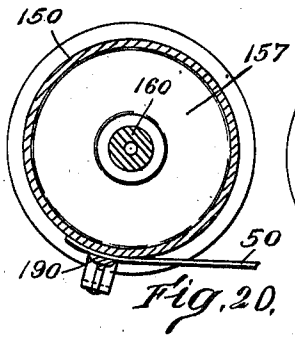


Fig. 20.

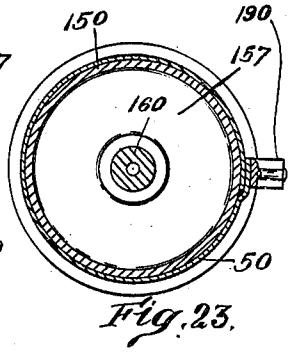
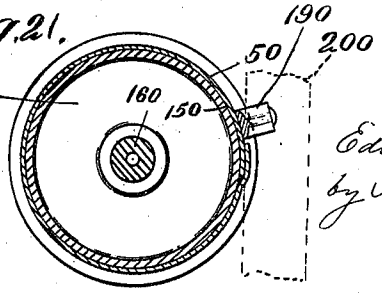


Fig. 23.

Fig. 21.



Witnesses:

H. B. Davis.

Cynthia Doyle.

Inventor:

Edwin H. Whitney

by Hayes & Harriman.

Attys.

E. H. WHITNEY.

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1,082,836.

Patented Dec. 30, 1913

13 SHEETS—SHEET 8.

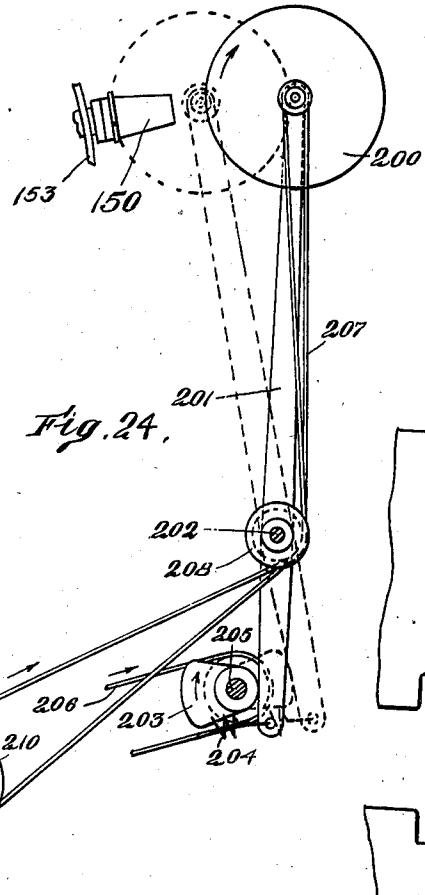


Fig. 24.

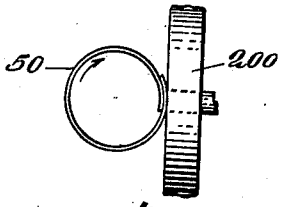


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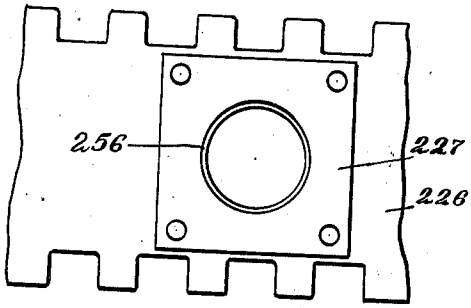


Fig. 26

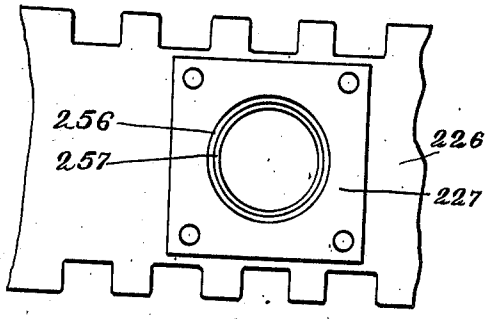


Fig. 27.

Witnesses:
H. B. Davis
Cynthia Doyle.

Inventor:
Edwin K. Whitney
by Hayes & Harriman
Atty.

E. H. WHITNEY.

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1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 9.

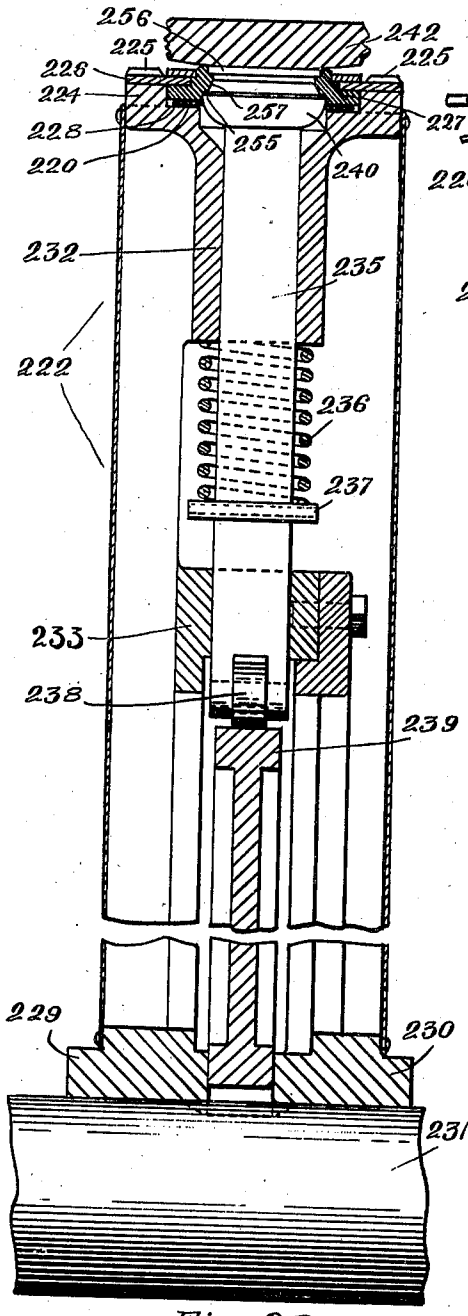


Fig. 28.

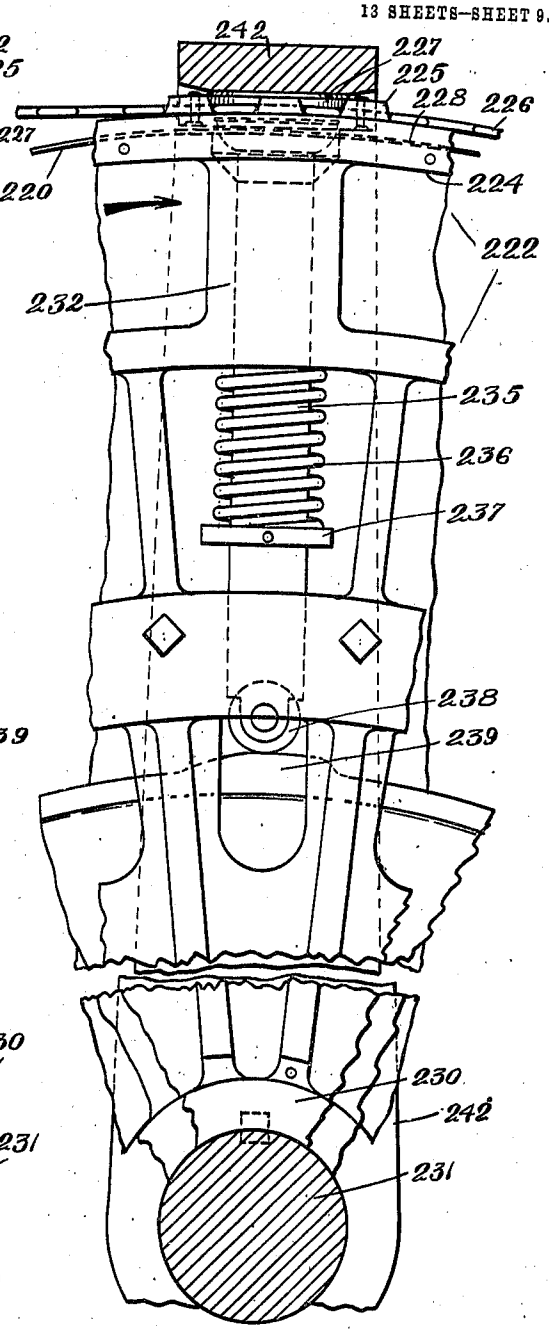


Fig. 29.

Witnesses:

H. B. Davis.

Cynthia Doyle.

Inventor:

Edwin H. Whitney

by Mayo & Harriman.

Attys.

E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

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1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 10.

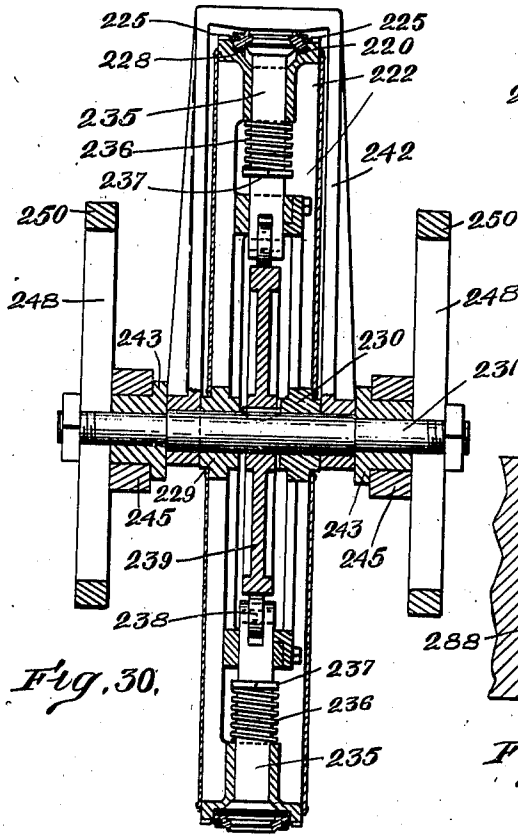


Fig. 30.

