

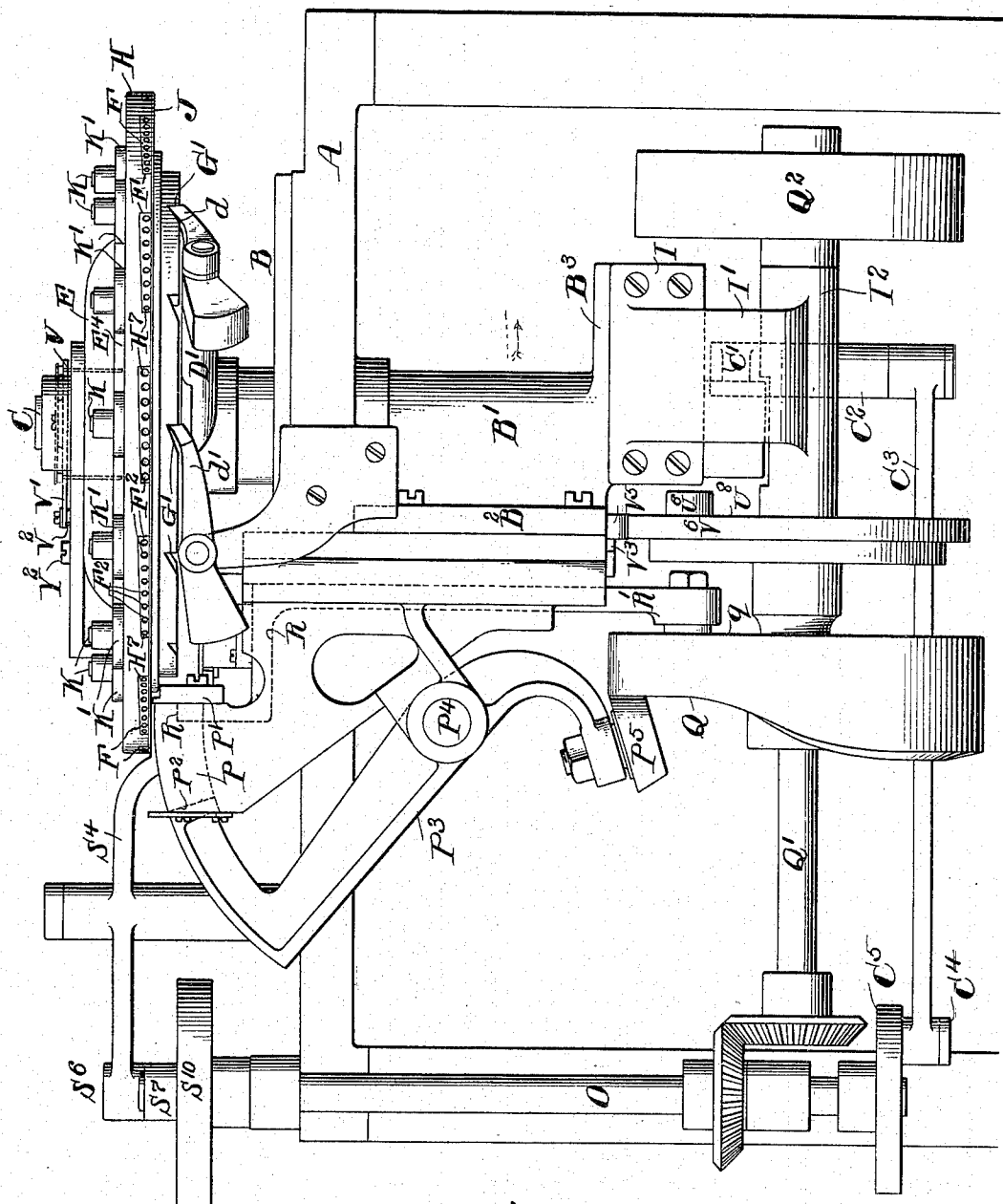
(No Model.)

7 Sheets—Sheet 1.

H. BILGRAM.
CIGARETTE MACHINERY.

No. 565,852.

Patented Aug. 11, 1896.



WITNESSES:

Harry Dwyer
F. Hastings

FIG. 1.

INVENTOR:

Hugo Bilgram
by his atty.
Francis J. Chambers

(No Model.)

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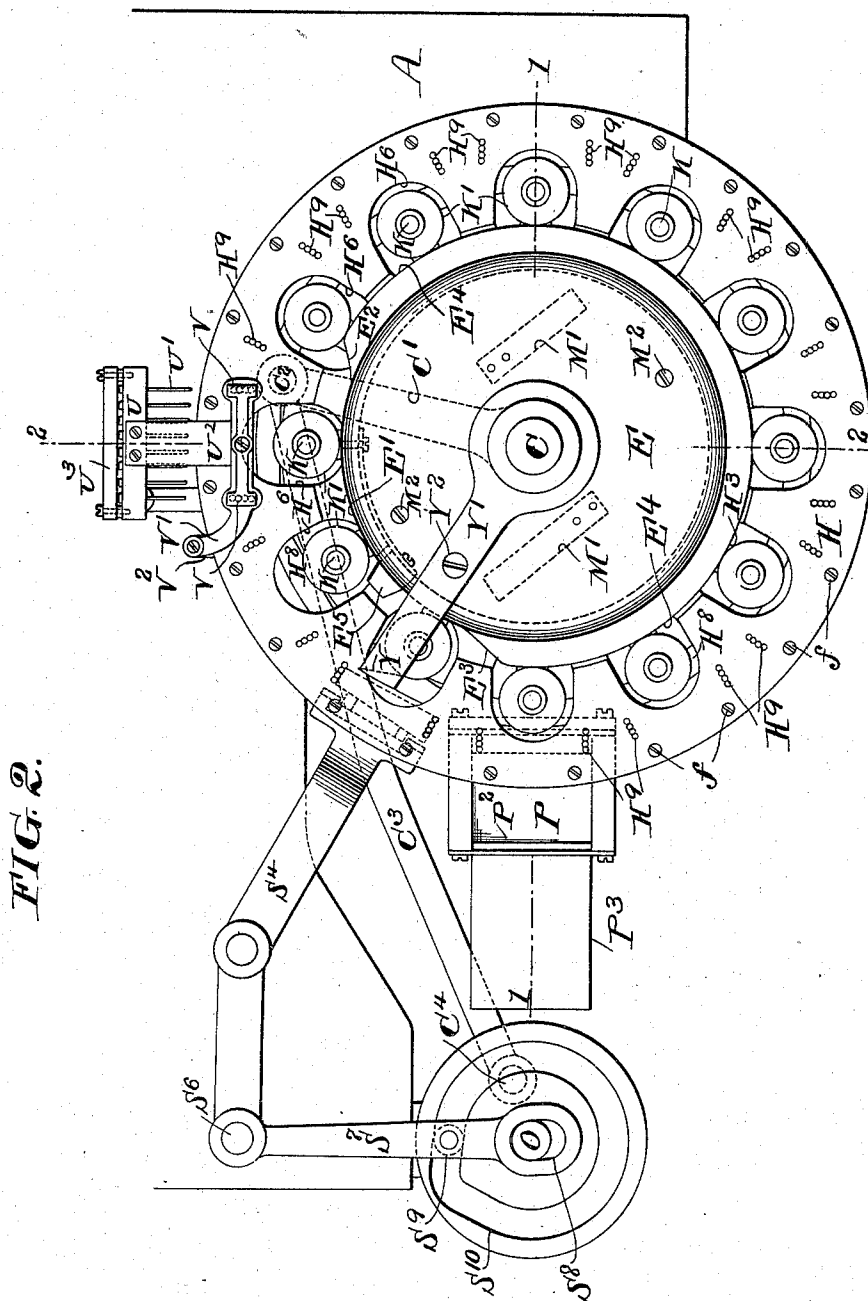


FIG. 2.

