

June 29, 1943.

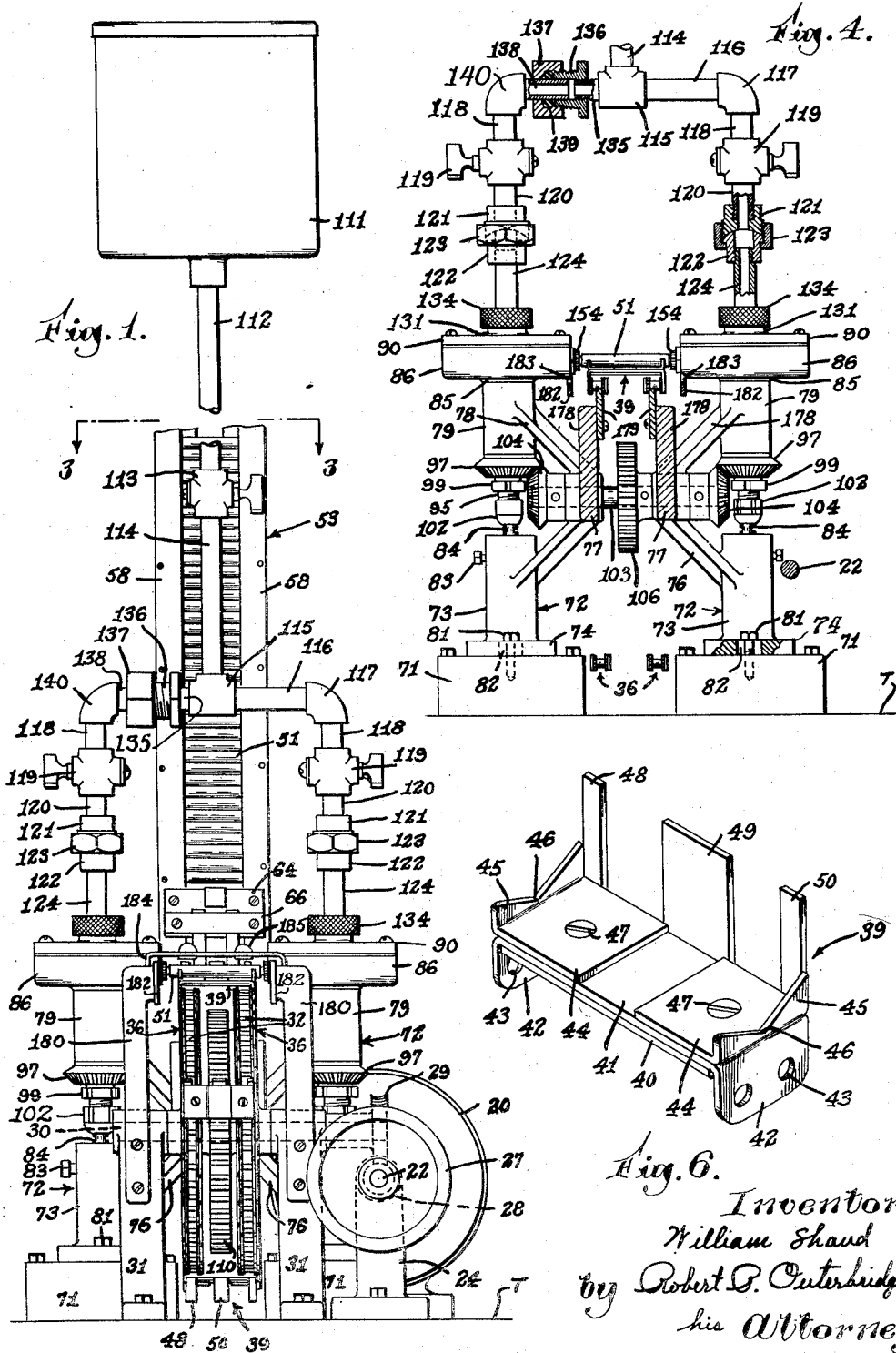
W. SHAND

2,322,747

MACHINE FOR TREATING CIGARETTES

Filed Dec. 27, 1937

6 Sheets-Sheet 1



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MACHINE FOR TREATING CIGARETTES