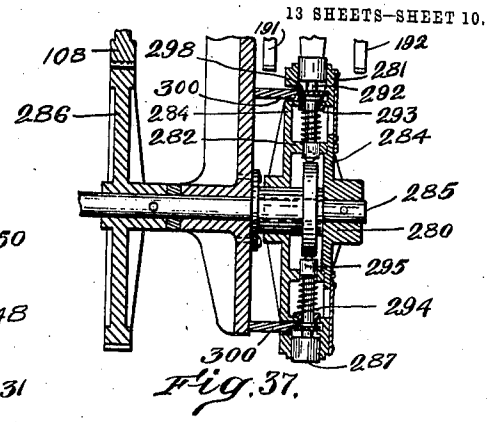


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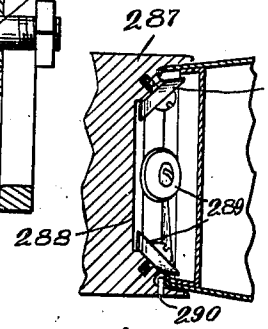


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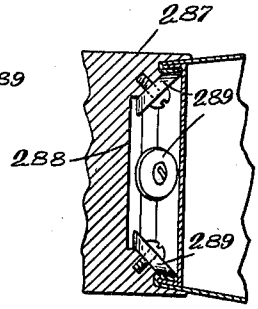


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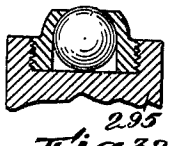


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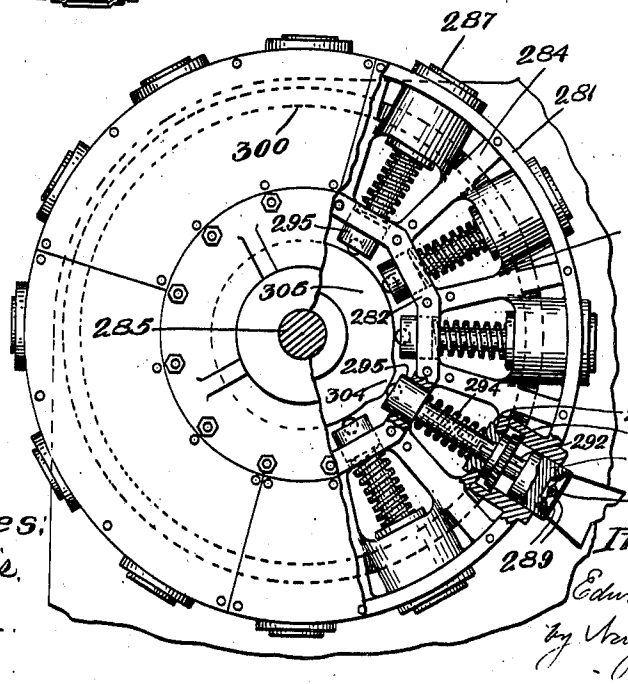


Fig. 36.

Witnesses:
H. B. Davis.
Cynthia Doyle.

Inventor:
Edwin H. Whitney
by Sayre & Harriman
Attys.

E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

APPLICATION FILED APR. 25, 1912.

1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 11.

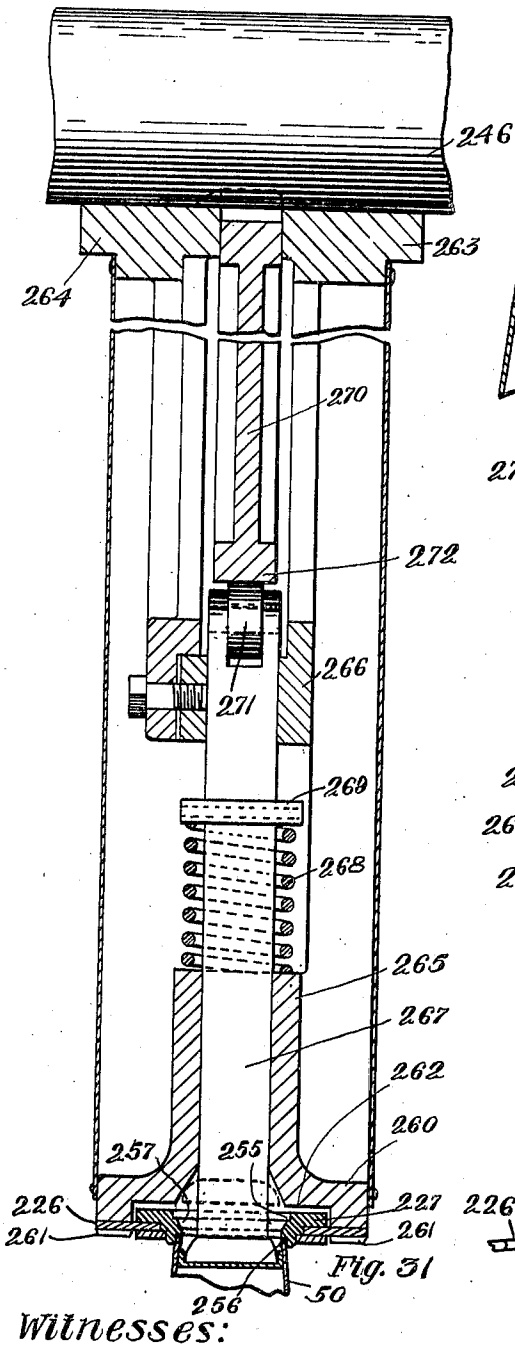


Fig. 31

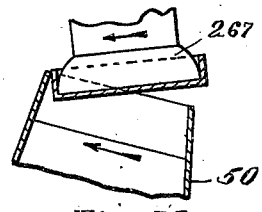


Fig. 33

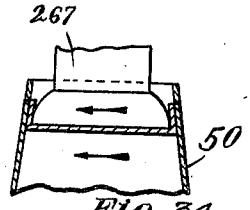


Fig. 34.

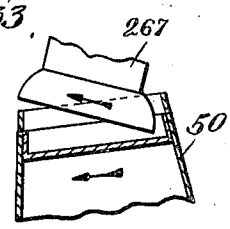


Fig. 35.

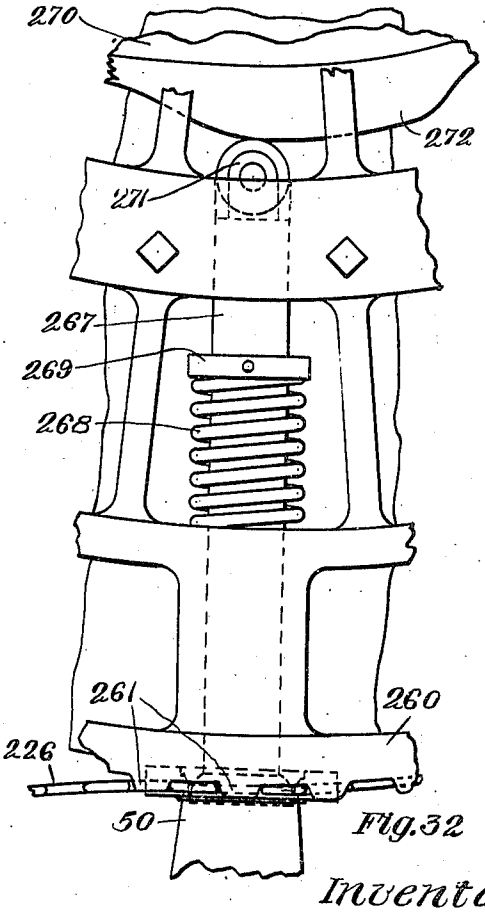


Fig. 32

Witnesses:

H. B. Davis

Cynthia Doyle.

Inventor:

Edwin H. Whitney

by Sayles & Kerrigan,

attys.

E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

APPLICATION FILED APR. 25, 1912.

1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 12.

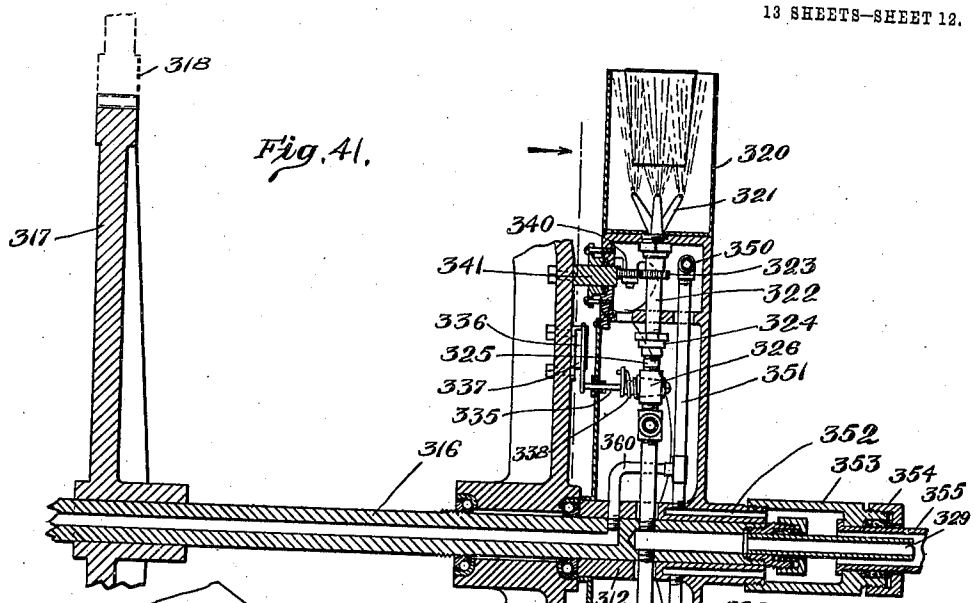


Fig. 41.