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(No Model.)

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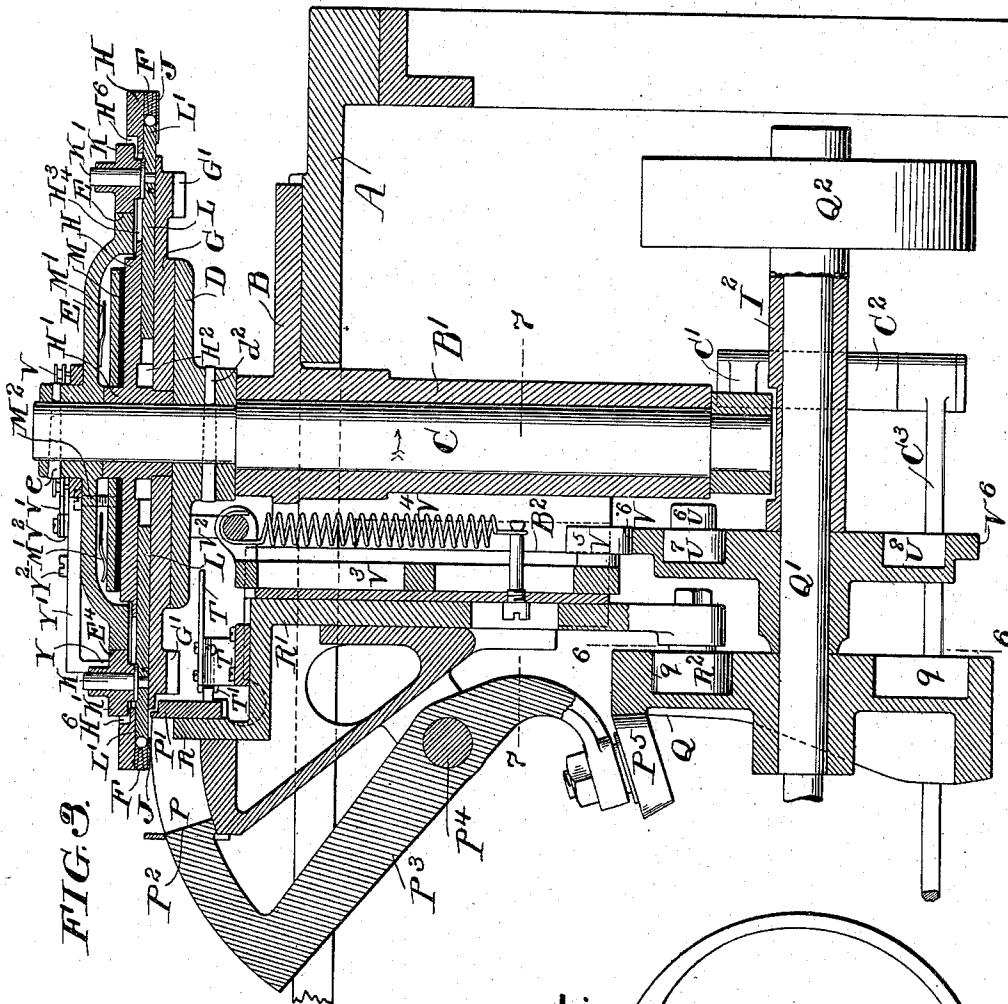


FIG. 3.

FIG. 4.

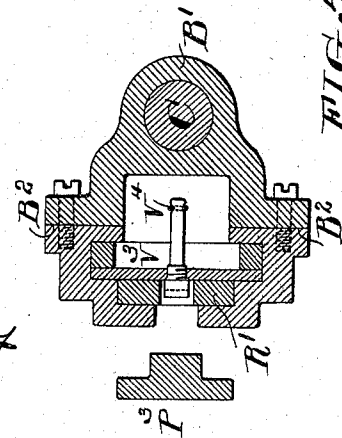
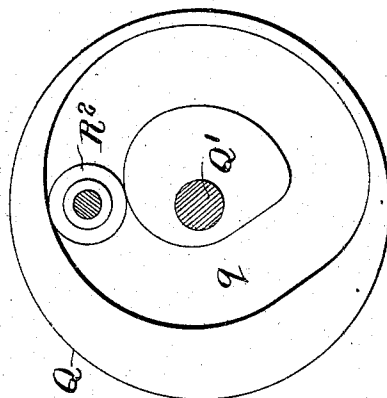


FIG. 5.



