No. 702,482. Patented June 17, 1902.

F. A. ROBINSON.

MACHINE FOR FILLING AND WRAPPING POWDERS.

(Application filed Jan. 13, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

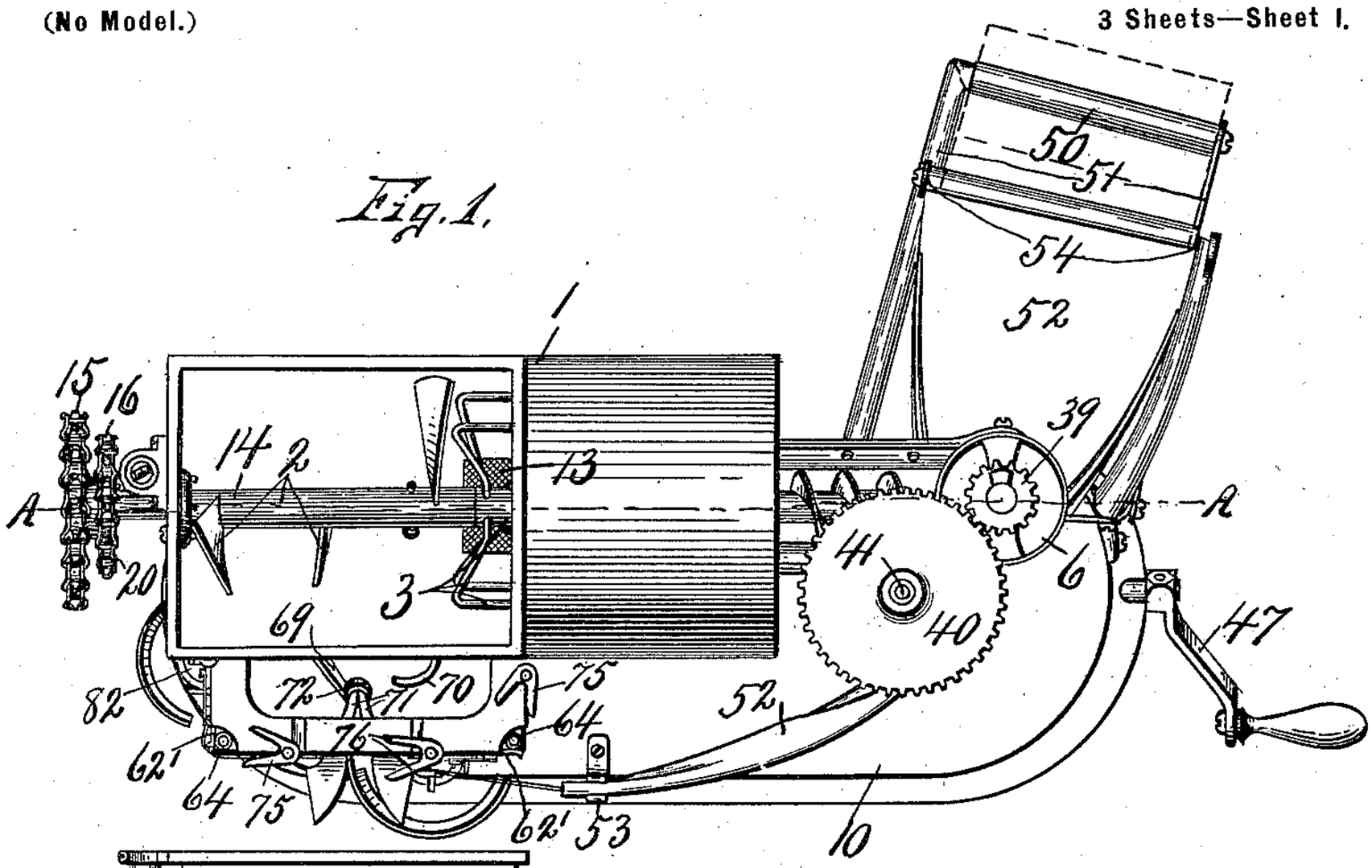
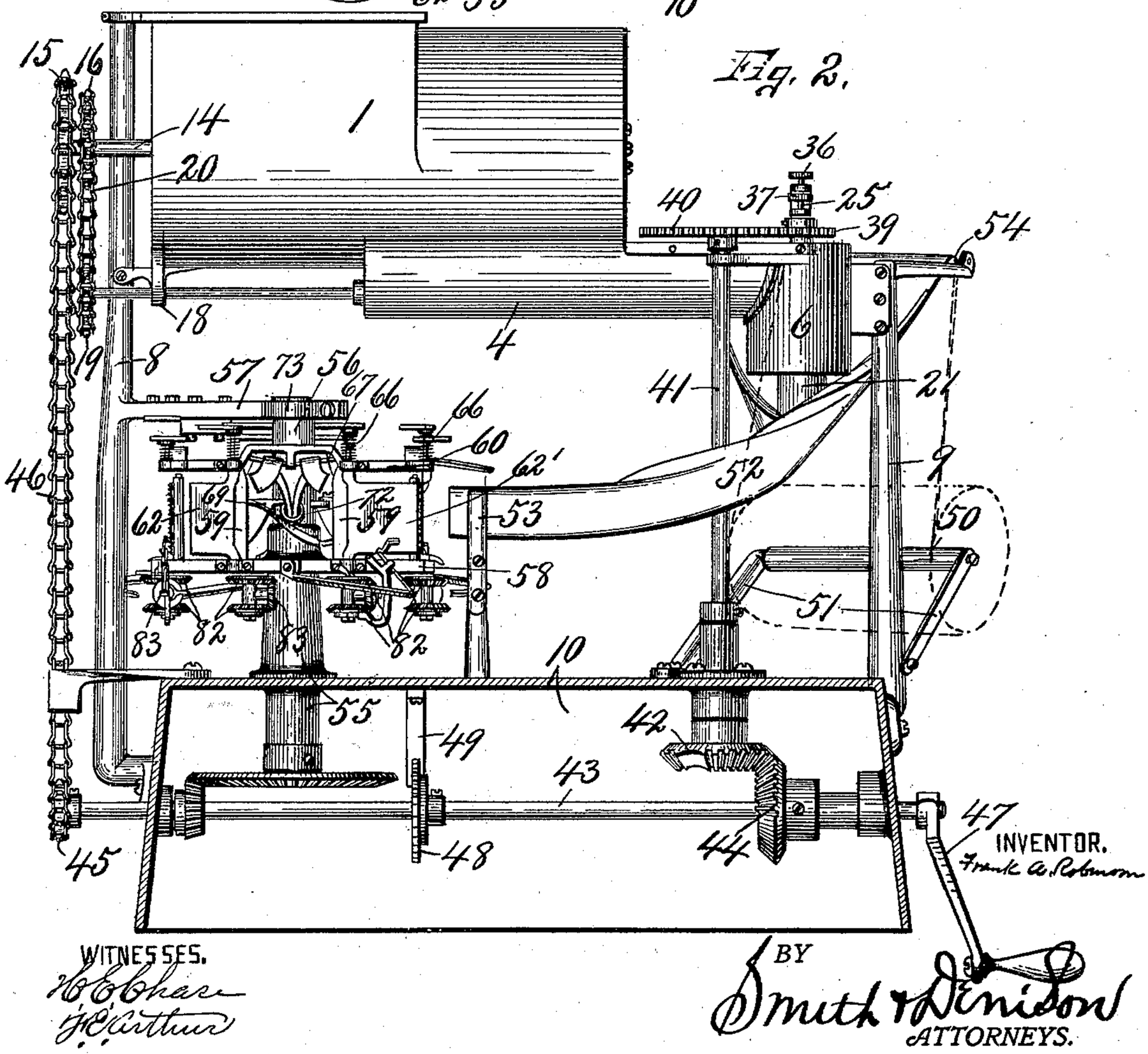