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6 Sheets-Sheet 2

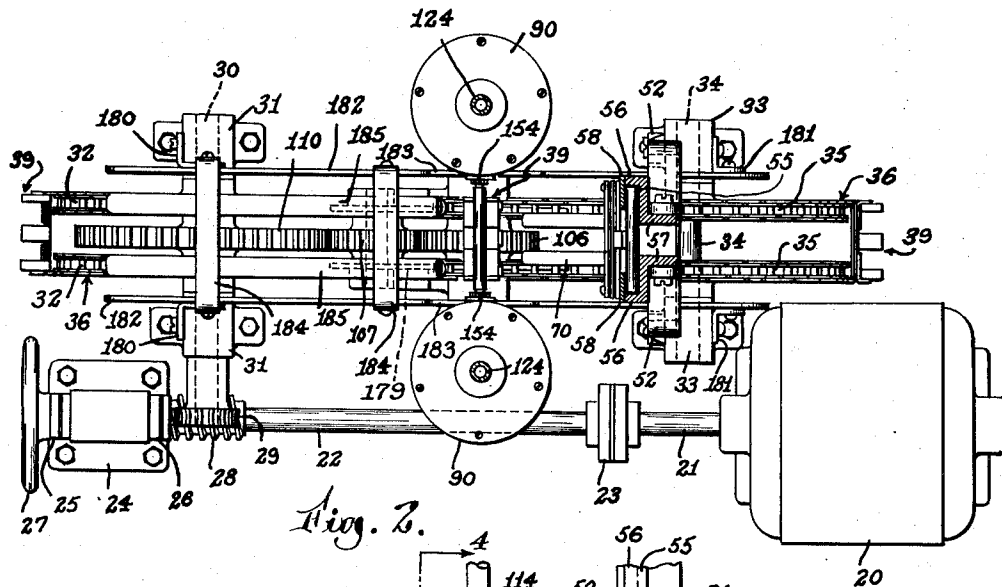


Fig. 2.