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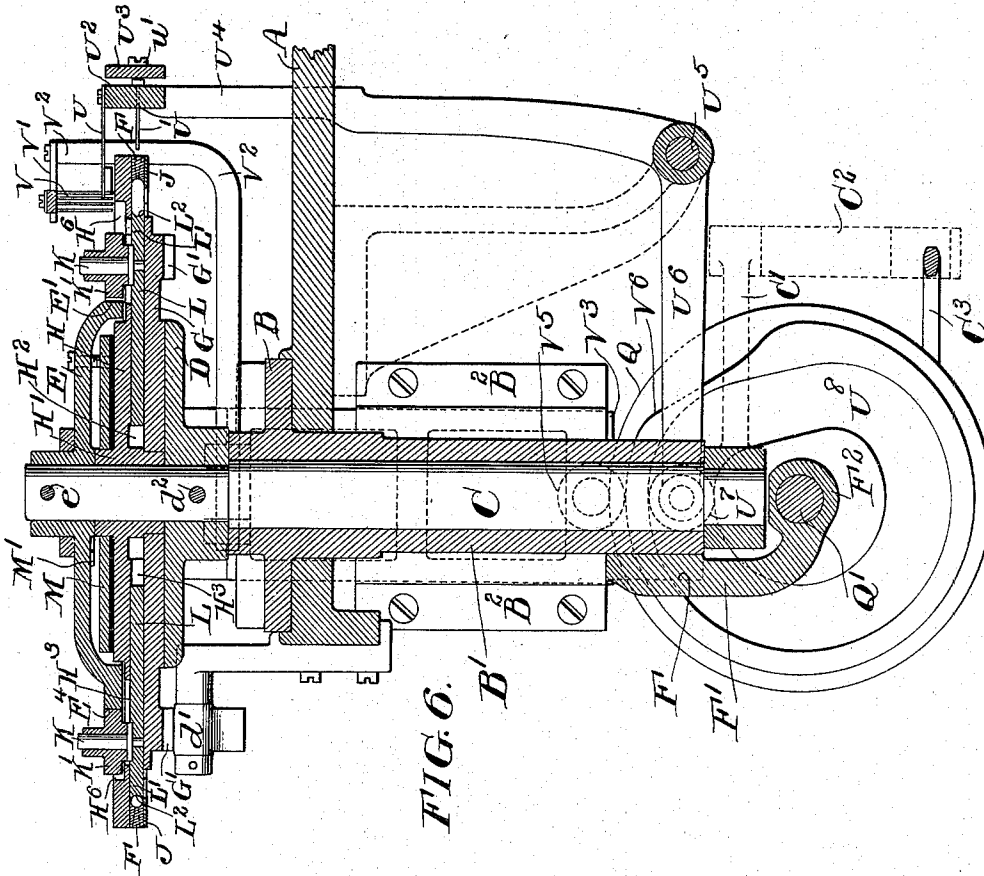
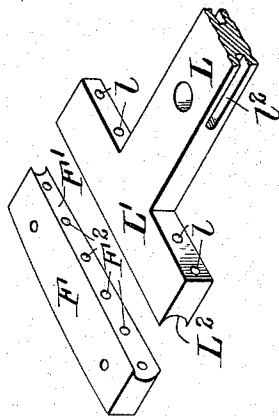


FIG. 7.



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FIG. 8.

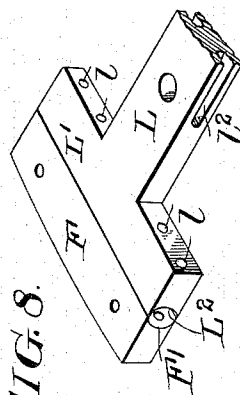


FIG. 9.



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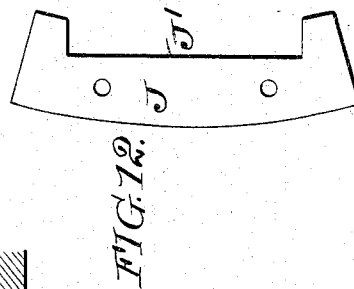
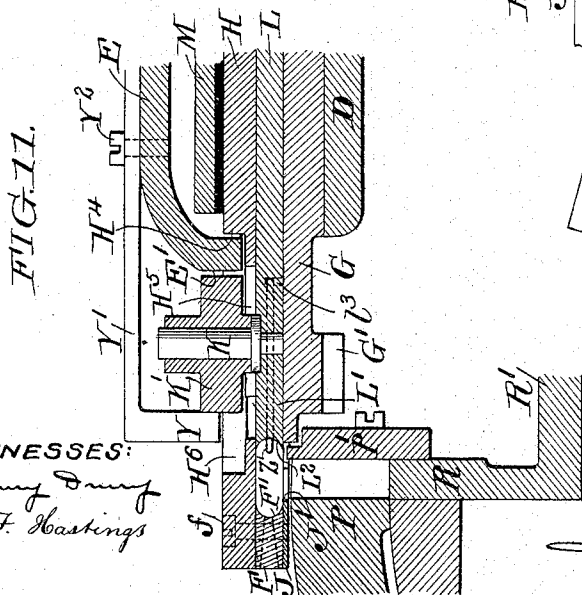
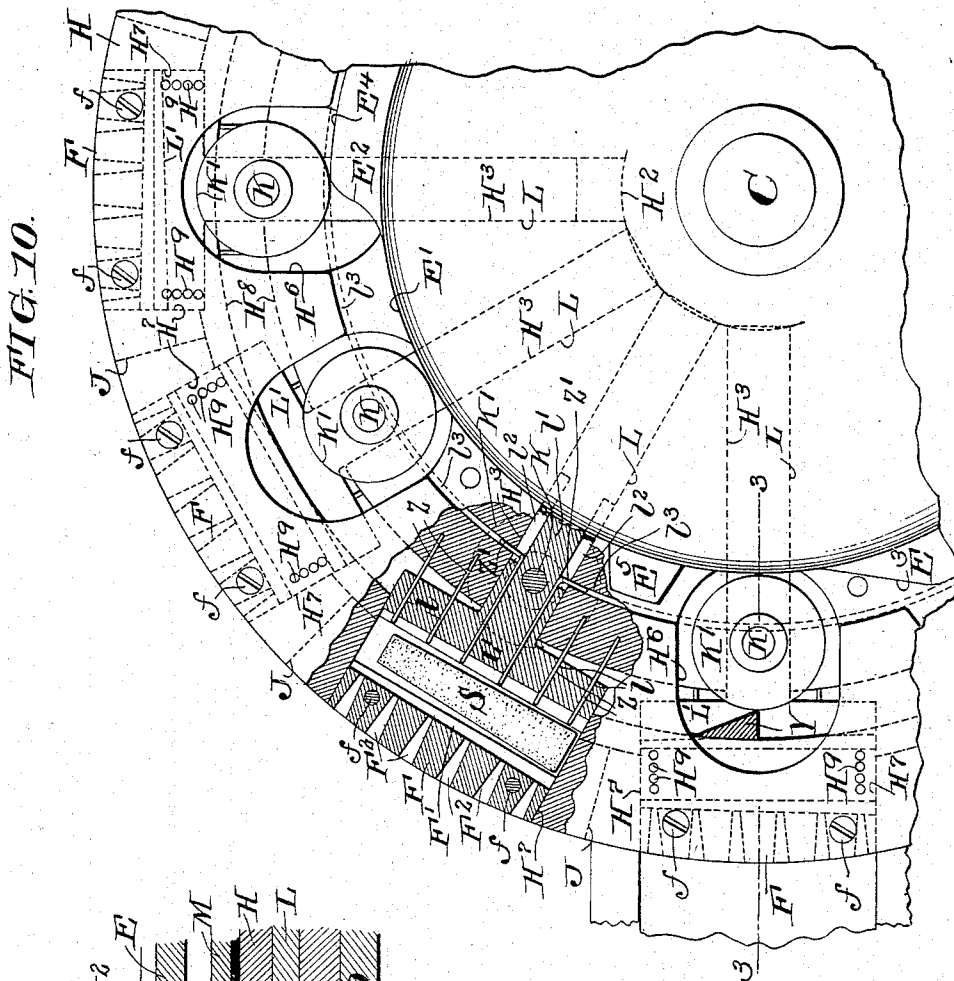
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7 Sheets—Sheet 5.

H. BILGRAM.
CIGARETTE MACHINERY.

No. 565,852.

Patented Aug. 11, 1896.