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

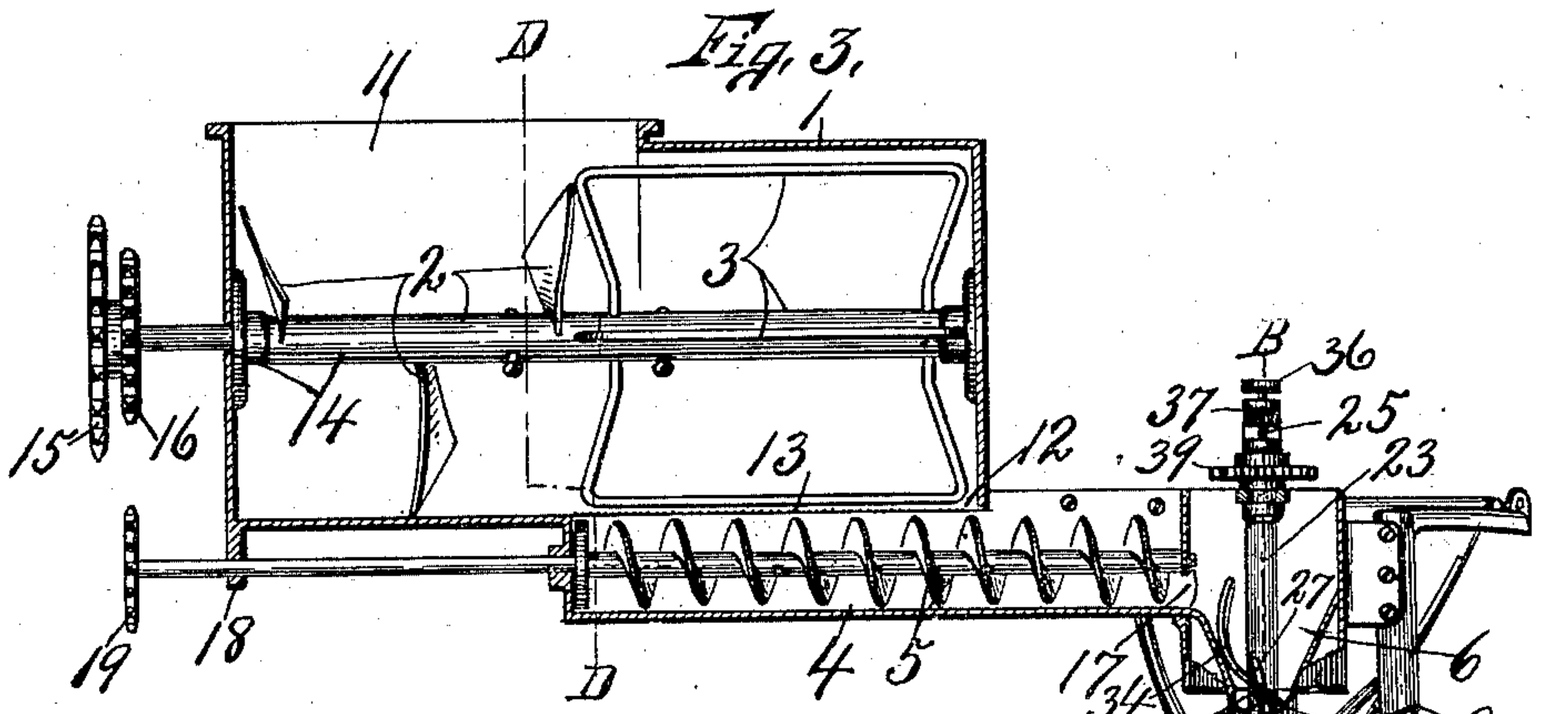


Fig. 7.

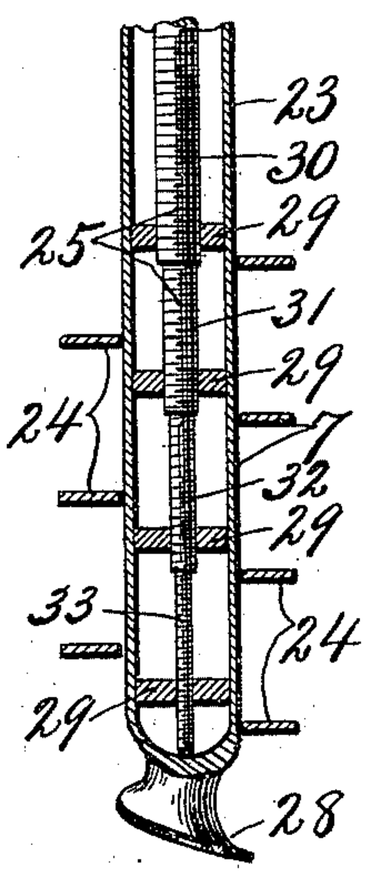


Fig. 4.

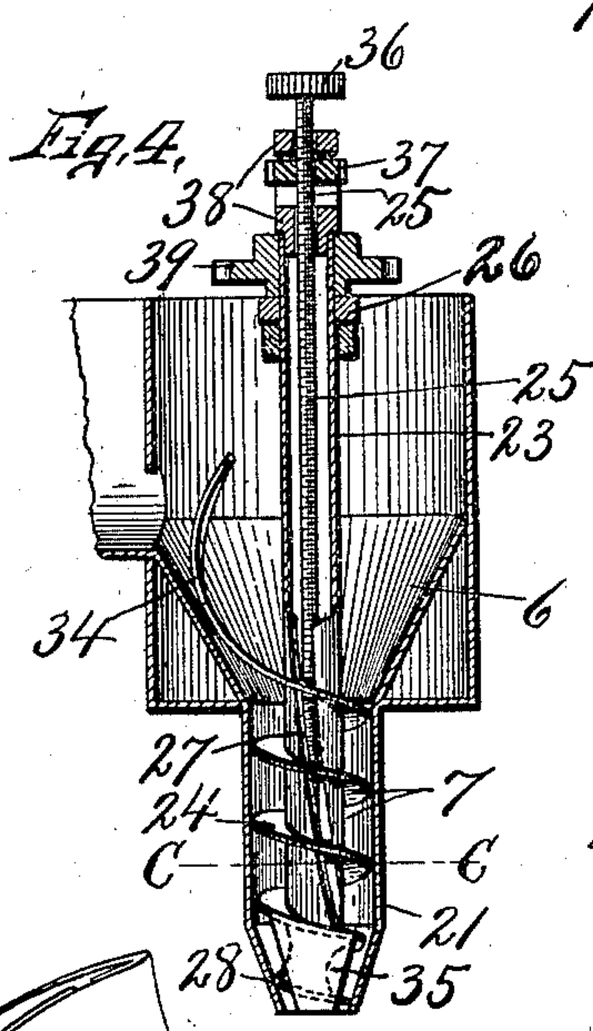


Fig. 5.

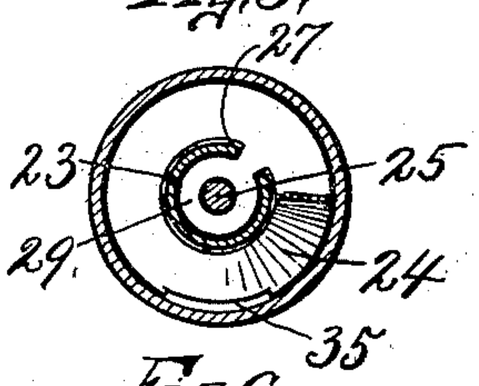


Fig. 6.