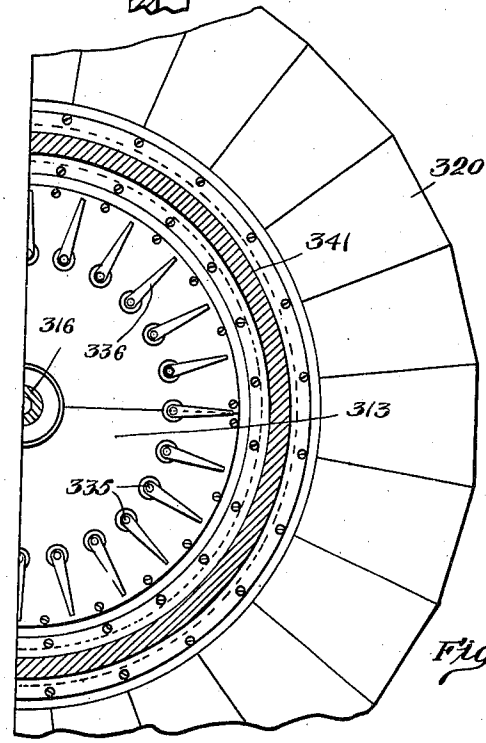


Fig. 42.

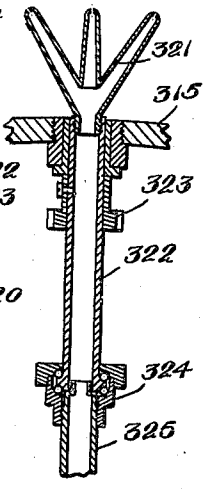


Fig. 43.

Witnesses.

H. B. Davis.

Cynthia Doyle.

Inventor.

Edwin H. Whitney

by Hayes & Harriman

attys.

E. H. WHITNEY.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING CUPS.

APPLICATION FILED APR. 25, 1912.

1,082,836.

Patented Dec. 30, 1913.

13 SHEETS—SHEET 13.

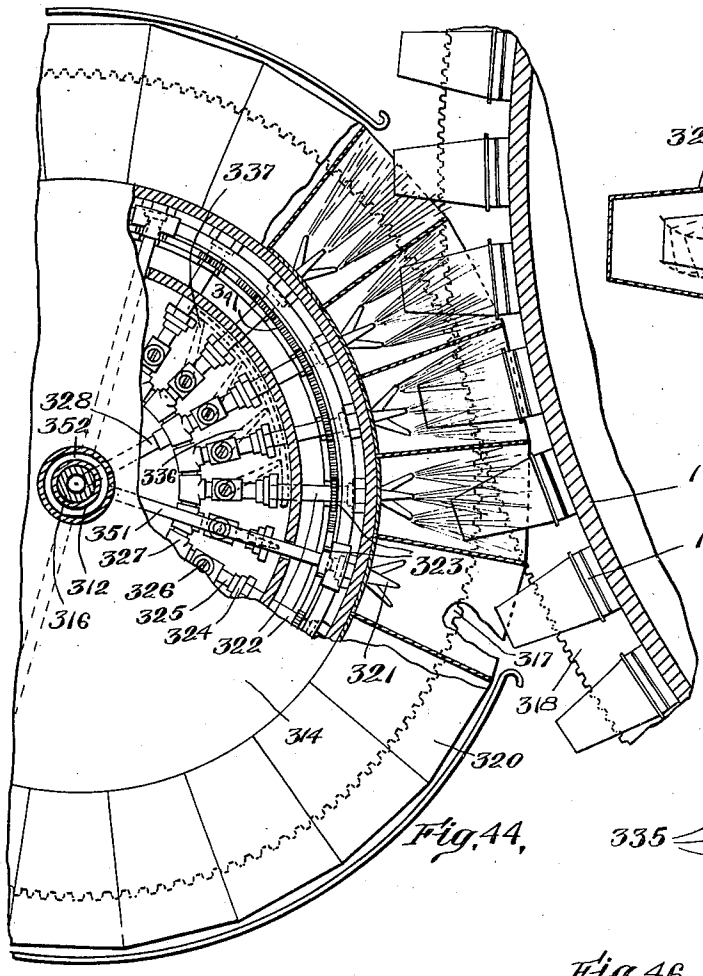


Fig. 44.

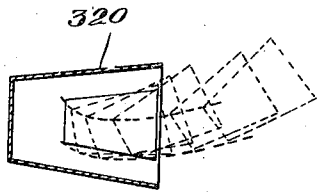


Fig. 45.

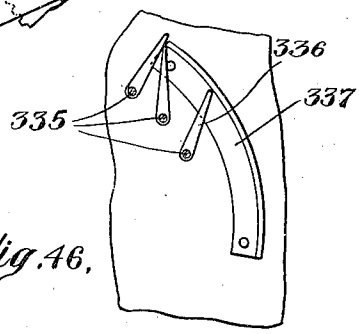


Fig. 46.

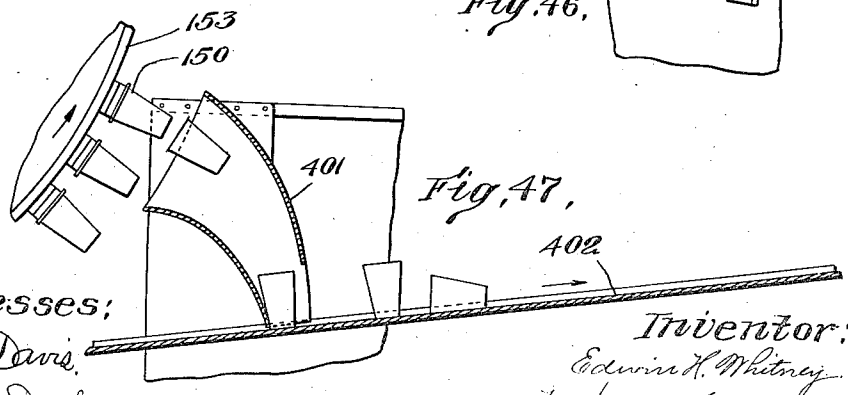


Fig. 47.

Witnesses:

H. B. Davis.

Cynthia Doyle.

Inventor:

Edwin H. Whitney.

by Mayo & Harriman.

Attys.

UNITED STATES PATENT OFFICE.

EDWIN H. WHITNEY, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR TO AMERICAN WATER-SUPPLY COMPANY OF NEW ENGLAND, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

AUTOMATIC MACHINE FOR MAKING PAPER DRINKING-CUPS.

1,082,836. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed April 25, 1912. Serial No. 693,255.

To all whom it may concern:

Be it known that I, EDWIN H. WHITNEY, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Automatic Machines for Making Paper Drinking-Cups, of which the following is a specification.

This invention relates to a machine for automatically forming paper drinking-cups, which are composed of cup-bodies and bottom-pieces inserted in the open ends of said cup-bodies.

The machine is designed to cut body-blanks from a web of paper and to feed each of said blanks to a mandrel on which it is formed into a cup-body, and to apply a line of paste to one edge of said blanks, so that when the blank is wrapped around the mandrel its edges will be overlapped, and said edges adhesively secured.

The machine also involves means to remove any surplus paste from the pasted joint of the cup-body; and also means to apply pressure upon the pasted joint to insure its adhesion.

The machine is also designed to cut bottom-pieces from a web of paper and to form flanges on said bottom-pieces and to thrust the flanged bottom-pieces into the open ends of the cup-bodies.

The machine also involves means to crimp the ends of the cup-bodies over upon the flanges of the bottom-pieces to insure the formation of a tight joint.

The machine is also designed to coat the completed cups with paraffin-wax or some equivalent substance, and, as said paraffin-wax is applied in liquid form, at a high temperature, means are provided to cool the coated cups, preparatory to ejecting them from the machine; and the machine also involves means to eject them upon a moving conveyer.

The machine is essentially of a rotary type, in that the cutting-means for the body-blanks and the cutting-means for the bottom-pieces are of a rotary type; and the mandrels are borne by a rotary mandrel-support by which the cup-bodies are formed and successively conveyed to the bottoming-device and coating-device and ejecting-device; and the spraying-devices by which paraffin is applied to the cups are borne by a rotary-carrier. Thus there is provided an easy running, continuously operating machine.

It is designed that a cup-body shall be formed and its bottom-piece inserted, and the cup coated and ejected during a cycle of operation of the mandrel-support.

Figure 1 is a side elevation of an automatic machine for making paper drinking-cups embodying this invention. Fig. 2 is a sectional detail of the feeding and cutting-means for the body-blanks. Fig. 3 is a diagrammatical view of the same, including the pasting-means. Fig. 4 is a view of the driving-means for the cutting-rolls for the body-blanks. Fig. 5 is a view of a portion of the web or paper from which the body-blanks have been cut. Fig. 6 is a plan view of the feeding and cutting-means for the body-blanks, including the pasting-means. Fig. 7 is a detail of the driving-means for the feeding-means for the body-blanks, to be referred to. Fig. 8 is an elevation of the feeding-means for the body-blanks and the pasting-means. Figs. 9 to 12 are detail views of the pasting-means. Fig. 13 is an enlarged longitudinal vertical section of the mandrel-support and mandrels and operating-means therefor. Fig. 13ª is a front view of the circular racks which are engaged by gears on the mandrel-shaft and clamping-member. Fig. 14 is an enlarged view of a portion of the mandrel-support, to illustrate the form of driving-gear thereon which is engaged by the endless die-carrying band. Fig. 15 is an enlarged longitudinal vertical section of one of the mandrels and clamping-member. Fig. 16 is a view of the gear on the mandrel and its rack. Figs. 17 to 23 are transverse sectional views of the mandrel in different positions, to be referred to. Figs. 24 and 25 are views of the means to remove surplus paste from the pasted-joint of the cup-body. Figs. 26 and 27, respectively, are plan and under side views of a portion of the die-carrying band. Fig. 28 is an enlarged vertical section of a portion of the cutting-punch-carrier and die-carrying band for cutting the bottom-pieces from a web of paper. Fig. 29 is a side elevation of the parts shown in Fig. 28. Fig. 30 is a longitudinal vertical section of the drawing-punch-carrier and die-carrying band for forming the bottom-pieces. Fig. 31 is an

enlarged vertical section of a portion of the drawing-punch-carrier and die-carrying band for forming flanges on the bottom-pieces and thrusting them into the open ends of the cup-bodies. Fig. 32 is a side elevation of the parts shown in Fig. 31. Figs. 33, 34, 35 are sectional views of a portion of the cup-bodies and bottom-piece, illustrating the insertion of a bottom-piece into the open end of a cup-body. Fig. 36 is a side elevation and partial section of the carrier for the crimping-tools. Fig. 37 is a longitudinal vertical section of the crimping-tool carrier on a small scale. Fig. 38 is a detail of the inner end of a crimping-tool holder. Figs. 39 and 40 are sectional views illustrating the method of crimping the end of the cup-body over the flange of the bottom-piece. Fig. 41 is an enlarged longitudinal vertical section of the spraying-device carrier and spraying-devices borne by it. Fig. 42 is a side elevation and partial section of a portion of the spraying-device carrier. Fig. 43 is an enlarged vertical section of one of the spraying-devices. Fig. 44 is an enlarged side elevation and partial section of the spraying-device carrier and a portion of the mandrel-support. Figs. 45 and 46 are details to be referred to. Fig. 47 is a view illustrating the removal of the cups from the mandrel-support.