WITNESSES:

Henry Dury
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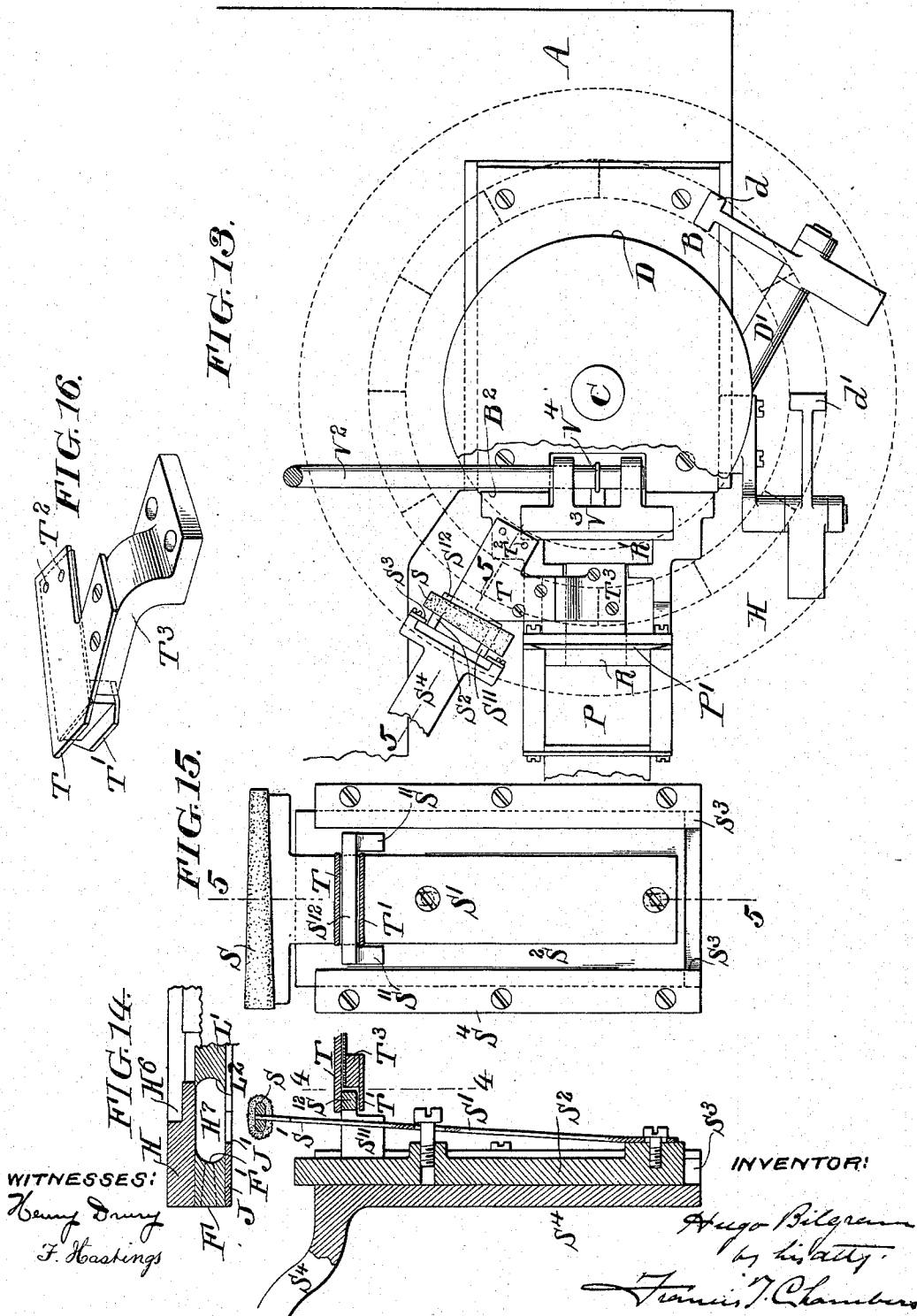
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H. BILGRAM.
CIGARETTE MACHINERY.

No. 565,852.

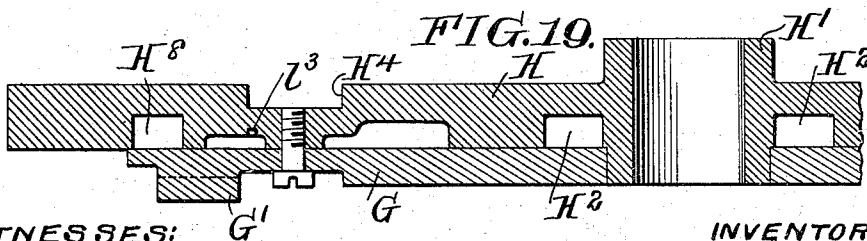
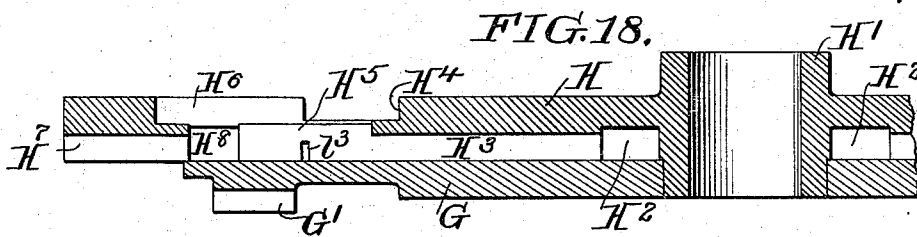
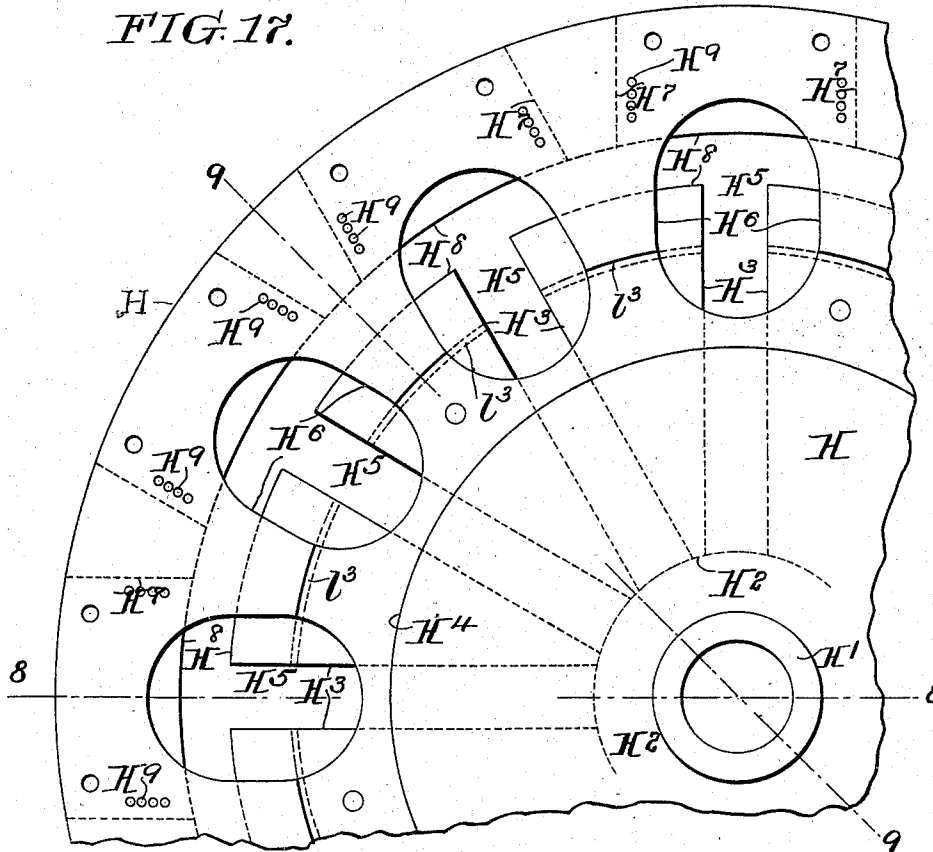
Patented Aug. 11, 1896.