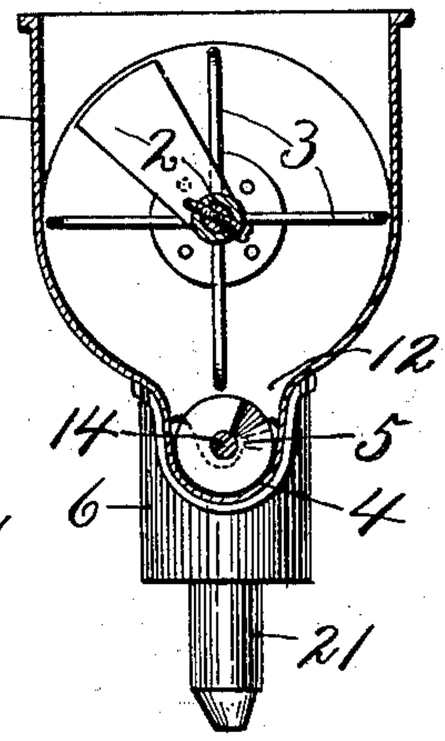


Fig. 11.

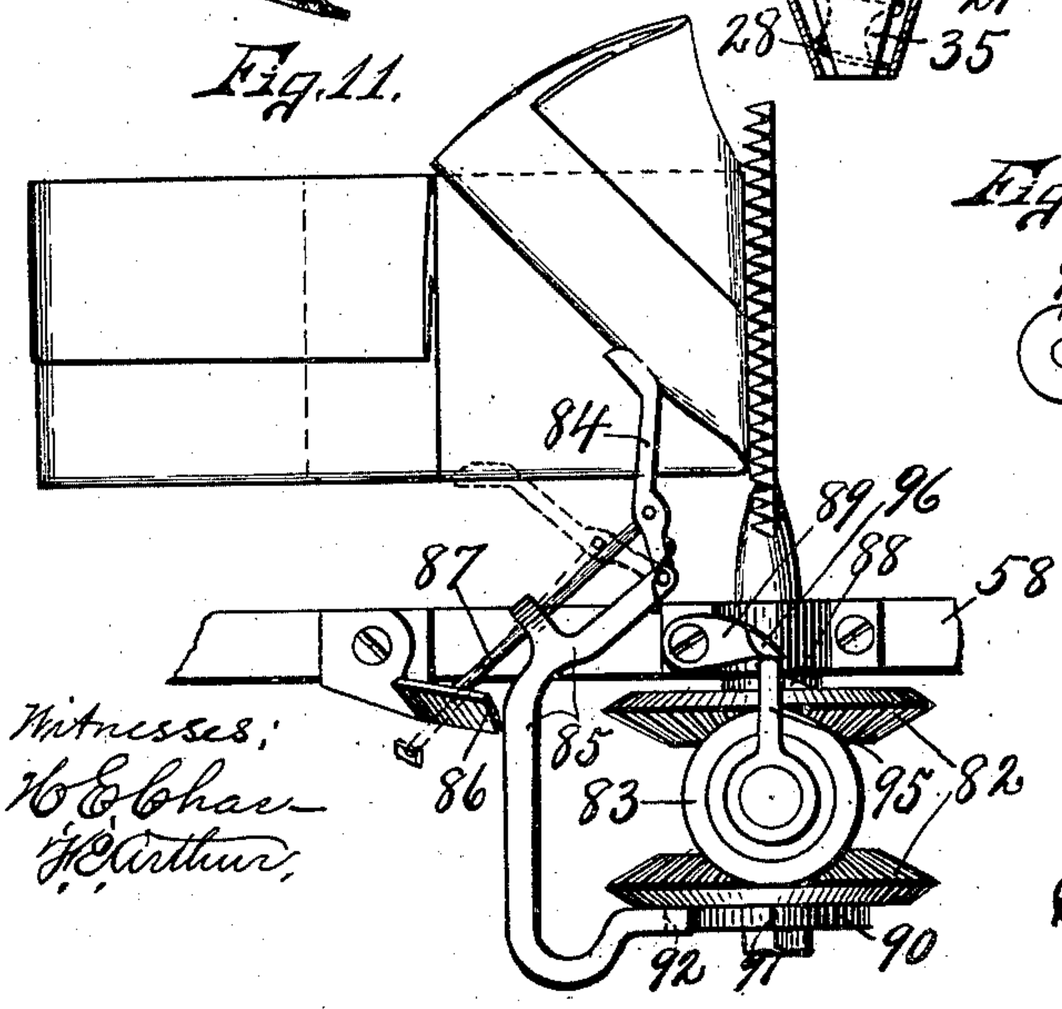
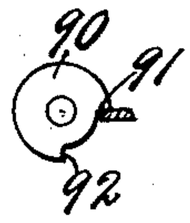


Fig. 12.



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MACHINE FOR FILLING AND WRAPPING POWDERS.

(Application filed Jan. 13, 1902.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 8.

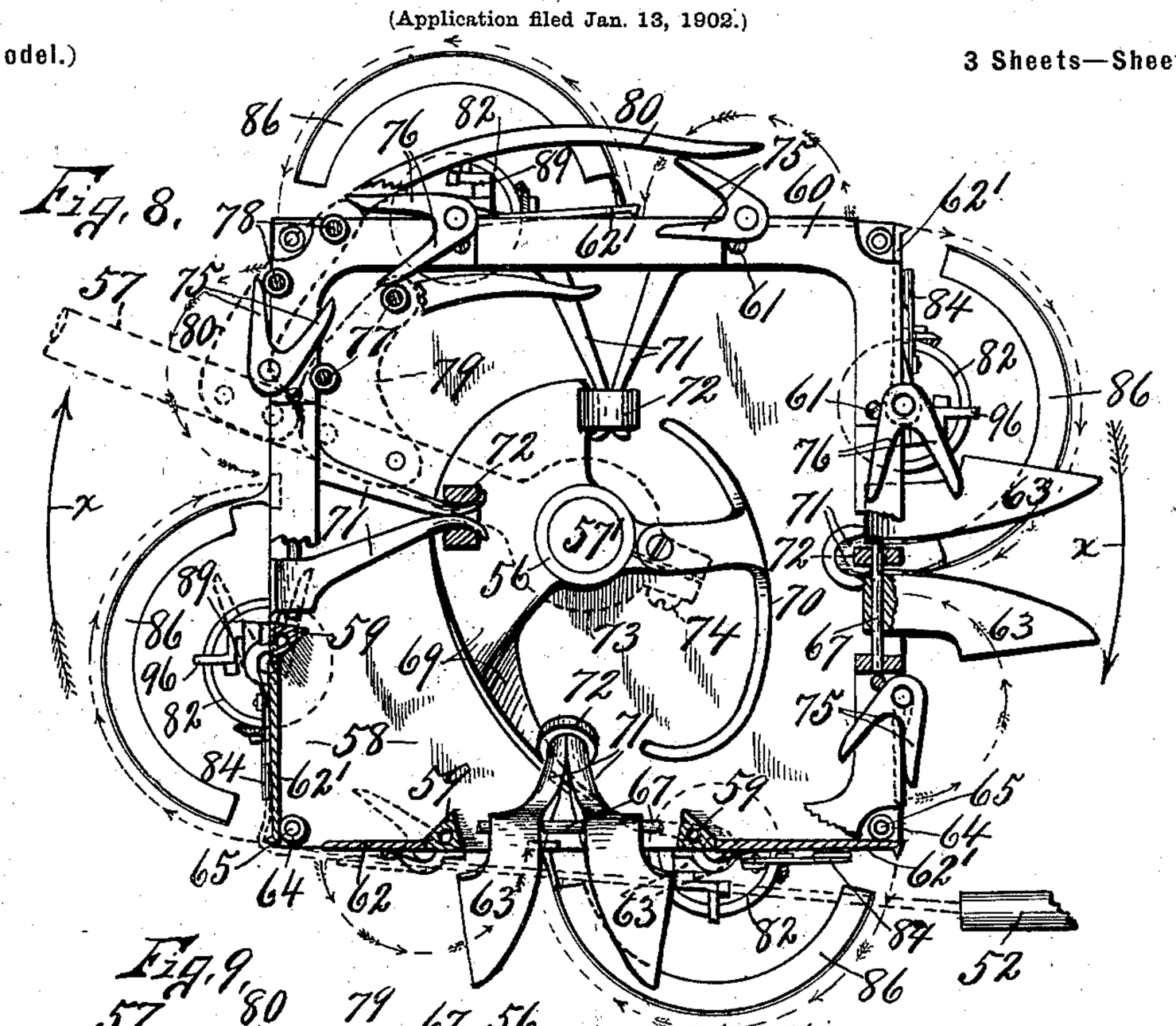


Fig. 9.