In the present embodiment of my invention a strip or web of paper, of a width greater than the height of the cups to be formed, is fed forward, and from it the body-pieces are cut, which are subsequently bent into circular form and their ends overlapped and adhesively secured together to produce the bodies of the cups. One form of mechanism is here shown for accomplishing these results for the purpose of illustrating my invention, which will now be described, but it will be understood that my invention is not limited to the particular structure of the various groups of mechanism here shown.

Referring to Figs. 1 to 12, a roll 10 of paper is supported by suitable bearings in a frame 14, and the strip of paper 11, is drawn from said roll intermittingly by a pair of feed-rolls 16, 17, secured to shafts 18, 19, respectively, journaled in bearings in the frame 14. To intermittingly rotate said feed-rolls a power-driven belt 20, passes over a pulley 22, secured to a shaft 24, journaled in bearings on the under side of the frame, a mutilated gear 25, is secured to said shaft 24, which meshes with a gear 26, mounted on a stub-shaft 27, arranged on the frame 14, and said gear 26 meshes with a gear 28, secured to the shaft 19, which shaft bears the lower feed-roll 17, and said gear 28 meshes with a like gear 29, secured to the shaft 18, which bears the upper feed-roll 16.

The parts are so proportioned that the length of strip drawn off by each intermittent movement is sufficient for a single body-piece to be cut therefrom. The strip is fed forward to a rotary punch and die which act to cut body-pieces therefrom, of suitable shape to form the bodies of the cups, and as the cups herein designed to be produced have conically formed bodies said body-pieces are sector-shaped, see Fig. 5. The rotary punch and die are positively yet intermittingly driven, and, as here shown, the aforesaid gear 26, which is rotated intermittingly by the mutilated gear 25, also meshes with a gear 40, secured to a shaft 41, journaled in the frame, and said shaft carries a cylinder 42, having a sector-shaped recess or female die formed on its periphery, and said gear 40, meshes with a gear 44, secured to a shaft 45, and said shaft 45 carries a cylinder 46, having a sector-shaped punch, shaped to correspond to the die on the cylinder 42.

During each cycle of operation of the punch and die a single body-piece 50, is cut out and is also positively fed forward, with the surrounding portion of the strip, between horizontally arranged plates 52 and 54, until it reaches a freely rotatable deflecting-cylinder 55, over which the waste portion of the strip 56 passes on its way to a pair of feed-rolls 34, 35. The lowermost feed-roll 34, is designed to be positively driven and the upper feed-roll 35 to be rotated by frictional engagement with the waste portion of the strip which is arranged between the two rolls, and, as here shown, the positively driven gear 29, before referred to, meshes with an intermediate gear 30, mounted on a shaft 31, journaled in the frame, and said gear 30 meshes with a gear 32, secured to the shaft 33, to which the lowermost feed-roll 34 is secured. The uppermost feed-roll 35 is mounted to rotate freely on a shaft 36, supported by the frame. As the gear 29 is rotated intermittingly the lowermost feed-roll 34 will be rotated intermittingly, so that the waste feed-rolls 34, 35, will be rotated intermittingly and in unison with the feed-rolls 16, 17. The waste portion of the strip will be conveyed from the feed-rolls 34, 35, to any suitable receptacle.

The body-pieces 50 are separated from the waste portion of the strip by the deflection of said waste portion due to its passing around the deflecting-cylinder 55, and they are pushed forward by the strip between a pair of guiding-plates, as the waste portion is being deflected, and by the deflecting-cylinder 55, coöperating with a stationary plate, arranged beneath it. Said stationary plate is here shown as an extension or continuation of the plate 52, and, as shown in Fig. 2, said plate is also extended beneath the guiding-plate 58, its forward edge terminating substantially flush with the for-

ward end of said guiding-plate 58, so that the forward end portion of said plate 52 and the guiding-plate 58 form the pair of guiding-plates just referred to. The body-pieces 50 are moved forward into engagement with one or more pairs of feed-rolls, two pairs being here shown, as 59, 60, and 61, 62, they being arranged one in advance of the other, but near together. The upper rolls 59 and 61 of said two pairs of feed-rolls are secured to shafts 63, 64, journaled in bearings in the frame, and said shafts 63, 64, have secured to them gears 66, 67, respectively, which mesh with an intermediate gear 68. The gear 66 also meshes with a gear 69, secured to a shaft 72 on the frame, and said shaft bears a sprocket-wheel 74, over which passes a sprocket-chain 76, which also passes over a sprocket-wheel 78, secured to the continuously rotating shaft 24.

As the shaft 24 rotates the feed-rolls 59, 61, are positively rotated, and by their frictional engagement with the body-pieces 50, which are passing between said rolls, and their companion feed-rolls 60, 62, the latter feed-rolls are rotated. It is designed and intended to feed the body-pieces 50 forward in a circular path, hence the feed-rolls 59, 60, and 61, 62, are made conical, and are supported by the frame so as to extend toward a common center, as best shown in Fig. 6, and the gears 66, 67, 68 and 69, are beveled to provide for such radial disposition of the rolls. As said feed-rolls are conically formed, in order to enable their bite to occupy a horizontal plane, the shafts bearing them are inclined, see Fig. 2. The first pair of rolls 59, 60, are arranged at such distance from the deflecting-cylinder 55, as to engage the forward end of a body-piece just before the rear end of said body-piece disengages the deflecting-cylinder, so that the body-pieces are held positively while passing from the deflecting-cylinder to said rolls. After passing between the rolls 61, 62, the body-piece 50, encounters the under side of an inclined deflecting-plate 80, see Fig. 8, and by it is bent downwardly to pass over an inclined guiding-plate 81, and by said guiding-plate is directed beneath a plurality of conical yieldingly-supported rolls 82, 83, 84, arranged in a slightly inclined plane. Said rolls 82, 83, 84, are mounted to rotate freely on stub-shafts 86, 87, 88, respectively, which project from blocks 90, toward the same common center as the conical feed-rolls before referred to, and said blocks are slidably mounted in ways 91, and pressed downward by springs 92. To hold the body-piece in engagement with said rolls 82, 83, 84, and to move it along a movable element is provided which is designed to move in a plane beneath said rolls, and as here shown said movable element consists of a propeller of novel construction, having several blades which successively pass beneath said rolls as the propeller is rotated. As the body-piece 50 leaves the inclined guiding-plate 81, it is engaged by one of the blades 94 of the propeller, and by said blade is held in engagement successively with the several rolls 82, 83, 84, as said blade is moved about its axis, the body-piece being thus supported above by the spring-pressed rolls and below by the blade, and the body-piece is moved forward by the positively moving blade. As here shown, the propeller blades 94 are pivotally mounted on radial arms 96, carried by a head 97, arranged at the upper end of a vertical spindle 98, which is supported at its upper end in a boss on the horizontal arm of an angle bracket 99, and its lower end in a step bearing 100. The propeller is rotated continuously, and as here shown, a bevel-gear 101 is secured to the spindle 98, which meshes with a bevel-pinion 102, secured to a short shaft journaled in the bearing 103, and said shaft has secured to it a worm-wheel 104, which meshes with a worm 105, secured to a shaft 106, having secured to it a spur-gear 107, which meshes with a large spur-gear 108, secured to a power-driven shaft 109. By means of the gearing just set forth the propeller spindle 98, is caused to rotate continuously. The propeller-blades 94 are sector-shaped and are pivotally supported along one edge only to the radial arms. Pivotally supporting the propeller-blades on the radial arms enables them to rock or tilt in order to cooperate with the several rolls 82, 83, 84, yet said rolls are yieldingly supported so that they will yield in an upward direction if necessary as the blades pass beneath them. As said blades are pivotally supported along one edge means are provided for engaging their opposite edges to hold them in correct position with respect to the rolls. As here shown, the means to engage and lift or otherwise control the position of the forward edges of the blades will now be described.

Referring to Figs. 6, 7 and 8, the bevel-gear 101, which is secured to the spindle 98, and which is continuously rotated also meshes with a bevel-pinion 110, secured to a shaft 111, and said shaft 111 bears a miter-gear 112, which meshes with a miter-gear 114, secured to a shaft 115, and said shaft 115 bears a miter-gear 116, which meshes with a miter-gear 117, secured to a shaft 118, and said shaft 118, bears a grooved pulley 120, over which a belt 121 passes, and said belt passes over a grooved pulley 122 secured to a shaft 124.

A cam 126, is secured to the shaft 118, and another cam 125, is secured to the shaft 124, and said cams are arranged to be successively engaged by the propeller-blades 94, which pass over them, and they act to lift the forward edges of said blades, thereby to

hold them in proper relation to the spring-pressed rolls 82, 83, 84, to press the body-pieces into firm engagement with said rolls and thereby to cause said body-pieces to move forward.