H. BILGRAM.
CIGARETTE MACHINERY.

No. 565,852.

Patented Aug. 11, 1896.



WITNESSES:

Henry Dunning
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INVENTOR:

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UNITED STATES PATENT OFFICE.

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MESNE ASSIGNMENTS, TO THE BONSACK MACHINE COMPANY, OF
SALEM, VIRGINIA.

CIGARETTE MACHINERY.

SPECIFICATION forming part of Letters Patent No. 565,852, dated August 11, 1896.

Application filed July 2, 1894. Serial No. 516,255. (No model.)

To all whom it may concern:

Be it known that I, HUGO BILGRAM, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Cigarette Machinery, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to mechanism for making cigarettes, and particularly to the mechanism for molding a filler of definite length preparatory to inserting it into a cigarette-tube. I may further say that my invention is particularly, though not exclusively, adapted for molding fillers into conical shape.

The object of my invention is, generally speaking, to provide improved mechanism for molding cigarette-fillers with rapidity and precision, and my improvement consists in improved mechanism for feeding the molds, in improved molds and ways of arranging and carrying the same to improved devices for discharging the formed fillers from the molds, in swabbing mechanism for cleansing the molds prior to use, and in various mechanical devices for operating the molds in connected parts.

The nature of my improvements will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a side elevation of mechanism embodying my improvements; Fig. 2, a plan view thereof; Fig. 3, a cross-sectional elevation on the line 1 1 of Fig. 2; Fig. 4, a cross-section on the line 7 7 of Fig. 3; Fig. 5, a face view of the cam indicated at *q*. Fig. 6 is a cross-sectional elevation on the line 2 2 of Fig. 2. Fig. 7 is a perspective view of two coacting die-sections between which the filler is brought to shape. Fig. 8 is a similar view of the die-sections, showing them closed together. Fig. 9 is a perspective view of the conical cigarette-filler molded in the dies. Fig. 10 is a plan view, on an enlarged scale, of a part of the mold carrying and operating mechanism, partly sectioned to clearly illustrate the interior construction. Fig. 11 is a

cross-sectional view on the line 3 3 of Fig. 10. Fig. 12 is a plan view of a detail of construction. Fig. 13 is a plan view illustrating various details of the apparatus situated below the mold-carrying table. Fig. 14 is a cross-sectional view on the line 5 5 of Fig. 15, shown on an enlarged scale. Fig. 15 is an elevation of the swabbing, carrying, and operating mechanism. Fig. 16 is a perspective view of the device used in operating the swab. Fig. 17 is a plan view of the wheel or table upon which the molds are carried, Fig. 18 being a cross-section on the line 8 8 of Fig. 17, and Fig. 19 a cross-section on the line 9 9 of Fig. 17.

A indicates the frame of the machine.

B is a bracket resting on and secured to the frame A, and from which depends a sleeve-bearing B' for the table-carrying shaft C.

B² B³ indicate bracket-arms extending out from the sleeve-bearing B', and to which are secured the stationary parts of the hopper P and of the slide-guides to be hereinafter described. From the lower part of the sleeve-bearing B' extends an arm B³, to which is secured, by means of the arm I' and plate I, the shaft-supporting sleeve I².

C is a shaft having a bearing in the sleeve B' and supported on the top of this sleeve by the plate D, secured to the shaft by the pin *d*², as shown. The shaft is given a reciprocating oscillatory movement by means of the lever-arm C', secured to its lower end and connected through the pivot-joint C² with the rod C³, having secured at its other end a crank-pin C⁴ on the crank-disk C⁵, which disk, as shown in Fig. 1, is secured on the shaft O, said shaft being operated by means of miter-wheels from the main driving-shaft Q' and driving-pulley Q².

The plate D, as already mentioned, is pinned to the shaft C, so as to move with it, and forming a part of or connected to this shaft is a lever-arm D', having at its outer end a pawl *d*, which is arranged to engage with notches formed on the under side of plate G (hereinafter described) and to reciprocate with the shaft C. *d'* (see Fig. 1) indicates another pawl placed to engage the said notches in the plate G or circular rack that is engaged by the pawl *d*; but this pawl is stationary in-

stead of reciprocating, as is the case with the said pawl d . Concentric with the shaft C, but not secured thereto, and resting on the plate D, is the flat circular plate G, having, near its outer periphery, teeth G' , spaced and arranged to be engaged by the pawls d and d' . Above this plate or table and secured to it is the plate H, which, as shown, is centered on the shaft C by means of its hub H' , but which, as in the case of the plate G, is not secured to the shaft. The plate H is preferably made by casting, and for convenience I form it in the mold with annular spaces H^2 and H^8 , for convenience in planning out the guide-grooves H^3 and H^7 . The plate H is also formed with a groove H^4 on its upper face to give access to the cam-face of the plate E, to be hereinafter described, and is formed with elongated cavities H^6 to give access and play to the cam-rollers K' . These cavities, at least in part, must extend through the plate, as indicated at H^5 , Fig. 11, so that the stems K of the cam-rollers K' can be connected to the mold-slides below.

l^3 indicates a narrow groove formed on the under side of the plate H for a purpose to be hereinafter described.

F F, &c., indicate a series of mold-sections permanently secured in the grooves H^7 of the plate H, F indicating the curved mold-face and F^2 F^2 pinholes extending through the body of the mold or die section to the mold-face.

J is a plate secured to the under side of the mold-sections F, and having an edge J' , which extends somewhat in front of the edge of the mold-face itself.