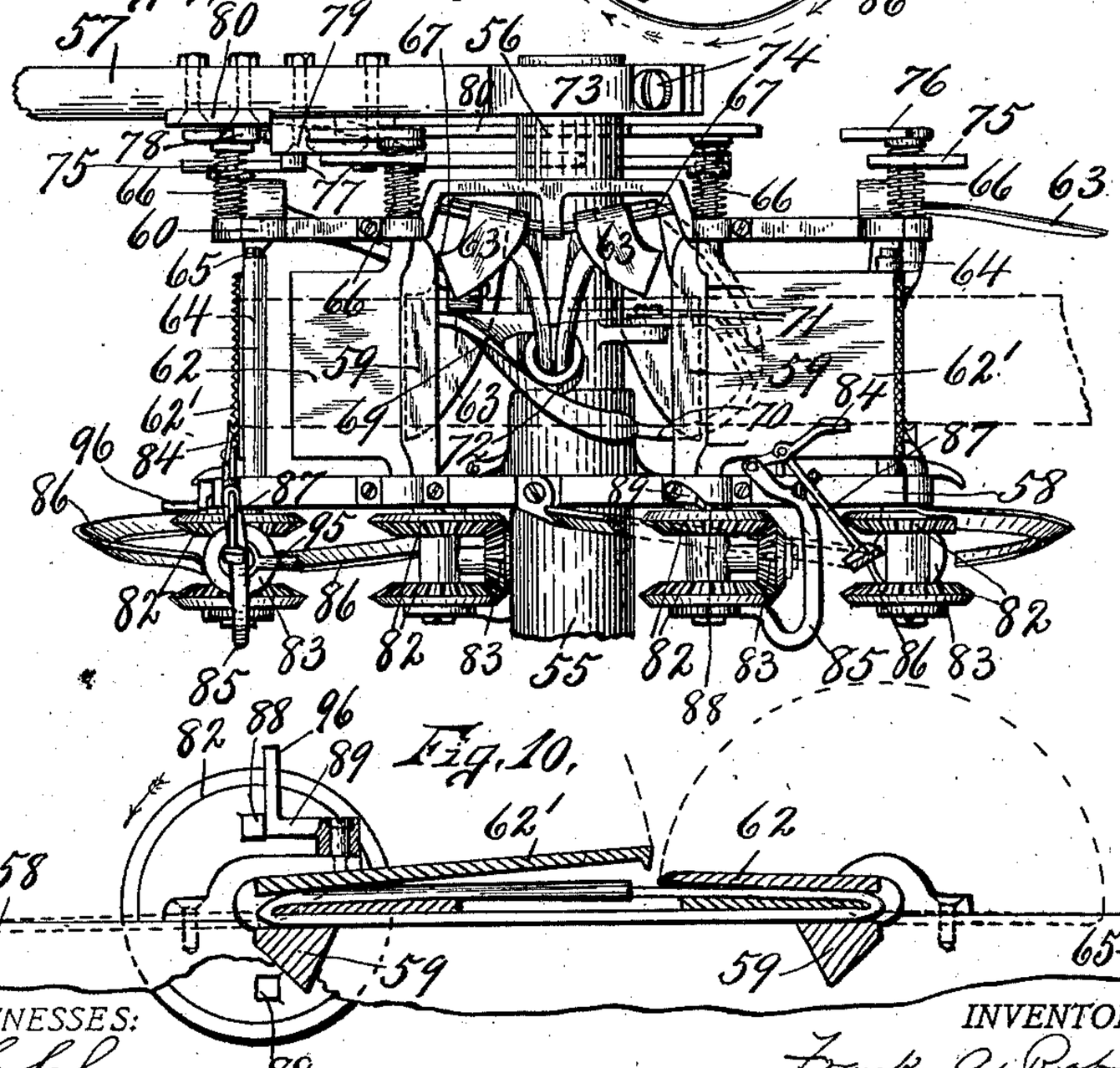
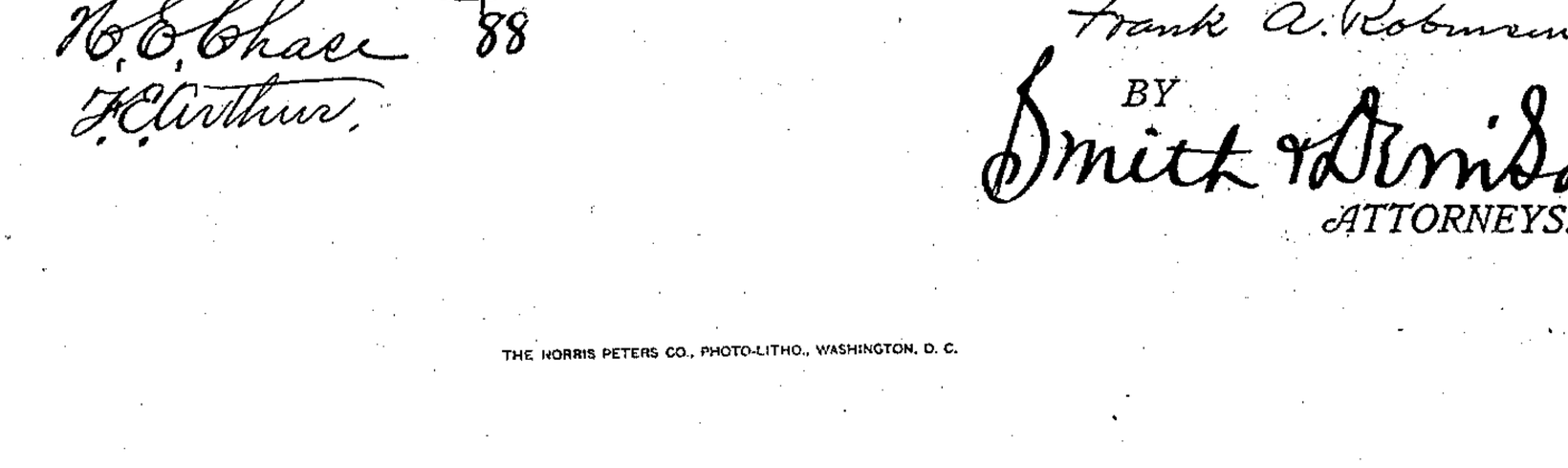


Fig. 10.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FILLING AND WRAPPING POWDERS.

SPECIFICATION forming part of Letters Patent No. 702,482, dated June 17, 1902.

Application filed January 13, 1902. Serial No. 89,531. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. ROBINSON, of Auburn, in the county of Cayuga, in the State of New York, have invented new and useful Improvements in Machines for Filling and Wrapping Powders, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in machines for filling and wrapping powders, having more particular reference to certain improvements in the device shown and described in my application, Serial No. 53,993, allowed January 6, 1902.