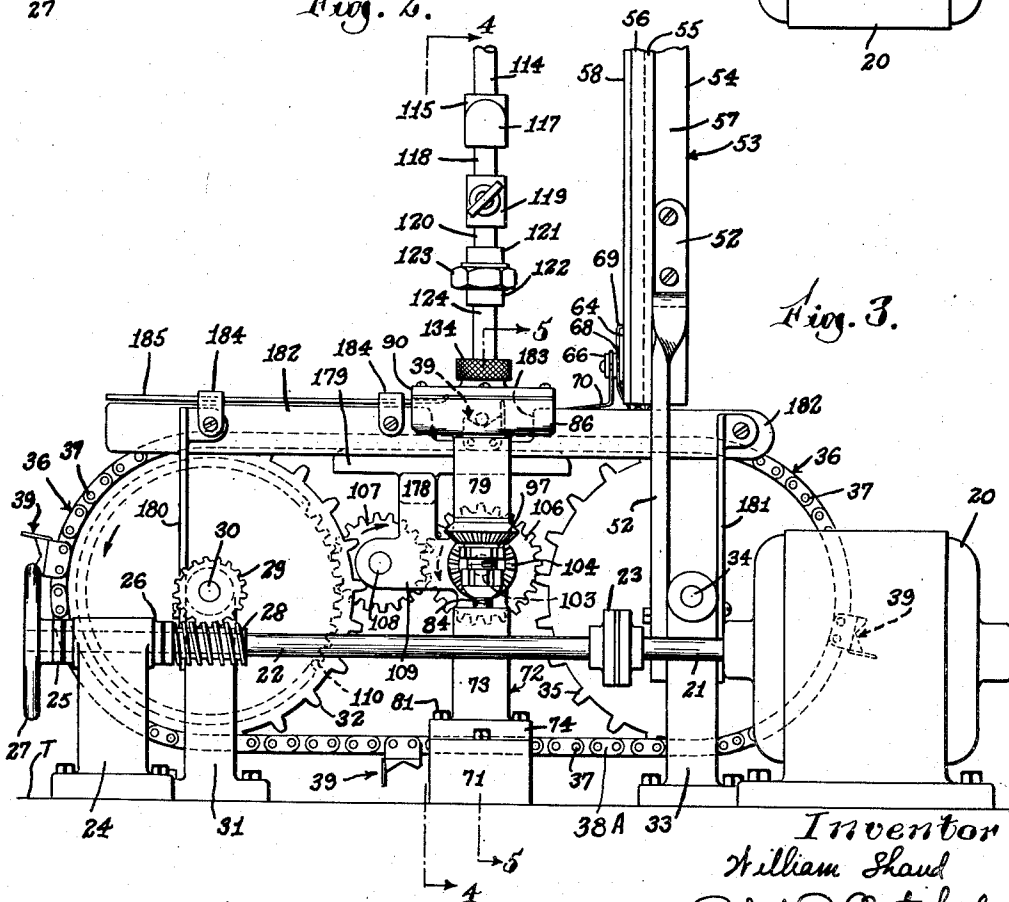


Fig. 3.