Referring to Fig. 6, it will be seen that the blades correspond in shape and size to the body-pieces 50 or thereabout, and said blades and coöperating-rolls act to move the body-pieces in the arc of a circle. Such movement continues until the body-pieces are moved into engagement with the pasting-mechanism.

The pasting-mechanism is designed to apply a line of paste to one end only of the body-pieces, and for this to be done one end will be exposed, and referring to Figs. 6 and 8 to 12, the forward edge of each blade 94 is arranged and timed to engage a body-piece a short distance in rear of its forward end, and to press it into engagement with the first roll 82 of the set, thereby leaving the end of the body-piece free, for a short distance, and the paste is subsequently applied to this free end of the body-piece. When a body-piece is moved forward by a blade 94, coöperating with the several rolls, its free end will be engaged by the pasting-mechanism. Said mechanism as here shown is of a rotating type, and comprises essentially two coöperating rolls 130, 132, usually conically formed. The upper roll 130 is formed with a smooth face and is rotatably mounted on a shaft 133, carried by a block 134, similar to the blocks 90, and similarly mounted, being yieldingly supported. The under roll 132 is provided with a longitudinally extended rib 136, by which the paste is applied to the exposed or free end of the body-piece. The roll 132 is positively driven, see Fig. 9, and has a gear 137, secured to it which meshes with an intermediate gear 138, secured to a shaft bearing a distributing-roll 139, and said gear 138, meshes with a gear 140, secured to a shaft bearing a paste-roll 141, which is journaled to rotate within a paste-receptacle 142. The paste-roll 141, is driven from the spindle 98, by a belt 144, which passes over a pulley 145 on the spindle, and over a pulley 146, on the journal of the roll 141, said belt also passing over idlers 147 to give it a quarter turn. The paste is delivered by the paste-roll 141, to the distributing-roll 139, and by said roll 139 is deposited on the rib 136 of the applying-roll 132, as said roll 132 rotates and its rib engages the distributing-roll. The body-piece is fed forward and the pasting-rolls are timed with respect to the movement thereof, so that the rib 136 will engage the free end of the forwardly moving body-piece and will apply a line of paste thereto, after which said body-piece is fed forward by said pasting-rolls to the forming mandrel.

150 represents one of the mandrels, a large number of which are employed, and said mandrels are extended radially from the periphery of a circular rotatable mandrel-support. Said support, as here shown, see Figs. 1, 13 and 15, consists of a hub 151, bearing a plurality of radial spokes 152, to the extremities of which a circular rim 153, is secured, and the mandrels are arranged on the outside of said rim. The hub 151, is secured to the continuously rotating power-driven shaft 109, above referred to, so that the mandrels carried by the mandrel-support are moved continuously in a circular path, being revolved about the shaft 109, as an axis. Said shaft 109, is rotated continuously, as here shown, by a gear 154, see Fig. 1, secured to a shaft 155, which gear engages a large gear 108, secured to the shaft 109, and said shaft 155, has secured to it a pulley over which a driving-belt 156 passes.

Each mandrel consists of a hollow frusto-conical shell having a web 157, at each end, each web being disposed a short distance from the end of the shell, to provide a shallow recess at each end of the shell, 158 representing the shallow recess at the outer end, and 159, the wall of the shallow recess at the inner end. Each mandrel is secured to a hollow shaft 160, which extends through the rim 153 of the mandrel-support and terminates in a case 162, secured to the frame-work of the mandrel-support, said case having a bearing 161 for the inner end of said shaft 160. Each shaft 160 is rotatably supported in a sleeve 163, which extends through the rim 153, and said sleeve is rotatably supported in a flanged bushing 164, arranged in a hole in said rim 153, which is held therein by a threaded-collar arranged on its threaded end-portion, and bearing against the inner side of the rim.

As soon as the paste has been applied to the body-piece 50, said body-piece is conveyed to one of the mandrels, and it is herein designed that it shall be engaged and held by suitable clamping-means in engagement with the mandrel, said clamping-means engaging said body-piece slightly in rear of the line of paste, so that the pasted end-portion is free, and then to rotate the mandrel and clamping-means to wind the body-piece around the mandrel and to cause its pasted end-portion to be overlapped by the opposite end-portion of the body-piece; then to wipe the joint thus formed by suitable yielding means, as a rag-wheel, which acts to remove any surplus paste, and then to apply a suitable pressure upon the joint to insure adhesion of the end-portions. The mechanism to accomplish these results will now be described.

Referring to Fig. 15, 190 represents a clamping-arm, which is made as a narrow

strip of metal of a length approximately equal to the length of the mandrel, and which is arranged in parallel with the side of the mandrel. Said clamping-arm is movable in a direction radial to the axis of the mandrel, thereby to engage the end-portion of the body-piece and hold it in engagement with the mandrel, and it is also movable rotarily with the mandrel while holding the body-piece in engagement therewith, in order that the body-piece may be wound around the mandrel, and it is also movable rotarily a short distance, independently of the mandrel, to enable it to move from a position adjacent the joint to a position above or upon the joint to apply pressure to or upon the joint. The support for the clamping-arm, as here shown, consists of a yoke 183 arranged in rear of and at the base of the mandrel, which embraces the hollow shaft 160, and has a stem 188 to which the inner end of the clamping-arm is attached, and has a projection 186, with or without a roll thereon for engagement with a cam by which its position and the position of the clamping-arm borne by it is controlled. Said cam is here shown as formed on the interior of the wall or flange 159, at the base of the mandrel, and is represented as comprising the circular portion of the wall, having three notches or recesses 165, 166, 167. The support for the clamping-arm is arranged between guides 184, 185, formed on the outer end of the sleeve 163, and is movable between said guides in a direction radial to the axis of the shaft 160, and is held in continuous engagement with the cam by means of a spring 181, the free end of which is arranged between pins 182 on the stem 188, and its opposite end is attached to the interior of a circular flange 180, arranged on the outer end of the sleeve 163, concentric with the axis thereof. Said support being held between the guides 184, 185, is movable rotarily with the sleeve on which said guides are formed in addition to being movable radially. Rotary movement of the support admits of the clamping-arm being moved rotarily with and also with respect to the mandrel, and permits the projection 186 thereon to occupy different positions with respect to the cam, being movable from one to another notch thereof.

For the purpose of rotating the clamping-member its sleeve 163 has a gear 170 secured to it which engages a stationarily supported circular rack 171, and for the purpose of rotating the mandrel its shaft 160 has a gear 172 secured to it which engages a stationarily supported circular rack 173, and, as the mandrel and clamping-member are borne by the continuously rotating mandrel-support it will be observed that by means of said stationarily supported racks said elements will be rotated. Said circular racks are secured to a circular plate having a center-hole for the shaft 109, and preferably having a bearing for said shaft. Both circular racks 171 and 173 are, however, mutilated, as will be hereinafter described, to cause the gears 170 and 172 engaging them to dwell at certain positions in the cycle of their operation, and the hubs of said gears are formed with flat places which engage cams arranged opposite the blank or toothless places in the racks, thereby to hold the shaft and sleeve bearing said gears from rotating while passing along said blank places. The blank places are arranged so as to control the operation of the mandrel and the clamping-member in the following manner.

Normally the clamping-member 190 is in the dotted line position Fig. 17, with respect to the mandrel, its projection 186 entering the notch 165, and both said member and mandrel are rotating about their axes in the same direction, and when in this position said member is removed from the mandrel a short distance. The mandrel-support moves the mandrel and its clamping-member onward and when in the proper position for the body-piece to be projected between the clamping-member and mandrel the gear 172 on the mandrel-shaft will engage the blank place 174 on the rack 173, thereby causing the mandrel to dwell, but the clamping-member will continue to move. As the clamping-member moves with respect to the mandrel its projection 186 passes from the notch 165 onto the portion between said notch and the notch 166, as shown by full lines Fig. 17, and at this moment the end of the body-piece is projected between the clamping-member and the mandrel, as represented in Fig. 18. The mandrel continues to dwell and the clamping-member continues to move with respect thereto until the projection 186 enters the notch 166, thereby permitting the clamping-arm to move radially toward the mandrel and engage the end of the body-piece, as shown in Figs. 19 and 20. At this moment the gear 172 again engages the rack 173 and both the mandrel and clamping-member are rotated about their axes while being moved rotarily by the mandrel-support and the body-piece is wound about the mandrel. The mandrel and clamping-member are thus rotated until the gear 172 on the mandrel-shaft and the gear 170 on the sleeve of the clamping-member, respectively, engage blank places 175 and 176 on the racks 173 and 171, and as soon as such engagement is effected both the mandrel and its clamping-member cease to rotate about their axes, although they continue to be moved rotarily by the mandrel-support, as shown in Fig. 21. While dwelling in this position means such as a rag-wheel is brought into opera-

tion to wipe the joint for the purpose of removing any surplus paste and to assist in adhesively securing the ends together, such means being hereafter described.