The objects are, first, to provide a suitable mechanism for feeding the powder in predetermined quantities to the wrapper during its transit through the folding device; second, to construct and arrange certain parts of the feeding mechanism so that the quantity of powder or other material being fed through the device may be varied at will during the operation of the machine, if desired; third, to provide the said mechanism with an intermittently-movable auxiliary feeding device driven from the same source of power and carrying a suitable closure, whereby the feed of the powder or other material through the discharge-opening is prevented during the interval of rest of said auxiliary feeding mechanism; fourth, to provide a fixed form or other folding device which is adapted to fold the wrapper around the powder or other material as said wrapper is drawn through said fixed folding device, the movement of the wrapper being continuous and so timed with relation to the feeding mechanism that a predetermined quantity of the powder or other material is discharged into the continuously-moving wrapper at regular predetermined distances; fifth, to provide a rotary wrapper folder and cutter driven from the prime mover and so relatively arranged and timed as to draw the wrapper through the fixed folder and to simultaneously cut the continuous wrapper into sections, with the powder folded therein at substantially its central portion, and to then fold the ends of the package inwardly toward each other, so as to close the end openings and to form a perfect package adapted to retain the powder therein; sixth, to provide this latter rotary folding device with means coacting therewith to interlock one of the end flaps of the package in the fold of the other end flap, all of which is accomplished without interruption in the movement of the revolving parts.

To this end the invention consists in the combination, construction, and arrangement of the component parts of a machine for filling, wrapping, and folding powders, all as hereinafter described, and pointed out in the claims.

Referring to the drawings, Figures 1 and 2 are respectively top, plan, and side elevation of a machine for wrapping and folding powders and similar material embodying the various features of my invention, portions of the base of the device in Fig. 2 being broken away for disclosing the interior driving mechanism. Figs. 3, 4, 5, and 6 are sectional views taken, respectively, on lines A A, Fig. 1, B B, Fig. 3, C C, Fig. 4, and D D, Fig. 3. Fig. 7 is an enlarged vertical sectional view through the lower end of the auxiliary screw-feeding device, showing particularly the means for moving the helices of the screw relatively to each other for varying the quantity of powder or other material fed thereby. Figs. 8 and 9 are respectively top, plan, and side elevation of the rotary head carrying the wrapper folding and cutting device, one of the sets of cutting and folding devices being shown in the position assumed when the package is filled and finally folded and just prior to its being discharged from the machine. Fig. 10 is an enlarged detail horizontal section through one set of the folding devices in the position last described, except that the end flaps of the package are shown in their interlocked position. Fig. 11 is an enlarged detail view of the mechanism for elevating one of the end flaps of the package into position for interlocking with the fold of the other end flap. Fig. 12 is a plan view of the washer employed as a stop for limiting the movement of the wrapper-elevating arm.

Similar reference characters indicate corresponding parts in all the views.

The mechanism for feeding the powder in

predetermined quantities into the wrapper during its transit through the folding devices preferably consists of a receptacle 1, a feed 2, and an agitator 3, movable in said receptacle, a subchamber 4, communicating with the interior of the receptacle 1, a screw-feed 5, movable in the subchamber 4, a hopper 6, receiving the discharge from the subchamber 4, an intermittently-movable auxiliary screw-feed 7, movable in the hopper 6, and mechanism, hereinafter described, for operating the feeding devices and agitator.

The receptacle 1, subchamber 4, and hopper 6 may be of any desired size, form, or construction and mounted in any suitable manner to carry out the objects hereinbefore stated; but, as seen in the drawings, these parts are preferably secured to each other and are mounted upon standards 8 and 9, rising from the opposite ends of a suitable base 10 in such manner as to leave a clear space between said parts and the base for the reception of the folding mechanisms hereinafter described, said receptacle, subchamber, and hopper being elevated a sufficient distance above the wrapper-folding device so that the powder or other material which it is desired to wrap into suitable packages may readily feed by gravity, if expedient, from the receptacle 1 to the hopper 6.

The receptacle 1 and subchamber 2 are usually arranged substantially horizontal, while the hopper 6 is preferably vertical, the receptacle 1 being provided with inlet and outlet openings 11 and 12, the inlet-opening 11 extending through one end of the upper wall of the receptacle and serving to receive the material to be wrapped and the outlet-opening 12 extending through the opposite end of the bottom wall and discharging into one end of the subchamber 4.

The side walls of the receptacle 1 preferably converge toward the discharge-opening 12, and I usually provide a screen 13, which covers the mouth of the discharge-opening 12 between the receptacle 1 and chamber 4 for the purpose of screening the powder or other material previous to wrapping same into packages.

The primary feeding mechanism 2 and agitator 3 are mounted upon a suitable shaft 14, the opposite ends of which are journaled in the end walls of the receptacle 1, said feeding mechanism consisting of spirally-arranged blades or wings usually alined with the inlet-opening 11 and serve to feed the material from said inlet-opening to the discharge-opening 12, while the agitator 3 preferably consists of open loops secured to the shaft 14 and traveling in close proximity to the upper face of the screen 13 as said shaft is revolved for preventing the packing of the material upon the screen and facilitating the gravity feed of the powder or equivalent material through the screen to the chamber 4. One end of the shaft 14 preferably extends through and beyond one end of the adjacent wall of the receptacle 1 and is provided with sprocket-wheels 15 and 16 for a purpose hereinafter described. The chamber 4 incloses the discharge-opening 12 and practically forms a continuation of the receptacle 1, which, being provided with a restricted discharge-opening 17, discharges into the hopper 6.

Revolubly mounted within the chamber 4 is the screw-feed 5, which is arranged substantially horizontal and is journaled in suitable bearings at the opposite ends of the chamber 4, said feed usually consisting of a screw usually extending the entire length of the discharge-opening 12 and terminating at the discharge-opening 17 or, rather, in proximity to the hopper 6. One end of the shaft upon which this screw-feed is mounted extends beyond the end wall of the chamber 4, and its outer end is journaled in a suitable lug 18, depending from the receptacle 1, and is provided with a sprocket-wheel 19, alined with the sprocket 16 and connected thereto by a chain or equivalent power-transmitting device 20, by which motion is transmitted from the shaft 14 to the shaft of the screw-feed 5.

The hopper 6 is adapted to form a continuation of the feed-chamber 4, being arranged at the discharge end of said chamber and adapted to receive the screened material fed by the screw 5. This chamber 6 is provided with a restricted or conical lower end depending beneath the discharge-opening 17 and terminates in a tubular pocket 21, which is also provided with a restricted discharge-opening 22 in one of its side walls, although the lower end of the tubular pocket is open.

The intermittently-movable auxiliary screw-feed 7 is mounted vertically within the hopper 6 and preferably consists of a revolving vertical tube 23, a spiral blade 24, and an adjusting-screw 25, the tube 23 being journaled at its upper end in a bearing 26, detachably secured to the side wall of the upper end of the hopper 6, and the lower end extends within the tubular pocket 21 and is provided with a lengthwise spiral slot 27, said tube terminating at its lower end in a spiral wing 28, which is usually solid and forms a closure for the lower open end of the tubular pocket 21. The spiral plate 24 encircles the lower end of the tube 23 within the pocket 21, being formed of substantially the same diameter as the interior of said pocket, so as to control the feed of the powder therethrough. The helices of this spiral blade are movable lengthwise of the tube 23, said helices being provided with nuts 29, movable within the tube 23 and engaged with differently-threaded portions 30, 31, 32, and 33 of the stem or screw 25, the threads 30, 31, 32, and 33 being so relatively arranged that when the screw 25 is turned in one direction the helices of the spiral blade will be expanded and when turned in the other direction will be drawn together to vary the quantity of material be-

tween adjacent helices, and thereby regulating the quantity of material discharged at each revolution of the tube 23. The upper end of this spiral blade 24 terminates in an agitator-arm 34, which moves within the conical portion of the hopper in proximity to the discharge-opening 17 for the purpose of preventing the packing of the powder within the hopper and at the same time facilitating its feed by the spiral blade 24.