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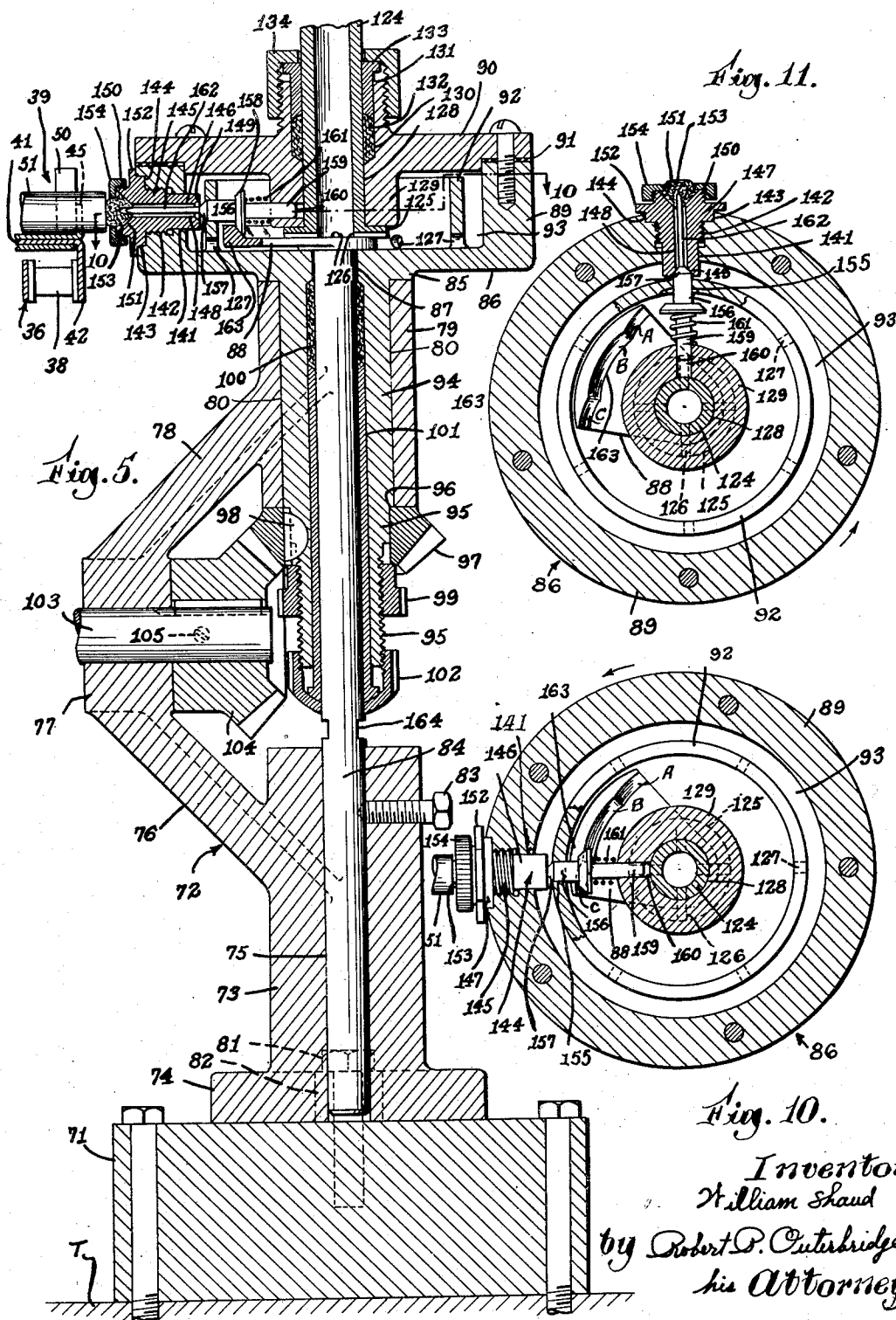
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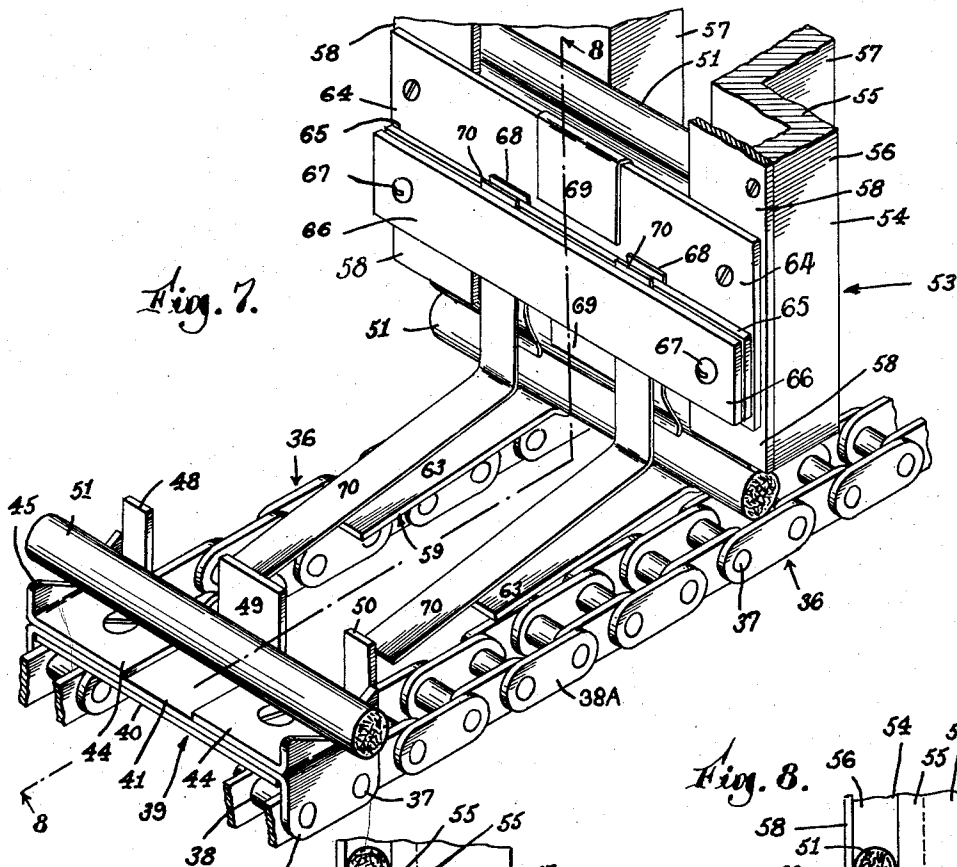


Fig. 7.