As soon as the rag-wheel has completed its operation the gear 170 on the clamping-member again engages its rack but the gear 172 on the mandrel-shaft continues to engage a blank-place on its rack as the mandrel-support continues to rotate, and the clamping-member is again moved with respect to the mandrel and its projection 186 disengaged from the notch 166 and moved into engagement with the notch 167, as represented in Figs. 22 and 23, such movement of the clamping-member operating to move the clamping-arm out of engagement with the end of the body-piece and then into engagement therewith, but at a point above the joint, see Fig. 23, whereupon said clamping-arm acts to apply a pressure upon the joint, aiding in adhesively securing it. Then the gear 170 again engages the blank-place 177 on its rack 171, and as the gear 172 is still in engagement with the blank place 175, both the mandrel and its clamping-member will dwell while being moved rotarily by the mandrel-support. Such movement continues until the gear 170 again engages its rack, and as the gear 172 still engages the blank place 175 the clamping-member is again moved with respect to the mandrel from the position shown in Fig. 22, to the dotted line position shown in Fig. 17, the projection 186 disengaging the notch 167 and moving into engagement with the notch 165. During such movement the clamping-arm is moved away from the joint so that an unobstructed space is formed between it and the joint. Then the gear 172 engages its rack 173 and both gears being then in engagement with their racks, both the mandrel and the clamping-member will be rotated about their axes. Said rotating movement of the mandrel continues while the body-piece thereon is being coated with paraffin-wax or other suitable substance, and is cooled, and is finally ejected from the mandrel, and at this time the mandrel-support has made approximately a complete cycle of its operation. The rag-wheel heretofore referred to will now be described. This wheel, represented at 200 in Figs. 1, 24 and 25, is of any usual or suitable construction, and is here shown as rotatably mounted at the upper end of a lever 201, fulcrumed at 202, and having its lower end arranged to press into engagement with a cam 203, by a spring 204. Said cam is secured to a shaft 205, adapted to be rotated by a belt 206 passing over a pulley on the shaft 155. The rag-wheel 200 is rotated by a belt 207 passing over an idler 208 and around a pulley 210 on the shaft 155. By means of this mechanism, the rotating rag-wheel is given a periodical oscillatory movement whereby one of its flat faces is moved along the pasted joint to wipe off any surplus paste, as represented in Fig. 25. As above stated the mandrel is dwelling during this time but is being moved onward by the mandrel-support, and engagement of the rag-wheel with it is for a sufficient length of time to accomplish the desired result. While the mandrel-support is rotating and the gears 170 and 172 are in engagement with the blank-places 175 and 177, and said mandrel and its clamping member are dwelling, the cup-bodies on the mandrels are brought into position to receive circular bottom-pieces which are projected into the open ends of the cup-bodies, the ends of said bodies projecting a short distance beyond the ends of the mandrel for this purpose. The means for forming such bottom-pieces and for inserting them in the cup-bodies will now be described. Said circular bottom-pieces are formed from a wide strip of paper 220, see Fig. 1, which is fed through a guide 221 onto the periphery of a circular punch-carrier 222, and beneath an endless die-carrying band which passes over said carrier. The punch-carrier is designed to carry a series of radially disposed punches, and the band is designed to carry a series of dies, and the dies and punches coact in such manner as to cut circular bottom-pieces from the strip of paper which is fed between them, like unto ordinary punches and dies, except that the operation is of a rotative character and is continuous. As here shown, the circular cutting-punch-carrier comprises a rim 224, see Figs. 28, 29 and 30, having two rows of sprocket-teeth 225, 225, arranged in parallel, and adapted to enter interdental spaces formed in the edges of the band 226 which carries the dies 227, see Figs. 26 and 27, thereby to enable said band to drive rotatively said carrier. Said rim also has a peripheral groove 228, between its sprocket-teeth to receive the strip of paper 220, and also the cutting-dies 227. The circular cutting-punch-carrier comprises a large circular member having a hub 229 and a smaller circular member having a hub 230, and said members are bolted together and their hubs arranged in alinement and mounted rotatably on a stationarily supported shaft 231. The large member 229, which bears the rim 224 aforesaid, is provided with a series of radially disposed guides 232, 233, arranged in alinement, in which the punches 235 are arranged to reciprocate longitudinally and radially with respect to the carrier.

Each cutting-punch 235 is encircled by a coiled spring 236, which bears against the inner end of the guide 232, and against a collar 237 secured to the punch, the tendency of which is to retract the punch or move it toward the center of the carrier.

The punches are moved by their springs 236 into engagement with a cam-disk 239, which is arranged between the hubs 229 and 230, and is keyed to the shaft 231, and is, therefore, stationarily supported, and the inner end of each punch may have a roll 238 thereon for engagement with said cam-disk. The outer end of each punch is formed with a cutting edge or portion which is shaped to coact with any of the dies 227, to cut the bottom-pieces from the strip. The cutting operation, however, is designed to take place at or about the time the band and cutting-punch-carrier meet, with the strip of paper between them, and at this place a support for the die is arranged above it, which, as here shown, comprises a yoke 242 supported on the shaft 231, at each side of the cutting-punch-carrier, the crown of which extends across the punch-carrier, near the rim thereof, and serves as an abutment against which the die is pressed while the punch is operated. The cam-disk 239 is represented in Fig. 29, as having a single projection arranged at a point opposite the crown of the yoke, and as the punch-carrier is rotated by the die-carrying band the punches will be successively moved outward while passing over said projection, to coact with a die and cut the paper, and will be immediately thereafter caused to resume their normal positions by their retractile springs.

The cutting-punch-carrier is arranged close to the rotating mandrel-support, and its driving die-carrying band derives its motion from said support so as to work harmoniously therewith, and, as here shown, said mandrel-support has on its rim 153, segment-gears 191, 192, see Figs. 13 and 14, which are spaced apart so as to engage the interdental spaces in the opposite edges of the die-carrying band 226, thereby to drive said band. Said segment-gears are also separated to enable the blades 94 of the rotatable propeller to pass between them.

The cutting-punch-carrier is adjustably supported to admit of tightening the die-carrying band, and, as here shown, its shaft 231 is mounted at its ends in blocks 243, see Fig. 30, which are slidable in slots 244, formed in arms 245, loosely mounted on a shaft 246. Said blocks 243 are adjustable in said slots by screws 247. The shaft 231 is also adjustably secured by nuts in arcuate slots 248, formed in the outer ends of arms 250, which are loosely mounted on bosses on the stationary frame bearing the circular racks 171, 173, or it may be otherwise supported. The yoke 242 is connected with the arms 245 by rods having turn-buckles 251, thereby to hold the yoke in fixed position yet admit of its adjustment so as to correctly locate it with respect to the die and punch which is being operated. The bottom-pieces which have been cut from the strip of paper will remain in the dies and will be carried along by the endless die-carrying band to the bottoming-device.

Assuming the bottom-pieces are cut at the top of the punch-carrier, as here shown, the waste strip from which the bottom-pieces have been cut is taken from the bottom of the carrier, see Fig. 1, and said waste strip may be passed through a slot 254, in the lower end of the guide-plate 221 to conduct it away from the machine. The bottoming-device by which the bottoming-pieces are formed with flanges and are thrust into the ends of the cup-bodies, is constructed similar in many respects to the bottom-piece cutting-device just described, and is shown particularly in Figs. 1, and 31 to 35, and comprises a rotatable plunger-carrier around which the aforesaid endless die-carrying band passes, and which is rotated by said band, and hence in unison with the bottom-piece cutting-device.

The rotatable plunger-carrier is located near the rotatable punch-carrier and along the space between said carriers the endless die-carrying band continuously engages the mandrel-support, whereby motion is imparted to it, and during such engagement with the mandrel-support the open ends of the cup-bodies are brought into engagement with the dies borne by the die-carrying band preparatory to having bottom-pieces thrust thereinto. As here shown, said dies 227 are arranged to act as cutting and also as forming dies, and have two circular recesses 255, 256, the recesses 255 being arranged on the inside and the recesses 256 being arranged on the outside of the dies, there being annular projections 257, between said recesses. The bottom-pieces, when cut, consist of flat circular disks, which enter and are retained in the recesses 255. As the endless band engages the gear on the mandrel-support the projecting ends of the cup-bodies enter the recesses 256, as represented in Fig. 31, and the bottom-pieces are thrust through the dies into the open ends of the cup-bodies while said cup-bodies are thus held. As the bottom-pieces are thrust through the dies the edges thereof are upturned by passing over the annular projections 257, forming flanges thereon, so that preparatory to being inserted in the cup-bodies they are flanged and when inserted therein the flanges engage the cup-bodies. The bottom-pieces are thrust through the dies by the plungers carried by the plunger-carrier. Said plunger-carrier is designed to carry a series of plungers, which are movable longitudinally and radially with respect to the carrier.

Referring to Fig. 31, the plunger-carrier is made circular, and comprises a rim 260, having two rows of sprocket-teeth 261, 261,

arranged in parallel, and adapted to enter the interdental spaces formed in the edges of the endless die-carrying band 226, so that said band imparts rotary motion to said plunger-carrier. Said rim 260 also has a peripheral groove 262 between its sprocket-teeth to receive the dies carried by said band. The plunger-carrier also comprises a large circular member having a hub 263, and a smaller circular member having a hub 264, and said members are bolted together and their hubs arranged in alinement and mounted rotatably on a shaft 246, which is stationarily supported by the frame. The large circular member bears the rim 260 and is provided with a series of radially disposed guides 265, 266, arranged in alinement, in which the plungers 267 are arranged to reciprocate longitudinally and radially with respect to the carrier. Each plunger 267 is encircled by a coiled-spring 268, which bears against the inner end of the guide 265 and against a collar 269, secured to the plunger, the tendency of which is to retract the plunger or move it toward the center of the carrier. The plungers are moved by their springs into engagement with a cam-disk 270, which is arranged between the hubs 263, 264, and is keyed to the stationary shaft 246 and is, therefore, stationarily supported, and the inner end of each plunger may have a roll 271 thereon for engagement with said cam-disk. The outer end of each plunger is shaped to pass through any of the dies, it being circular and of approximately the same size as the passage through the annular projection 257, but smaller than the circular recess 255, so that when engaging the flat circular disk and thrusting it past the annular plunger 257 the flange will be formed at the edge of said disk. The cam-disk 270 is represented in Fig. 32 as having a single projection 272 arranged opposite the place where it is designed to move the plungers outwardly, so that as the plunger-carrier is rotated by the die-carrier band the plungers will successively pass over said projection and will be moved outwardly and thereafter caused to return to their normal positions by their retractile springs 268. The plungers and the cup-bodies are both moving in the arcs of circles, and they approach each other at an angle, as represented in Fig. 33, moving in the direction of the arrows there shown, and when in alinement the plunger has arrived at the end of its outward movement, as in Fig. 34, after which the plunger leaves the cup-body at an angle with respect thereto, as represented in Fig. 35, so that the bottom-pieces are inserted in the open ends of the cup-bodies with one side in advance of the other, the operation being like unto a rolling or rocking motion. Such motion enables the insertion of a bottom-piece which is slightly larger in diameter than the opening at the end of the cup-body, for it will be observed that the cup-body is frusto-conical in form and hence its lower end is slightly tapered, and the bottom-piece should be slightly larger in diameter than the opening at the end. The bottom-pieces are thrust into the lower ends of the cup-bodies for a considerable distance, so that the flanges of the bottom-pieces terminate some little distance beyond the ends of the cup-bodies in order that said ends may be turned over upon the flanges, as will now be described. While the mandrel-support is rotating and the mandrels are dwelling, as aforesaid, the cup-bodies having the bottom-pieces inserted in their open ends are brought into position to be acted upon by suitable crimping-means, whereby the lower ends of the cup-bodies are turned over upon the flanges on the bottom-pieces.