As seen in Fig. 5, the nuts 29 are united to the helices of the spiral plate 24 through the spiral slot 27, this connection serving to lock the tube 23 and spiral blade 24 together, so as to rotate simultaneously and at the same time permit the helices to be moved lengthwise of the tube 23. The lower extremity of the tube 23, adjacent to the wing 28, is provided with a closure 35, which is so relatively arranged as to close the discharge-opening 22 during the interval of rest in the revolution of the tube 23, this tube being connected to the driving mechanism in such manner as to make a complete revolution at regular predetermined intervals. The threaded stem 25 extends through the upper end of the tube 23 and is provided with a handpiece 36 and a lock-nut 37, movable between shoulders 38 of a yoke or head secured to the upper end of the tube 23, this yoke or head being provided with openings to receive the threaded stem 25.

Secured to the upper end of the tube above the bearing 26 is a pinion 39, which meshes with a gear 40, mounted upon an upright shaft 41, the upper end of which is journaled in a suitable bearing projecting from the hopper 6, and its lower end is journaled in a bearing provided on the base 10 and is provided with a mutilated gear 42 within the base which is preferably formed hollow to receive the driving mechanism hereinafter described. This driving mechanism usually consists of a horizontal shaft 43, which is journaled at its opposite ends in the end walls of the base 10 and is provided with a mutilated gear 44, meshing with the mutilated gear 42, and is also provided with a sprocket-wheel 45, connected by a chain 46 to the sprocket-wheel 15 on the shaft 14, whereby motion is transmitted from the shaft 43 to the feed mechanism 2 and agitator 3. This driving-shaft may be rotated by any desired power, is here shown as provided with a hand-crank 47, and in order to prevent the retrograde movement of the shaft I provide the same with a ratchet-wheel 48, coacting with a stop-pawl 49, which may be fixed in any desired manner to permit the shaft to be rotated in one direction and prevent its rotation in the other direction.

The mechanism thus far described comprises the means for feeding the powder or other material in predetermined quantities from the receptacle 1 to the discharge-opening 22.

The operation is as follows: The powder or other material to be wrapped or folded into packages is admitted through the inlet-opening 11 either by hand or through a suitable conveyer into the receptacle 1 and is fed from the inlet-opening along the bottom wall by means of the spiral blades 2 to the screen 13 and outlet-opening 12, the powder being agitated across the face of the screen and kept from packing or solidifying and at the same time is sifted through the screen into the subchamber 4, from which it is fed by the screw-feed 5 through the discharge-opening 17 into the hopper 6, and it is therefore evident that but a small quantity of the powder remains in the hopper at a time. The powder thus fed from the subchamber 4 into the hopper in regular limited quantities gravitates onto the spiral blade 24, said blade being of substantially the same diameter as the tubular portion 21, preventing the precipitation of the powder until properly fed downwardly by said spiral blade, and only a predetermined quantity can be retained between the helices of said blade, which is gradually conveyed downwardly to the discharge-opening 22 and is prevented from passing out through said opening when the spiral blade 24 is at rest by the gate or closure 35, and as soon as the blade is rotated the closure 35 is also rotated from the opening 22, and the portion of the powder between the lower and next adjacent helix is thus free to pass out through the opening 22 and onto the paper which is normally drawn under the end of the tube 21 to receive the discharged powder. If it is desired to vary the quantity of material adapted to be carried between the helices of the blade 24, the stem 25 may be adjusted to force the helices toward or away from each other, as may be required, whereupon the lock-nut is moved to hold the stem in its adjusted position.

The paper for forming the wrappers is preferably in the form of a roll mounted upon a spindle or rolling sleeve 50, detachably mounted upon suitable arms 51, carried by the supporting-base 10, the free end of the paper being then passed upwardly into a fixed guide or folder 52, which extends beneath the discharge-opening 22 and feed 7 and usually consists of one or more plates which are substantially flat at one end at one side of the discharge-opening 22 and are then bent or folded gradually to the desired form at the other end for folding the paper lengthwise as it is drawn through said fixed guide or folder. This fixed guide or folder is supported in such manner as to be readily removed when necessary without interfering with the other parts of the machine, being held at one end by a removable clamp 53, and its other end is hooked or detachably interlocked with a suitable spindle or arm 54, projecting from one of the upright standards, as 9.

The mechanism for carrying out the fifth object of my invention—namely, the means for cutting and folding the wrappers to retain the powder—consists, preferably, of an upright rotary head having its lower end journaled in a suitable bearing 55, provided

on the base 10, and its upper end is journaled in a bearing 56, secured to an arm 57, projecting from the upright standard 8. This revolving head is preferably provided with a plurality of sides or faces and in this instance is shown as consisting of a square frame having a base-plate 58, interposed between the bearings 55 and 56 and secured to a revolving shaft 57′, each side of which is provided with upright posts 59, to the upper ends of which is secured an open plate or cap 60 by suitable screws or other fastening means 61. Each of the sides of this revolving head is provided with a pair of horizontal swing-gates or folders 62 and 62′ and a pair of vertical swing-plates or grippers 63, the grippers 63 being pivotally supported at a point above and between the pivots of the gates 62 and 62′, so that when the grippers 63 are folded downwardly in the act of gripping the wrapper the plates 62 and 62′ are free to fold over and upon the grippers 63. The gates 62 and 62′ are provided at their upper and lower ends with trunnions journaled in suitable bearings in the lower and upper plates 58 and 60, with their axes in substantial alinement with each other and with the outer edges of the upright posts 59, said folding-plates 62′ being normally folded outwardly from each other against buffers 64, which are removably mounted upon spindles 65, projecting upwardly from the corners of the base-plate of the rotary head in such manner as to form suitable stops for the end folding-plates 62′ of each side of the rotary head. The upright free edges of the gates 62′ are provided with a series of teeth for severing the wrapper from the continuous fold as it comes from the fixed folder or guide 52. These gates 62 and 62′ are held in their normal position against the buffers 64 by springs or equivalent means 66, which encircle the upper trunnions of the gates, one end of the spring being secured to the trunnion and the other interlocked with the head in any well-known manner for holding the springs tensioned, said gates 62 and 62′ being movable between upper and lower plates 58 and 60.

In order to permit the buffers to be removed and replaced by new ones when the same become impaired or otherwise unfit for use, the corners of the upper plate 60 are cut away in such manner that the tubes may be readily slipped over the upper ends of the spindles 65.

As previously stated, the grippers 63 are arranged in pairs and are pivotally mounted upon the head at their upper ends, being preferably mounted upon inclined spindles 67, and are adapted to be rocked upon said spindles by fixed cams 69 and 70, said grippers being each provided with inwardly-extending arms 71, the inner extremities of which are arranged in close proximity to each other and are adapted to receive a roller 72, which locks the arms of the grippers together and forms a roller-bearing adapted for engaging the cams 69 and 70. It is thus apparent that each of the grippers and its inwardly-projecting arm forms a bell-crank pivoted upon the inclined bearings 67, and that owing to the fact that the inner ends of the arms are locked together by the rollers 72 both of the grippers of each pair rock simultaneously as the head is rotated upon its bearing.

The cams 69 and 70 are secured to the upright bearing 56, which consists of a sleeve having its upper end secured in a split hub 73, whereby said bearing or sleeve 56 may be rocked upon its axis for adjusting the position of the cams 69 and 70, and the sleeve may then be firmly clamped in position by means of a screw 74 in the jaws of the split hub. As seen in the drawings, Figs. 8, 9, and 10, these cams are so arranged relatively to the fixed folder 52 that when either of the faces or sides of the rotary head is in alinement with the discharge end of the fixed folder the grippers 63 are elevated above the folded paper as it comes from the fixed folder 52, and as it continues to rotate in the direction indicated by the arrows *x*, Fig. 8, the cam 69 elevates the inner arms of the grippers, and thereby forces the grippers downwardly against the folded material, and at the same time owing to the inclined bearing of said grippers they are drawn laterally away from each other with a sliding contact upon the fold, thereby more firmly pressing the folds together and insuring a more perfect grip upon the fold to draw the same through the fixed folder 52 as the head continues to rotate. These grippers 63 are usually quite thin, and their outer edges are substantially straight and are adapted to determine the length of the filled portion of the wrapper when in their operative position, said grippers being so relatively arranged as to move downwardly against the upright posts 59 with their straight edges in substantial alinement with the inner upright edges of the gates 62, so that when the gates are folded inwardly toward each other the axis of movement is substantially coincident with the upright edges of the grippers 63, thereby folding the ends of the wrapper firmly around the grippers.