L L, &c., indicate a series of slide-bars fitting and moving readily in the grooves H^3 of the plate H, and having at their outer extremities mold-sections L' , which fit and move on the inside of the slots or grooves H^7 . The curved mold-face of this section is indicated at L^2 , U indicating pinholes extending through this mold-section and l^2 l^2 indicating cavities in the sides of the slides L for the insertion of pins adapted to extend through the inner holes l of the die-section L' . Such pins are indicated in position in Fig. 10 of the drawings at $Z' Z'$, the inner ends of the pins being bent and inserted in the grooves l^3 of the plate H. The other pins (indicated at $Z Z$, &c.) are simply secured in place by being forced into holes bored in that portion of the plate H which faces the grooves H^7 .

Both the pins Z and Z' are, it will be observed, stationary with respect to the plate H, and they either do or do not project from the mold-sections in accordance with the backward-and-forward motion which is given to it. As shown, pins K are secured to the slide-bars L and extend up through the slots or openings H^5 of the plate H, these pins serving as the bearings for the cam-rollers K' , which lie in the cavities or recesses H^6 of the plate H and through which a forward-and-backward motion is given to the slide-bars and mold-sections carried on the ends thereof.

E indicates a plate secured as by a pin or key e to the shaft C, so as to oscillate therewith. The outer edge of this plate is of irregular contour at the points indicated by E^3 , E^5 , and E^2 , (see Fig. 2,) the portion of the edge between the points E^3 and E^2 , in one direction, coinciding with the circumference of a circle drawn from the center of shaft C (except at the point E^5) and is indicated in the drawings by E' , while the portion of the edge of the plate E, in the reverse direction, between the points E^3 and E^2 coincides with the circumference of a circle of greater diameter, but drawn from the same center, and is indicated in the drawings by E^4 . For convenience these projections and depressions in the edge of the plate E are designated as "cams" E^3 , E' , E^5 , E^2 , and E^4 , and they are arranged on the edge of plate E, so as to register with or engage the rollers K' .

E^5 is a short cam projecting from the part E' of the edge of plate E about midway between the cams E^3 and E^2 and operates to engage the cam-rollers K' to momentarily close the mold-sections upon the inserted swab, as hereinafter described.

Y' is an arm secured to the plate E and having at its outer end a cam-section Y extending down so as to engage the cam-rollers on the outer side.

M is a friction-plate lying upon the top of the plate H, but secured to the plate E as by pins M^2 , so as to turn or oscillate with said plate. It is held against the plate H with the desired frictional force by means of springs $M' M'$, arranged to act between the plate E and the said friction-plate.

The operation of the parts already described is as follows: At each forward motion of the shaft C, or motion in the direction of the arrow, (see Figs. 1 and 3,) the pawl d engages one of the teeth G' of the plate G and causes said plate, together with the plate H, secured to it, to move forward through an arc equal to that traversed by the shaft. When the shaft C begins its backward motion, the pressure of the friction-plate M upon the plate H is sufficient to cause the said plate to move backward slightly with the shaft until the teeth G' are engaged by the stationary pawl d' , which pawl holds the plates G and H, composing what I call the "mold-carrying wheel proper," stationary until the shaft begins another forward motion. My reason for using the friction-plate M is to insure that the plates G and H do not move forward beyond the movement of the pawl d , and that the ratchet-teeth G' are forced into intimate contact with the stationary pawl d' , whereby there shall be an exact registration between the molds and the unattached mechanism and especially an exact alinement of the pin-holes F^2 and H^9 with their respective pins. With each forward motion of the shaft C and mold-carrying wheel the sectional molds and the cams secured to the plate E move forward together and without affecting each other; but

at each backward motion of the shaft and plate E, attached thereto, the cam-face E³ is moved against a cam-roller K' in immediate juxtaposition to it, forcing said roller, together with the slide-bar L and mold-section L', connected with it, outward, so that the mold-section is moved with respect to the stationary mold-section from the position shown in Fig. 7 to that shown in Fig. 8. The part E⁴ of the cam edge of plate E being of uniform distance from shaft C holds the roller and mold-section in the position shown in Fig. 8 until it reaches the cam-surface E², where it is released from the pressure of the cam E⁴ and is free to move backward, its backward motion being accomplished by devices not yet described. The cam E⁵, situated between the cam-faces E² and E³, acts like the cam E³ to push out one of the movable mold-sections at each backward motion of the shaft C and its attached plate E, but the mold-section so operated upon is thrust in or back again by the wedge-like cam Y by the same backward motion of plate E and immediately after the operation of the cam E⁵. It will be observed that in the construction I have described the molds open upon the under side of the mold-carrying wheel, and this arrangement, while not absolutely necessary, I greatly prefer as facilitating the feed and discharge of the mold. I may also properly state here that I make my molds of the length of the cigarette for which the filler is intended and provide them with end abutments formed of the walls of the slots H⁷, said abutments serving to mold and pack the filler at the ends while the body is being molded by the pressure of the coacting mold-sections. In this way I am enabled to produce a filler of precisely the right size for the shell or wrapper into which it is to be inserted, and which will require no trimming, and I produce a cigarette with well-filled and with even-appearing ends as well as a compact and well-molded body.

Another feature to which I desire to call attention is that in the case of molds adapted to produce conical fillers, such as that indicated in Fig. 9 of the drawings, the slots H⁷ are formed to exactly fit the stationary mold-sections and so that the lower edges of the various mold-sections will lie in the same plane. This is best shown in Fig. 1 of the drawings. It will also be noticed that, in the construction I have described, the lip J' of the plate J, secured on the under side of the mold-section F and extending beyond the edge of the mold itself, will, when the movable section is closed upon the stationary section, overlap its edge as well. The function of this plate is to effectually close any opening on the under side of the closed sections of the mold, so as to insure that no filaments of tobacco will hang down and give, as it were, a beard to the molded filler.

Resuming now the description of the parts shown in the drawings, P is a hopper, the breadth of which is substantially equal to

the length of the mold, and is adapted to register with one of the molds, while the mold-plate H is stationary, and immediately before its movable section comes under the action of the cam-face E³. The rear wall P' of the hopper is formed so that its top edge will lie close to the under side of the movable mold-section L', the front of this edge registering with the front edge of the said mold-section when it is drawn back, as indicated in Fig. 11.

P² indicates a plunger forming, so to speak, the front wall of the hopper and moving toward and away from the rear wall P', its forward motion carrying it to a position just in front of the feed-plunger R, the function of which will be hereinafter described. As shown, the plunger P² is secured on the end of the pivoted lever P³, P⁴ indicating the pivot, and the backward-and-forward motion being given to the lever and plunger by means of a cam Q, working against a cam-roller P⁵ and secured to the main driving-shaft Q'. As shown in the drawings, the bottom of the hopper is made up of a segment of a cylindrical surface drawn from the center of the pivot P⁴.