The crimping-mechanism comprises a rotatable-carrier having a plurality of crimping-tools, and is represented particularly in Figs. 1 and 36 to 40. Said carrier, as here shown, comprises an outer annular rim 281, and an inner polygonal rim 282, which is connected to said outer rim by a series of radial arms 284, and a hub 280 secured to said polygonal rim 282, and also to a shaft 285, the latter being journaled to rotate in the frame of the machine and arranged at the edge of the mandrel-support.

A gear 286, see Fig. 37, is secured to the shaft 285 which meshes with a large gear 108, secured to the shaft 109 of the mandrel-support. Between the several arms 284 and projecting outwardly through the rim 281 are cylindrical bearings or supports for the cylindrical holders 287, of the crimping-tools, said holders being longitudinally movable and also rotatable in said bearings. Said holders are formed with conical recesses 288 in their outer ends, in which recesses crimping-rolls 289 are rotatably mounted. Said rolls are mounted on inclined studs and have beveled edges. As here shown, there are four crimping-rolls in the recess at the end of each cylindrical holder. The recess in the end of each holder is of a diameter corresponding to the diameter of the end of the cup-body, and of a depth approximately equal to the length said end projects beyond the end of the mandrel, and as the crimping-tool carrier and mandrel-support rotate the ends of the cup-bodies are brought opposite the recesses in the ends of the holders, and when thus oppositely disposed the projecting ends of the cup-bodies are caused to enter the recesses upon a movement of the holders in an outward direction. A pin 290 projects through the wall of the recess of each holder into the path of movement of the end of the cup-body entering the recess, thereby to engage the edge of said end portion, and as the crimping-tool holder is moved outwardly

and is rotatable said pin acts to turn said edge inward and over the flange of the bottom-piece, and then the beveled edged rollers act to roll down said inwardly turned portion upon the inside of the flange. The holders are arranged on stems 292, which extend through circular guiding-members 293, and through holes in the polygonal rim 282, and a coiled spring 294 encircles each stem and bears at one end against the guiding-member 293 and at its other end against a head 295 on the stem, thereby to retract the holder and press it into engagement with a stationarily supported cam-disk 305, which latter has a projection 304 opposite the place where the holder is to be moved outwardly during a cycle of operation of the crimping-tool carrier. In order that the crimping-tool may rotate, at least while crimping the end of the cup-body, a gear 298 is arranged on each stem 292, see Fig. 36, which engages a circular rack 300, arranged on the frame and which is stationarily supported thereby.

The gears and stems are connected by a spline whereby the stems are movable axially with respect to the gears, yet are caused to be rotated by the gears, thus admitting of the crimping-tool being moved outwardly when required, and permitting continuous rotation while so moved. As here shown, the rack is made continuous so that as the crimping-tool carrier revolves the crimping-tools will be rotated continuously, but this is immaterial, as it is only necessary that they shall rotate while crimping the end of the cup-body.

In Fig. 39 the crimping-tool is shown as rotating and moving outwardly, and the pin 290 is engaging and turning in the end of the cup-body, and in Fig. 40 the crimping-rolls are brought into action to complete the turning-in of said end of the cup-body.

After the ends of the cup-bodies have been crimped over the flanges of the bottom-pieces, the cups thus formed are then carried by the continuously rotating mandrel-support into position to be coated with paraffin-wax or some equivalent material. The coating operation may be effectively carried on by the employment of a plurality of spraying-devices or nozzles, which act to deliver the paraffin, in liquid condition and at a high temperature, in the form of spray. This coating-mechanism is represented particularly in Figs. 1, and 41 to 46. The spraying-devices or nozzles are borne by a rotating-carrier which I herein denominate a spraying-device carrier. Said carrier consists, as here shown, of a hollow drum comprising a hub 312, side walls 313 and 314 and a rim 315 arranged at the outer edges of the side walls. Said drum is secured to a shaft 316 having its bearings in the frame of the machine, and said shaft has secured to it a gear 317 which engages a gear 318 secured to the shaft 109 of the mandrel-support, hence the drum is rotated in unison with the mandrel-support. On the outer rim of said drum cup-shaped compartments 320 are formed, here shown as quadrangular and contiguously disposed, and composed of plates secured together and to the rim, although they may be otherwise constructed. They extend radially from the drum, and the drum is so arranged with respect to the mandrel-support that the cups on the mandrels successively enter the several cup-compartments as the drum and mandrel-support rotate. The cup-compartments are made larger than the cups so as to inclose them, as shown in Fig. 41.

The number of spraying-devices borne by the rotating-carrier or drum correspond with the number of cup-compartments which are arranged on the rim thereof, and said devices consist of rotatable spraying-nozzles connected with a common source of supply of liquid paraffin. As here shown 321 represents one group of spraying-nozzles which may be of any well-known or suitable construction, to deliver liquid paraffin, in the form of spray, and said spraying-nozzles are arranged on the outside of the rim 315 and at the bottom of a cup-compartment, and said spraying-nozzles are connected to a pipe 322, which is extended through the rim radially toward the axis of the drum, and said pipe has secured to it a gear 323, which engages a pinion 340, borne by the drum, which in turn engages a stationary circular rack 341, secured to the frame, and which projects through the wall of the drum to admit of continuous engagement therewith by the pinion as the drum rotates, thereby to rotate said spraying-nozzles. The inner end of said pipe 322 is connected rotatably by a coupling 324 and nipple 325 with a valve-case 326, which latter is connected to a T-fitting 327, and said T-fitting is connected to other like T-fittings, all of which are arranged in circular form, and said circularly arranged T-fittings are connected by numerous short pipes 328 with the shaft 316, the end portion of which is made hollow at a point where said short pipes are connected with it, and a pipe 329 is connected by a suitable stuffing-box with the hollow end of said shaft which extends to a tank 330 containing the liquid paraffin. The liquid paraffin is adapted to flow through the pipe 329 and hollow end of the shaft 316, and the numerous short pipes 328 and circularly arranged T-fittings to the valve-case and thence to the spraying-nozzles. As here shown, a valve and spraying-device, such as above described is connected to each T-fiting. Each valve is separately operated, thereby to control the flow of liquid paraffin to the spraying-device which it controls, and

for the accomplishment of this result the valve contained in each valve-case has a stem 335, provided with an arm 336, which is extended from the stem at right angles and radial to the axis of the drum, and a curved plate 337, see Fig. 46 is fixed to the stationary frame, in the path of movement of said arms 336, which is adapted to be engaged for a short period of time during a cycle of operation of the drum for the purpose of moving the arm and thereby turning the valve to open the way and admit of the flow of liquid paraffin. The valve-stem has a spring 338 connected with it which acts to return the valve to normal position and close as soon as the arm 336 disengages said curved plate. Said curved plate is arranged at the proper place to cause the valves to operate at the moment the cups are contained in the cup-compartments so that the cups will be coated with liquid paraffin at the proper moment.

A heating-means is arranged in the drum, which, as here shown, consists of a steam circulatory system, and comprises a circularly formed pipe 350, arranged in the drum near the rim thereof, which is connected by numerous radial pipes 351, to the hub 312 of the drum, and said hub has an annular recess or chamber 352, which extends to the end of the hub, and a large pipe 353 or box is connected to the end of the hub, which is in open communication with said annular recess 352, and said pipe is connected rotatably by a coupling 354 with a pipe 355, from the side of which leads a pipe 356, which extends up to the tank 330 and is connected to one end of a coil 357, arranged in said tank, and the other end of said coil is connected with a steam supply. One or more pipes 360, may be connected to the pipes 351, which extend to an axial passage through the shaft 316, to carry off the water of condensation.

When the mandrel-support is moved in its cycle of operation far enough to carry the cup into the cup-compartments the gear 170 will engage its rack 171 and the gear 172 will engage its rack 173, so that the mandrel and its clamping member will rotate, and will continue to rotate while the spraying-device operates to apply the liquid paraffin to the exterior of the cup.

After the cups are coated with hot liquid paraffin they are carried by the mandrel-support through a cooling-compartment by which the film or coating thereon is solidified. This compartment is represented in Fig. 1, at 370, its front wall being broken away to illustrate the mandrel-support therein. Said compartment is curved in the direction of its length on an arc about the axis of the mandrel-support, and is made U-shaped in cross-section to admit of the cups entering it at one end, passing through it and leaving it at the opposite end. A pipe 371 is connected to said compartment by which cool air is supplied.

After the cups have been coated with paraffin and cooled they are carried forward by the mandrel-support into position to be acted upon by the means employed to remove them from the mandrels and convey them to a convenient location for packing and shipment. Compressed air is herein employed as the means to accomplish this result, which is supplied by a pipe 390, connected by a union 391, to one end of the shaft 109, and the end portion of said shaft 109 is made hollow to form an axial passage 392, communicating with said pipe 390. Radial pipes 394 are connected to said shaft which are in open communication with said axial passage 392, and said radial pipes are connected by branches to a circularly formed conduit composed of numerous T-fittings connected together and represented at 395. Each T-fitting has a short pipe leading from it which is connected to a valve-case 396, and a short pipe 397 leads from said valve-case to a hollow box 162, in which the inner end of the mandrel-shaft 160 has its bearing, and said mandrel-shaft is made hollow throughout its length and the end portion of the mandrel has a center-hole so that passages are provided from the supply-pipe 390 to the ends of the mandrels for the air which is forced therethrough under pressure, thereby to forcibly remove the cups from the mandrels. Each valve-case 396 contains a valve having a stem 398 provided with an arm 399, adapted to be engaged by a pin 400 on the frame to open the valve during a cycle of operation of the mandrel-support. The valve is automatically closed by a spring which is connected to the valve-stem. When one of the arms 399 encounters a pin 400 its valve is opened and the blast of air caused to pass through the corresponding mandrel-shaft 160, against the inside of the bottom of the cup. The cup is thus forced from the mandrel and falls through a chute 401, see Fig. 47, onto a moving conveyer 402, by which it is carried to a suitable location for packing and shipment. By this automatic machine it will be noted there is no manual manipulation or touching of the hands of the operator during the entire sequence of operations from the paper web to the completed article, thus insuring a thoroughly sanitary cup, especially adapted for drinking purposes.