The means for folding the gates 62 and 62′ of each pair inwardly toward each other preferably consists of forked arms 75 and 76, mounted, respectively, upon the upper trunnions of the gates 62 and 62′, and fixed shoulders 77 and 78, said shoulders 77 and 78 being mounted upon arms 79 and 80, projecting from the arm 57. I preferably employ a pair of shoulders 77, which coact with the forked arms 75 in such manner that as the head continues to rotate from its initial position after receiving the folded paper the advance end of the wrapper, which has been previously cut off by the rocking of the gate 62′, is automatically folded backwardly upon itself, and as the head continues to move the gate 62 is held in its position by the engagement of one of the forked arms 75 with a cam 80.

During this continued movement of the head the gate 62′ is rocked from its normal position by the engagement of the forked arms 76 with the shoulders 78, thereby severing the wrapper from the body and at the same time folding the adjacent end of the wrapper inwardly upon the previously-folded advance end of the wrapper, this inner folding of the gate 62′ being effected before the forked arm 75 leaves the cam 80.

The cam 69 is provided with a substantially horizontal bearing-face which is of sufficient length to hold the grippers 63 in their closed position until the gates 62 and 62′ are released from their closed position, whereupon the springs 66 return the gates to their normal position and the grippers are free to move outwardly, this outward movement being made positive by engagement of the roller 72 with the cam 70, whereupon the package is released from the grippers, this releasing being facilitated by the drawing together of the grippers, owing to their being pivoted to the inclined bearings 67. The movement of the gates and grippers just described at each side of the head is completed during a partial revolution of the head, so that the gates and grippers are in their normal position for receiving the strip of folded paper before either side of the head completes a full revolution, or, in other words, returns to its initial or starting position, as seen in Fig. 8, it being understood that the side of the head in alinement with the discharge end of the fixed folder 52 is regarded as the initial position.

The means for interlocking the inwardly-folded ends of the wrapper with each other preferably consists of a pair of separated gears 82, loosely mounted upon the lower trunnion of the gate 62′, a pinion 83, meshing with said gears and adapted to rock with the gate 62, a lifting-lever 84, pivoted to an arm 85, which is secured to one of the gears, as the lower gear 82, and a cam 86, coacting with the lifting-rod 87 to control the action of the lever 84. (Better seen in Figs. 9, 10, and 11.) The operation of this latter mechanism is as follows: One of the gears 82, as the upper gear, is provided with a shoulder 88, which is normally engaged by a detent 89 for holding the upper gear from revolving during a limited movement of the gate 62′, said detent being usually pivoted to the lower plate of the revolving head. The upper gear being thus fixed from rotation, it will be understood that when the gate 62′ is rocked by means of the forked arm 76, coacting with the shoulders 77, the pinion 83 will be similarly rocked and will thereby rotate the lower gear 82, carrying the arm 85 twice as fast as the movement of the gate and pinion, or, in other words, the arm 85 will be rocked a full half-revolution during a quarter-turn of the gate and pinion, and that during this movement the lever 84, which is carried by the arm 85 and is normally engaged with the lower edge of the adjacent end of the wrapper, will be similarly rocked a half-revolution, thereby carrying said end of the wrapper forwardly in advance of the movement of the gate. During this forward movement of the lever 84 the lower end of the arm 87, which is connected to said lever, rides upon the face of the cam 86, and thereby elevates the end of the wrapper as it is folded forwardly until the free end of said end is brought to a point above the inwardly-folded opposite end of the wrapper, whereupon the lower end of the arm 87 leaves the cam abruptly and the lever 84 drops automatically out of engagement with the end of the wrapper and permits the folds of this end of the wrapper to automatically drop over the opposite end of said wrapper, the elasticity of the paper or other material of which the wrapper is formed being sufficient to close the folds of the elevated end of the wrapper downwardly upon the other end. The elevating mechanism being now in position, the gate is free to continue its inward rocking movement by means of the forked arm 76 and shoulders 77, which operation presses the adjacent inwardly-folded ends of the wrapper firmly in position.

In order to form a stop for limiting the rocking movement of the arm 85, I provide the lower trunnion of the gate 62 with a washer 90, having shoulders 91 and 92, arranged in the path of the adjacent end of the arm 85, said shoulders being separated from each other a distance equal to substantially the quarter-revolution of the arm 85, so that the shoulder 92 forms a stop for the arm 85 when in its normal position, as seen in Fig. 11, and the shoulder 91 forms a stop for said arm when rocked half a revolution from its normal position, it being understood that owing to the fact that the arm travels twice as fast as the trunnion of the gate 62′ and the washer 90, secured thereto, the shoulder 91 will have moved a quarter of a revolution during a half-revolution of the arm 85, and therefore will be in position to stop the further movement of the arm 85 when it reaches its half-revolution.

In order to release the upper gear 82 of the gate 62′ after its first quarter-turn, after the arm 85 has reached the limit of its movement, I provide the supporting-spindle of the pinion 83 with an arm 95, which is adapted to engage a finger 96 upon the pawl 89 for elevating said pawl out of the path of the shoulder 88 when the gate 62′ and the pinion moving therewith reach their first quarter-turn, and it is thus obvious that when the detent is moved from its operative position and the lower gear 82 and arm 85, secured thereto, have reached the limit of their movement the upper gear 82 will continue to rotate with the gate 62′ the other quarter-turn, and when the gate is released the gears 82, pinion 83, arm 85, and lever 84 and parts connected thereto are returned to their normal position by the spring 66 and the operation repeated.

The rotary folding-head, the intermittent

discharge of the auxiliary feed in the hopper 6, and the driving mechanism therefor are so relatively timed that the central portions of the wrappers containing the powder is impinged in the rotary head by the grippers 63 of each of the successively-moving sides of said rotary head, and the auxiliary feeding-screw in the hopper 6 is so relatively timed as to make one discharge as each successive face or side of the head is presented to the wrapper in the act of gripping the same for drawing the continuous fold through the fixed former 52, it being understood that the time of discharge may be regulated at will by changing the position of the teeth of the gears 39 and 40 relatively to each other.

When the ends of the wrappers are folded and interlocked with each other in the manner previously described, the mechanism for causing the interlocking of the free ends of the folds or flaps of the wrapper is returned to its normal position in substantially the same manner as it moves to its operative position, except that the movement is released, and in order to permit its return movement the cam which coacts with the lever-operating rod 87 is hinged to the frame or head and preferably to the lower plate 58, so that as the rod 87 leaves the cam abruptly at the limit of the inward movement of the gate 62′ the lower end of said rod, which may be provided with a shoulder, engages the lower face of the cam and rocks the same upwardly until it reaches and passes beyond the opposite end of the cam, whereupon said cam automatically returns by gravity to its normal position and the operation is repeated as often as the gates 62′ of the several sides of the rotary head are actuated by their forked arms 76, coacting with the fixed shoulders 77, these shoulders being provided with suitable anti-frictional rollers for reducing the friction incidental with the engagement of the forked arms therewith.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that the detail parts of the mechanisms for carrying out the various objects of my invention may be somewhat changed without departing from the spirit of this invention. Therefore I do not limit myself to the precise construction and arrangement shown and described.