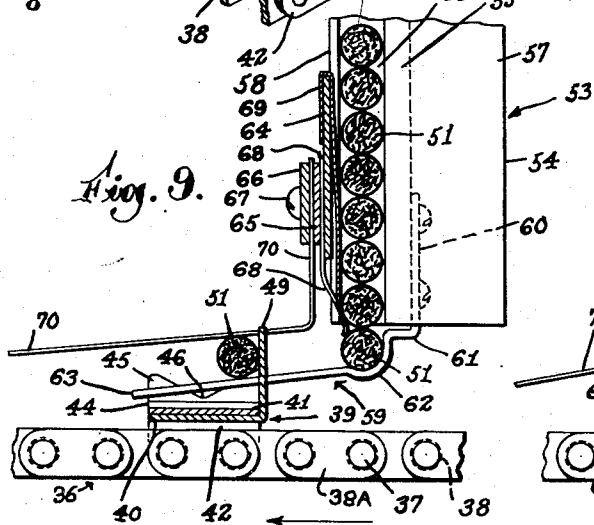


Fig. 9.

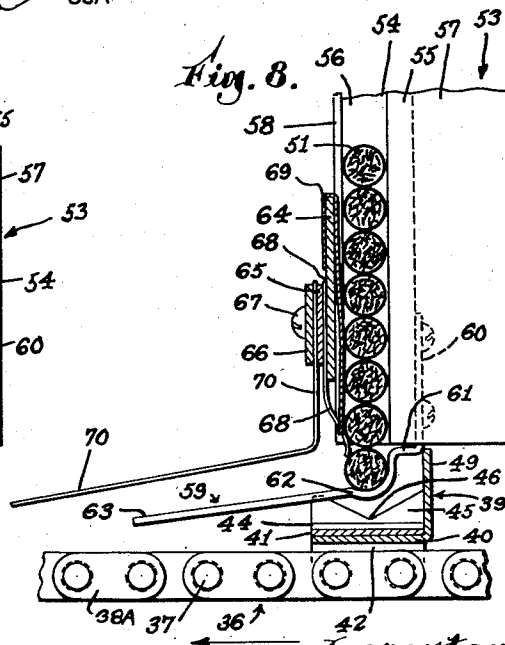


Fig. 8.

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Fig. 12.

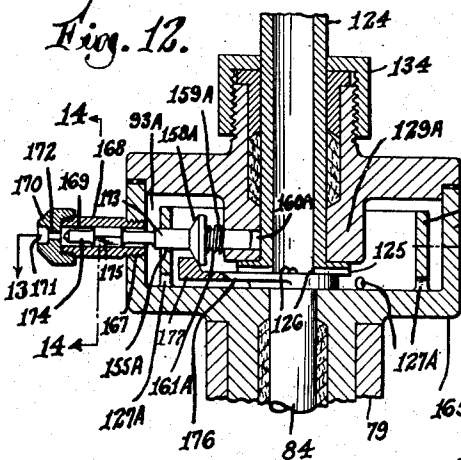


Fig. 13.

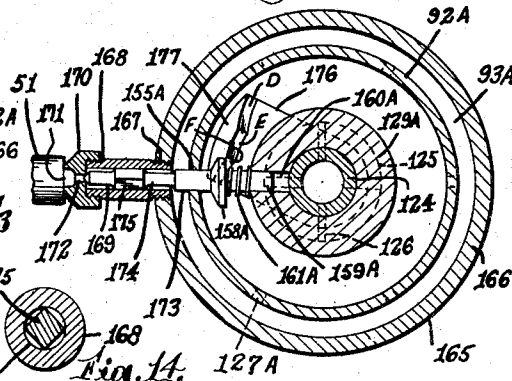


Fig. 14.

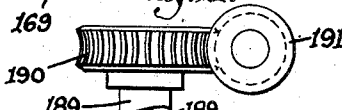


Fig. 15.