R indicates a vertically-moving plunger reciprocating through an opening in the bottom of the hopper P and just in front of the rear wall P'. It is secured to a slide R' and actuated by the cam q, acting on the cam-roller R², secured to the bottom of the slide. The two-part mold F and L' comes to register with the hopper with the movable section L' thrown back, as indicated in Fig. 11. The feed-plunger R is then drawn down so that its top lies flush with the bottom of the hopper and the plunger P² is drawn back, so as to leave the opening of the hopper free. A charge of tobacco is then thrown into the hopper P in front of the plunger P², which is moved forward, compressing the tobacco between its face and the rear wall P', until it occupies the position shown in Fig. 11, where it comes to rest, and the plunger R then begins its upward motion, forcing the partly-compressed tobacco before it up into the mold. When this is accomplished, the cam-surface E³ in the backward motion of the plate E comes in contact with the roller K' and forces the movable mold-section L' forward until the mold is closed and the tobacco firmly compressed between the two sections, the lip J' passing beneath the lower edge of the die-section L' and preventing the projection of any threads of tobacco below the mold. The next forward motion of the mold-carrying plate H brings another mold to register with the feed-hopper, the filled mold being held tightly compressed by the elevated surface E⁴ of the cam, which continues in operation until, in due order, the roller is released by the retreating cam-face E², which permits the mold to be opened.

Passing next to the mechanism for opening and discharging the molds, (best shown in

Figs. 2 and 6,) U is a finger extending inward from a block U², secured to the end of the lever U⁴, which lever is pivoted at U⁵, and the end of its arm U⁶ carries the cam-roller U⁷, which runs in the box-cam U⁸, secured on the main driving-shaft Q'. Each inward motion of the lever U⁴ brings the finger U in contact with a roller K' shortly after it passes the retreat-
 15 ing cam-face E², and the finger pushes the roller and the movable mold-section back to the position as indicated in Fig. 6, opening the mold. The backward motion of the movable mold-section causes the relatively stationary pins Z and Z' to project from the curved
 20 face L² of the mold-section L', so as to thrust the molded filler out from the mold-face. At the same time a series of pins U', which are attached to the block U², are, by the inward motion of the lever-arm U⁴, thrust into the
 25 holes F² of the mold-section F for such a distance that they will project beyond the curved face of this mold-section and force the filler away from it. Preferably these pins U' fit loosely in holes in the block U² and have heads
 30 u', which rest on the outside of the block and are held in position by a clamping-plate U³. This construction I adopt in order to give the pins a certain amount of freedom. The pins Z, Z', and U' serve to force the filler away
 35 from both mold-sections; but, as in my construction the fillers while molding are forced with considerable pressure against the end walls of the slots H⁷, in which the mold-sections are secured, it is desirable to have additional mechanism which will force the molded
 40 fillers downward out of the mold. For this purpose I form series of pin-holes H⁹ H⁹ in the plate H, so as to come above each end of the molded filler in the position it occupies
 45 when the molds are open, and I provide two sets of pins V V, (see Figs. 2 and 6,) which, after the molds open, are forced down through the holes H⁹ against the filler, which is by this means thrust entirely out of the mold
 50 and allowed to fall into or upon any convenient receiving device. The pins V are secured to a cross-bar V', attached in turn to the bent bracket or arm V², the other end of which arm (see Figs. 3, 6, and 13) is attached
 55 to a slide V³. The pins are given a properly intermittent up-and-down motion by the action of the cam V⁶, acting on the cam-roller V⁵, secured to the slide V³, the said cam-roller being held in contact with the cam by the
 60 spring V⁴.

Passing now to the mechanism for swabbing or cleaning the mold prior to filling, after the filler is discharged from the mold the mold in the consecutive action of the machine and still wide open is brought into register with a swab S. (Best shown in Figs. 10, 13, 14, and 15.) While the mold is at rest in this position, the swab is forced up into it. This, in the construction shown in the drawings, is accomplished by the following mechanism.

The swab S is secured on the end of a spring-

arm S', the lower end of which is secured to a slide S², moving in guides (indicated at S³) and secured to an arm S⁴ of a pivoted lever 70 having on the other side of its pivot an arm S⁵, which (see Figs. 1 and 2) is pivotally secured at S⁶ to a rod S⁷, having a yoke S⁸, which extends over the end of shaft O, and a cam-roller S⁹, which runs in the box-cam S¹⁰. Arms 75 S¹¹ S¹¹ (see Figs. 14 and 15) support a cross-bar S¹², which is engaged by a plate T and a spring-plate T', fastened to the plate T at T², Fig. 16, the plate T being secured to a bracket T³, which bracket, as best shown in Figs. 3 and 80 13, is secured to the slide R', so as to move up and down with it. After the mold comes to register with the swab, the swab is thrust up into the open mold by the upward movement of slide E, the spring-plate T' permitting a slight 85 play or movement of the swab. After the swab has been thus carried into the mold the short cam E⁵ comes in contact with the roller K' of the movable mold-section and forces it outward, bringing the mold-sections toward each 90 other, so that the swab is brought into contact with both mold-faces, the mold being held in this partly-closed position while the lever-arm S⁴, which carries the swab, is moved by its cam connections, and by its means the 95 swab is given a longitudinal motion in the mold, wiping off any fragments of tobacco which may stick to it. As soon as this is accomplished, and it takes a very short time, the cam Y (see Figs. 10 and 11) comes in contact 100 with the outside of the cam-roller K' and forces the movable mold-section back, thus releasing the swab, which is drawn down by the downward motion of the slide R', after which the mold is moved to register with the 105 feed-hopper.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a series of two-part filler-molds and means for intermittently 110 moving the same, of a hopper arranged to register with the molds in turn, a plunger P² arranged to sweep the tobacco beneath the mold and a plunger R arranged to act between the wall P' of the hopper and plunger P² and to press the filler into the mold and means for closing the mold on the filler.

2. The combination with a series of two-part filler-molds opening on their undersides, 120 and means for intermittently moving the same, of mold-filling mechanism arranged below the molds and adapted to force a tobacco charge upward into each mold in turn and mechanism for closing the molds on the 125 charge and opening them to discharge the molded fillers.

3. The combination with a two-part filler-mold for forming conical cigarette-fillers, of a lip J' arranged to extend beyond the edge 130 of one mold-section and overlap the edge of the other section when the mold is closed.

4. The combination with a mold-carrying wheel and mechanism acting continuously to

intermittently rotate the same, of a series of mold-sections for forming conical cigarette-fillers secured to and rotating with the wheel, and a coating series of mold-sections also moving with the wheel but movable also in substantially radial lines thereon to and from the fixed sections.

5 The combination with a substantially horizontal mold-carrying wheel and means continuously acting to intermittently rotate the same, of a series of mold-sections for forming conical cigarette-fillers secured to and rotating with the wheel and a coating series of mold-sections also moving with the wheel but movable also in substantially radial lines thereon to and from the fixed sections.

6 The combination with a substantially horizontal mold-carrying wheel and means for intermittently rotating the same, of a series of mold-sections secured to and rotating with the wheel and a coating series of mold-sections also moving with the wheel but movable also in substantially radial lines thereon to and from the fixed sections, the said mold-sections and carrying-wheel being arranged so that the molds will open downward to receive and discharge the fillers.