I claim—

1. In a machine for feeding and wrapping powders, a conduit having an outlet, and an automatic means including a closure to intermittently close and open the outlet, a rotary screw-feed, and expansible helices carried by the screw.

2. In a machine for feeding and wrapping powders, an upright conduit having an outlet, and an intermittently-moving feed comprising a screw having expansible helices, and a closure carried by said screw and movable across the outlet to open and close the same.

3. In a machine for feeding and wrapping powders, a conduit having an outlet, and a rotary screw-feed having a closure movable across the opening for the purpose specified.

4. In a machine for feeding and wrapping powders, a conduit having an outlet, and a screw-feed carrying a closure intermittently opening and closing the outlet.

5. In a machine for feeding and wrapping powders, a conduit having an outlet, and a rotary screw-feed having a closure between adjacent helices for the purpose specified.

6. In a machine for feeding and wrapping powders, a conduit having an outlet, a rotary screw-feed having expansible helices, and a closure carried by the screw for the purpose described.

7. In a machine for feeding and wrapping powders, a conduit having an outlet, a rotary screw-feed having expansible helices, and a closure secured to the periphery of one of the helices and movable across the outlet.

8. In a machine for feeding and wrapping powders, a conduit having an outlet, a revolving stem carrying a closure for the outlet, and an expansible spiral blade mounted on the stem.

9. In a machine for feeding and wrapping powders, a hopper having an outlet, an intermittently-revolving spiral blade, a closure carried by the lower end of said blade and movable across the outlet for intermittently opening and closing said outlet, and a curved agitator-arm carried by the upper end of said spiral blade, substantially as described.

10. In a machine for feeding and wrapping powder, a rotary spiral blade and an inclosure therefor having a discharge-opening, in combination with a closure for the opening revolving with the blade, and means to rotate the blade one revolution at regular predetermined intervals.

11. In a machine for feeding and wrapping powder, a screw having an axially-movable helix, and an additional helix fixed from axial movement and provided with a gate or closure for the purpose set forth.

12. In a machine for feeding and wrapping powder, a screw comprising a fixed helix and an expansible spiral blade, a gate or closure on the fixed helix, and a single operating member for expanding the helices of the spiral blade.

13. In a machine for feeding and wrapping powder, a conduit having a discharge-opening, a rotary spiral blade having its helices provided with nuts, a stem having different threads engaged with the nuts, and a gate rotating with the blade across the opening.

14. In a machine for feeding and wrapping powder, a conduit having a discharge-opening, a rotary spiral blade having its helices provided with nuts, a stem having different threads engaged with the nuts, a lock-nut en-

gaged with the threaded stem, and a gate rotating with the blade across the opening.

15. A feeding device for powder-wrapping machines comprising chambers one discharging into the other, the latter chamber having a discharge-opening, and a screw-feed in each chamber, one being movable intermittently and provided with a gate or closure for the opening.

16. A feeding device for powder-wrapping machines comprising a vertical hopper, a screw-feed in the hopper, a horizontal chamber discharging into the hopper, a screw in said chamber, a receptacle discharging into the chamber, a screen between the receptacle and chamber, and an agitator in the receptacle movable across the screen.

17. A feeding device for powder-wrapping machines comprising a vertical hopper, a screw-feed in the hopper, a horizontal chamber discharging into the hopper, a screw in said chamber, a receptacle discharging into the chamber, a screen between the receptacle and chamber, and a rotary feed and agitator in the receptacle for the purpose set forth.

18. A feeding device for powder-wrapping machines, comprising a receptacle, a subchamber and a vertical hopper discharging respectively from one to the other, the hopper being arranged at right angles with the subchamber and having a discharge-opening, an intermittently-operated screw-feed in the hopper and provided with a closure for the opening, a feeding device in the receptacle, and a prime mover connected to said feeding device and screw-feed.

19. A feeding device for powder-wrapping machines, comprising a receptacle, a subchamber, and a hopper discharging respectively from one to the other, the hopper being arranged at an angle with the subchamber and having a discharge-opening, an intermittently-moving feeding device in the hopper, a gate or closure carried thereby for the discharge-opening, feeding devices in the receptacle and subchamber, and a prime mover connected to the feeding devices for imparting continuous movement to those in the receptacle and subchamber and intermittent movement to the feed in the hopper.

20. A feeding device for powder-wrapping machines, comprising a receptacle, subchamber and a hopper discharging respectively from one to the other, the hopper being arranged at an angle with the subchamber, a prime mover, feeding devices in the receptacle and subchamber actuated by the prime mover, and an expansible spiral blade in the hopper actuated intermittently by the prime mover.

21. A feeding device for powder-wrapping machines, comprising an upright conduit having a discharge-opening, a rotary expansible spiral blade in the conduit moving intermittently one revolution at a time, a closure for the opening moving with said blade, means for expanding and holding the spiral blade in its adjusted position, and additional means for feeding the powder to said spiral blade.

22. A wrapping and folding mechanism for powders, comprising a former, a moving frame having means to draw the wrapper through the former, automatic means on the frame for separating the wrappers and folding their ends toward each other, and additional means for interlocking one end of the wrapper in the fold of the other end.

23. A wrapping and folding mechanism for powders, comprising a former, a rotary head having means to draw the wrappers from the former, end-folding gates carried by the head, one of which is arranged to separate the wrappers, means for folding the ends of the wrapper, and means operated by one of the gates to interlock one end of the wrapper in the fold of the other.

24. A wrapping and folding mechanism for powders, comprising a former and mechanism to draw the wrappers through the former and fold the same and to simultaneously separate the wrappers and interlock one end in the fold of the other end.

25. A wrapping and folding mechanism for powders, comprising a former, and automatically-operating mechanism to draw the wrappers from the former and fold the same and to simultaneously separate and interlock the ends of the wrapper with each other without interruption in the operation of said mechanism.

26. A wrapping and folding mechanism, comprising a former, a continuously-rotating head having means to draw the wrappers from the former, an end-folding gate for separating the wrappers, means for folding the wrappers, and means for interlocking one end in the fold of the other end, substantially as described.

27. A wrapping and folding mechanism comprising a former, a rotary head, a gripper carried by the head to engage and hold the wrapper, a cam for actuating the gripper, end-folding gates carried by the head, one of said gates arranged to separate the wrappers, means to close the gates independently of each other, and means operated by one of the gates to interlock one end of the wrapper in the fold of the other.

28. A wrapper and folding mechanism comprising a former, a continuously-rotating head, a gripper carried by the head to engage and fold the wrapper, a cam operating the gripper, end-folding gates on the head, one of said gates arranged to separate the wrappers, means operated by one of the gates to interlock one end of the wrapper in the fold of the other, and means to close the gates one in advance of the other.

29. A wrapping and folding mechanism, including a former, a rotary head, a gripper carried by the head, means to operate the gripper, gates mounted on the head to fold the ends of the wrapper, and additional means for interlocking the ends of the wrapper with each other.

30. A machine for filling, wrapping and folding powders comprising an upright conduit and a horizontal chamber and a rotary screw-feed in each, one screw having a spiral blade expansible axially, means to expand the helices of the spiral simultaneously, a former for supporting the wrapper material at the discharge-opening of the upright conduit, a rotary head having grippers to engage and draw the wrapper through the former, and mechanism carried by the head for folding and interlocking the ends of the wrappers.

31. A machine for filling, wrapping and folding powders comprising a former, an upright conduit, an intermittently-rotating spiral blade, a fixed former for the wrapper, and a rotary head carrying mechanism to separate the wrappers and to fold their ends inwardly, and automatic means on said head to interlock one end of the wrapper with the other end as the head is rotated.

In witness whereof I have hereunto set my hand this 9th day of January, 1902.

FRANK A. ROBINSON.

Witnesses:
H. P. DENISON,
H. E. CHASE.