I claim:—

1. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for associating the bottom-pieces with the cup-bodies by a tilting movement, and pneumatic means for ejecting the

cups from the machine, substantially as described.

2. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for associating the bottom-pieces with the cup-bodies by a tilting movement, means for coating the cups with wax, means for cooling the coated cups and means for ejecting the cups from the machine, substantially as described.

3. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting circular bottom-pieces from a web of paper, means for flanging said bottom-pieces and for associating them with the cup-bodies by a tilting movement and pneumatic means for ejecting the cups from the machine, substantially as described.

4. In a machine for making paper cups, the combination of means for cutting sector-shaped blanks from a web of paper, means for forming said blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for associating said bottom-pieces with the cup-bodies by a tilting movement, and pneumatic means for ejecting the cups from the machine, substantially as described.

5. In a machine for making paper cups, the combination of means for feeding a web of paper, means for cutting body-blanks from said web of paper, means for forming said body-blanks into cup-bodies, means for feeding another web of paper, means for cutting bottom-pieces from said web of paper, means for associating the bottom-pieces with the cup-bodies by a tilting movement, and pneumatic means for ejecting the cups from the machine, substantially as described.

6. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for thrusting said bottom-pieces into the open ends of the cup-bodies by a tilting movement, and means for ejecting the cups from the machine, substantially as described.

7. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for flanging said bottom-pieces and thrusting them into the conical open ends of the cup-bodies by a tilting movement, and means for ejecting the cups from the machine, substantially as described.

8. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for flanging said bottom-pieces and thrusting them into the open ends of the cup-bodies by a tilting movement, means for turning the ends of the cup-bodies over upon the flanges of the bottom-pieces, and means for ejecting the cups from the machine, substantially as described.

9. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, clamping-means for each mandrel to engage the body-blank and hold it in engagement with the mandrel, said clamping means being rotatable with said mandrel, means to feed the blanks into engagement with the clamping-means, and means to affix bottom-pieces to the open ends of the cup-bodies while upon the mandrels, substantially as described.

10. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, clamping-means for and movable with each mandrel about the axis of the mandrel to engage the body-blank and hold it in engagement with the mandrel, means to feed the blanks into engagement with the clamping-means and to apply a line of paste to the edge of the blanks while in transit, substantially as described.

11. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, clamping-means for each mandrel to engage a body-blank and hold it in engagement with the mandrel, said clamping means being rotatable with said mandrel, means to feed the blanks into engagement with said clamping-means, means to cut bottom-pieces from a web of paper, and means for associating said bottom-pieces with the cup-bodies on said mandrels, and means to eject the cups, substantially as described.

12. In a machine for making paper cups, the combination of a rotary cutting-device for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the body-pieces are formed, clamping-means for each mandrel to engage a body-blank and hold it in engagement with its mandrel, said clamping means

being rotatable with said mandrel, means to feed the blanks into engagement with said clamping-means, means to cut bottom-pieces from a web of paper, and means to associate said bottom-pieces with the cup-bodies on said mandrels, and means to eject the cups, substantially as described.

13. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, a corresponding number of clamping-means borne by said support rotatable about the axes of the mandrels to engage the blanks and hold them in engagement with the mandrels, means to rotate said mandrels, means to operate said clamping-means, and means to rotate said clamping-means independently of and also in unison with the mandrels, and means to affix bottom-pieces to the cup-bodies on the mandrels, substantially as described.

14. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, a corresponding number of clamping-means borne by said support, rotatable about the axes of the mandrels, to engage the blanks and hold them in engagement with the mandrels, means to rotate said mandrels, means to move said clamping-means radially with respect to the mandrels, and means to move said clamping-means rotatably, independently of and also in unison with said mandrels, and means to affix bottom-pieces to the cup-bodies on the mandrels, substantially as described.

15. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which the cup-bodies are formed, rotatable and radially movable clamping-means associated with each mandrel, to engage the body-blanks and hold them in engagement with the mandrels, rotary feeding-devices for feeding the blanks from the cutting-device into engagement with the clamping-means, and means to affix bottom-pieces to the open ends of the cup-bodies on the mandrels, substantially as described.

16. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, and means for thrusting said bottom-pieces into the open ends of the cup-bodies by a rocking motion, substantially as described.

17. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, a rotary carrier for said punches, and means for thrusting said bottom-pieces into the open ends of the cup-bodies by a rocking motion, substantially as described.

18. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, a rotary carrier for said punches, an endless band carrying said dies, and means to remove the bottom-pieces from the dies and thrust them into the open ends of the cup-bodies by a rocking motion, substantially as described.

19. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, and means for forcing said bottom-pieces through the die openings to form flanges thereon and for thrusting the flanged bottom-pieces into the open ends of the cup-bodies by a rocking motion, substantially as described.

20. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, and means for forcing said bottom-pieces through the die-openings to form flanges thereon and for presenting them opposite the open ends of the cup-bodies in an angular position with respect thereto and for thrusting them into said open ends by a rocking motion, substantially as described.

21. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, plungers for forcing said bottom-pieces through the die-openings to form flanges thereon and for thrusting the flanged bottom-pieces into the open ends of the cup-bodies and a rotary carrier for said flanged bottom-pieces, substantially as described.

22. In a machine for making paper cups, the combination of means for cutting body-blanks, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which said blanks are formed into cup-bodies with open ends, dies and punches for cutting bottom-pieces from a web of paper, and means for thrusting said bottom-pieces through the die-openings and

into the open ends of the cup-bodies by a rocking motion, substantially as described.

23. In a machine for making paper cups, the combination of means for cutting body-blanks, a rotary mandrel-support, a plurality of rotatable mandrels borne by said support on which said blanks are formed into cup-bodies with open ends, a series of dies and punches for cutting bottom-pieces from a web of paper, a series of plungers for forcing the bottom-pieces through the die-openings and into the open ends of the cup-bodies, rotary carriers for said punches and said plungers and an endless band for said dies, which latter serves as the driving-means for said carriers, and means connected with the rotary mandrel-support to drive said band, substantially as described.

24. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, and means for feeding the web of paper to said dies and punches, and means for thrusting the bottom-pieces through the die-openings and into the open ends of the cup-bodies by a rocking motion, substantially as described.

25. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, means for thrusting the bottom-pieces through the die-openings to form flanges thereon and to thrust the flanged bottom-pieces through the die-openings to bodies by a rocking motion, and rotatable means for turning the ends of the cup-bodies over said flanges, substantially as described.

26. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, plungers for thrusting the bottom-pieces through the die-openings to form flanges thereon and to thrust said flanged bottom-pieces into the open ends of the cup-bodies, a second set of plungers, means to rotate said second set of plungers, and means borne by the second set of plungers to turn over the ends of the cup-bodies upon the flanges of the bottom pieces, substantially as described.

27. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, dies and punches for cutting bottom-pieces from a web of paper, plungers for thrusting the bottom-pieces through the die-openings to form flanges thereon and to thrust said flanged bottom-pieces into the open ends of the cup-bodies, means to move said plungers longitudinally, a second set of plungers, means to rotate said second set of plungers, and means operated by the second set of plungers to turn over the ends of the cup-bodies upon the flanges of the bottom-pieces and a rotary carrier for said plungers, substantially as described.

28. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, means for cutting bottom-pieces from a web of paper, means for associating said bottom-pieces with the cup-bodies, a rotary carrier, a plurality of spraying-devices borne by it and arranged respectively in compartments thereon, said carrier being arranged with its compartments disposed to receive successively the cups to be sprayed, substantially as described.

29. In a machine for making paper cups, the combination of means for cutting body-blanks, means for forming said blanks into cup-bodies having open ends, means for cutting bottom-pieces from a web of paper, means for associating said bottom-pieces with the cup-bodies, a rotary carrier, a plurality of spraying-devices borne by it and arranged respectively in compartments thereon, said carrier being arranged with its compartments disposed to receive successively the cups to be sprayed, and automatic means to control the delivery of liquid paraffin at a high temperature from said spraying-devices, substantially as described.

30. In a machine for making paper cups, the combination of means for cutting body-blanks, a rotary mandrel-support, rotatable mandrels disposed radially on said support on which the blanks are formed into cup-bodies, means for preparing and affixing bottom-pieces to said cup-bodies, a rotary carrier having radially disposed compartments to receive the cups on the mandrels, a plurality of spraying-devices borne by said carrier arranged respectively in said compartments, valves to control the delivery of the liquid paraffin from said spraying-devices, and means to automatically open and close the valves, substantially as described.

31. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for forming said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for associating the bottom-pieces with the cup-bodies, and means for coating the cups with wax liquefied by heat, means comprising a cooling compartment for cooling the wax-coated cups, and means for ejecting the cups, substantially as described.

32. In a machine for making paper cups, the combination of means for cutting body-blanks from a web of paper, means for form-

ing said body-blanks into cup-bodies, means for cutting bottom-pieces from a web of paper, means for associating the bottom-pieces with the cup-bodies by a tilting movement, and means for directing a blast of air against the interior of the cups to remove them from the machine, substantially as described.

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

EDWIN H. WHITNEY.

Witnesses:
GEO. R. BLINN,
AMOS L. TAYLOR.