7 The combination with a mold-carrying wheel, and means for intermittently rotating the same, of a series of mold-sections secured to the outer edge of the wheel and rotating with the wheel and a coating series of mold-sections situated inside of the stationary sections also moving with the wheel but movable also in substantially radial lines therein to and from the fixed sections and the cam-plate E provided with a cam E^3 , E' , E^2 , for actuating the said movable sections.

8 In combination with an intermittently-moving mold-carrying wheel having slots cut therein of substantially the length of the cigarettes to be formed, a series of relatively-fixed mold-sections secured across said slots, a coating series of mold-sections also secured across said slots but movable therein to and from the fixed sections the walls of the slots serving as end abutments to the molds, a feed-box or hopper of substantially the breadth of the length of the molds and a feed-plunger of substantially the length of the mold arranged to force the tobacco from said hopper into the molds.

9 In combination with an intermittently-moving mold-carrying wheel having slots cut therein of substantially the length of the cigarettes to be formed, a series of relatively-fixed mold-sections secured across said slots, a coating series of mold-sections also secured across said slots but movable therein to and from the fixed sections, the walls of the slots serving as end abutments to the molds, a feed-box or hopper of substantially the breadth of the length of the molds, a compacting-plunger working in the hopper and arranged to press the tobacco to a position over the feed-plunger, and a feed-plunger of substantially the

length of the mold arranged to force the tobacco from said hopper into the molds.

10 The combination with a substantially horizontal mold-carrying wheel, a series of two-part conical cigarette-molds arranged on said wheel so as to open on the under side thereof and so that their lower edges will be in the same plane and a filling-plunger arranged to push the fillers upward into the mold and to lie flush with the lower edge of the movable mold-section while said section is closing over it upon the filler.

11 In combination with a mold-carrier and a series of two-part filler-molds, one part of each mold being stationary and the other movable, a series of pin-holes, as F^2 , extending through the body and face of the stationary mold-section and a series of intermittently-movable pins U' located, when in their normal position, outside of the stationary mold-section and operating to be brought into alinement with and thrust through the holes F^2 to push the fillers out of the stationary section.

12 In combination with a mold-carrier and a series of two-part filler-molds provided with a series of pin-holes as l extending through the movable mold-section and a series of pins Z secured to the carrier and extending through the holes l of the movable mold-section so as to enter the mold-cavity when said section is retracted, all substantially as described, and so as to push the fillers out of the sections.

13 In combination with a mold-carrier and a series of two-part filler-molds provided with a series of pin-holes as F^2 and l extending through each mold-section, a series of pins Z secured to the carrier and extending through the holes l of the movable mold-section so as to enter the mold-cavity when said section is retracted, and a series of intermittently-movable pins U' arranged to be thrust through the holes F^2 of the stationary section, all substantially as described, and so as to push the fillers out of the sections.

14 In combination with a mold-carrier and a series of two-part filler-molds, one part of each mold being stationary and the other movable, pushers, as pins V , arranged to enter the mold at each of its ends and substantially at right angles to the movement of the movable section to push the filler from between the mold-sections.

15 In combination with a mold-carrier and a series of two-part filler-molds provided with a series of pin-holes as F^2 and l extending through each mold-section, a series of pins Z secured to the carrier and extending through the holes l of the movable mold-section so as to enter the mold-cavity when said section is retracted, a series of intermittently-movable pins U' arranged to be thrust through the holes F^2 of the stationary section, all substantially as described, and so as to push the fillers out of the sections, and a pusher, as

pins V, arranged to enter the mold and push the fillers from between the sections.

16. In combination with a mold-carrier and a series of two-part filler-molds provided with a series of pin-holes as F^2 and l extending through each mold-section, a series of pins Z secured to the carrier and extending through the holes l of the movable mold-section so as to enter the mold-cavity when said section is retracted, a series of intermittently-movable pins V arranged to be thrust through the holes F^2 of the stationary section, and a mold-opening arm as U arranged to thrust the movable section away as the pins F^2 enter the fixed section.

17. In combination with a mold-carrying wheel and a series of molds supported and carried thereon, a mold-swab, and mechanism for intermittently moving the carrying-wheel into registration with the swab, and mechanism for thrusting the swab into each mold in turn, the said mechanisms being operated from the same driving-shaft.

18. In combination with a mold-carrier and a series of two-part molds supported and carried thereon, a mold-swab, and swab-actuating mechanism whereby the swab is thrust into and longitudinally moved in each mold in turn.

19. In combination with a mold-carrier and a series of two-part molds carried thereon, a swab mechanism for thrusting the swab into an open mold, mechanism for closing the mold on the swab, mechanism for longitudinally moving the swab in the mold, and mechanism for opening the mold and withdrawing the swab therefrom preparatory to charging the mold.

20. The combination of an intermittently-revolving mold-carrying wheel, a series of relatively fixed and movable mold-sections carried thereon, mechanism for filling the molds operating during each rest of the carrier for holding the molds charged while the sections close, and mold-closing mechanism acting on the movable sections while in register with the feed mechanism and while the carrier is at rest.

21. The combination of an intermittently-revolving mold-carrying wheel, a series of relatively fixed and movable mold-sections carried thereon, mechanism for filling the

molds operating during each rest of the carrier, an oscillating cam $E^3 E' E^2 E^4$ working in one direction while the carrier-wheel is at rest and in the other direction moving with the carrier, said cam operating to close the filled mold in its backward sweep and its part E^4 holding the molds closed for the desired distance, and a mold-opening device acting to open the mold at the point where the filler is delivered therefrom.

22. The combination of the intermittently-rotating mold-carrying wheel, the series of two-part molds carried thereby, the oscillating cam $E^3 E' E^2 E^4$ acting to close the molds and hold them closed for a determined period, the cam E^5 acting to close the molds for a limited period after they are emptied and before they are filled, mold-opening devices as U and Y acting to open the molds when released by the cams aforesaid, a mold-swab and mold-filling mechanism, all substantially as and for the purpose specified.

23. The combination of the intermittently-rotating mold-carrying wheel, the series of two-part molds carried thereby, the oscillating cam $E^3 E' E^2 E^4$ acting to close the molds and hold them closed for a determined period, the cam E^5 acting to close the molds for a limited period after they are emptied and before they are filled, the mold-opening pusher U, the mold-opening cam Y oscillating with cams $E^3 E' E^2 E^4$ and E^5 and filling and swabbing mechanism as described.

24. The combination of the mold-carrying wheel having a circular rack G' secured to it, with an oscillating shaft C, a pawl d moving with shaft C and arranged to engage rack G' and move the table in one direction, a stationary locking-pawl d' arranged to engage the rack and hold the wheel against backward motion and a friction-clutch M moving with shaft C and in contact with the wheel whereby the table is carried back until engaged by pawl d' .

25. The oscillating swab-carrier S^4 in combination with a slide carried thereby, a swab supported on said slide and mechanism for moving the slide up and down in the carrier.

HUGO BILGRAM.

Witnesses:

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