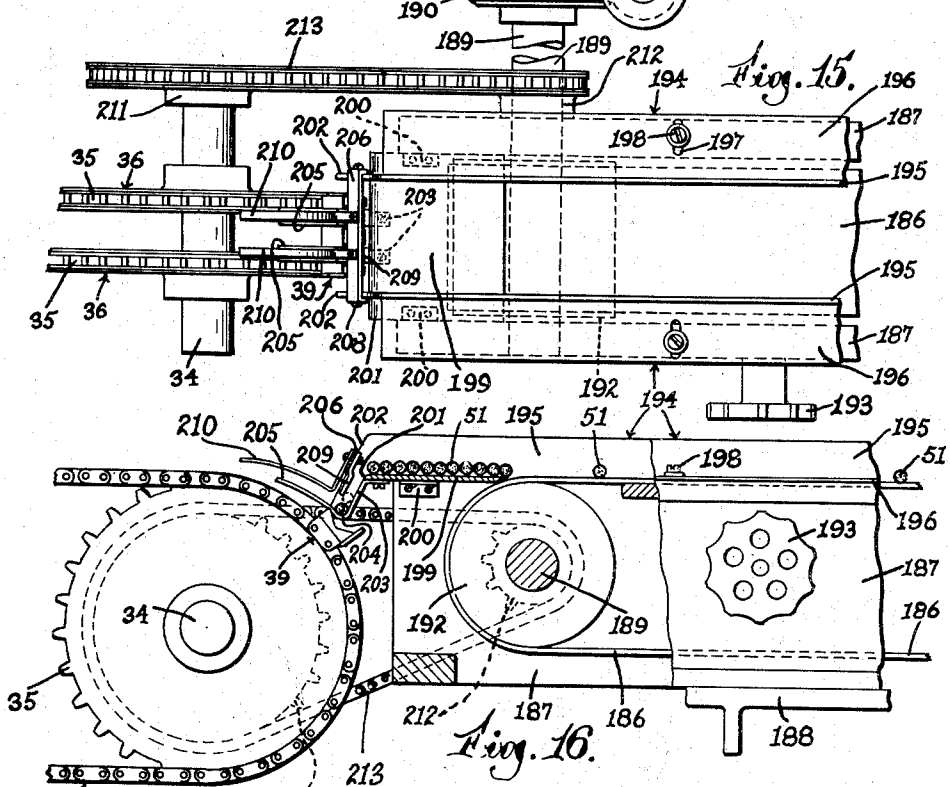
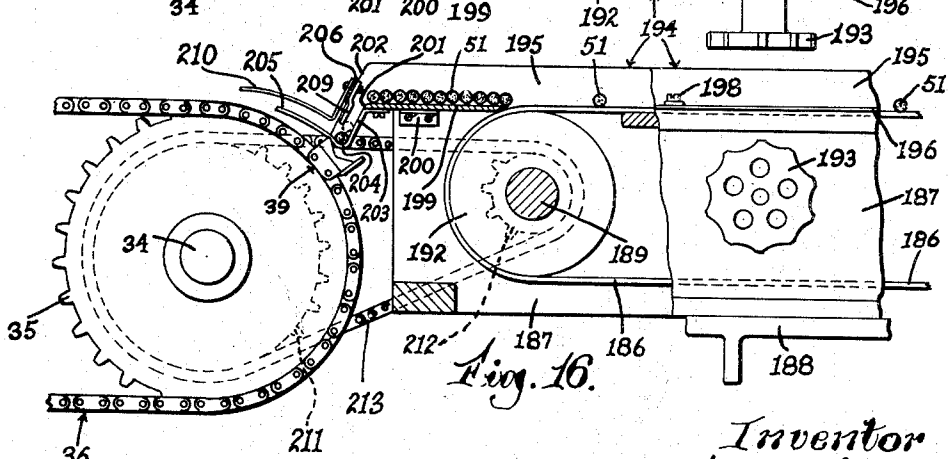


Fig. 16.



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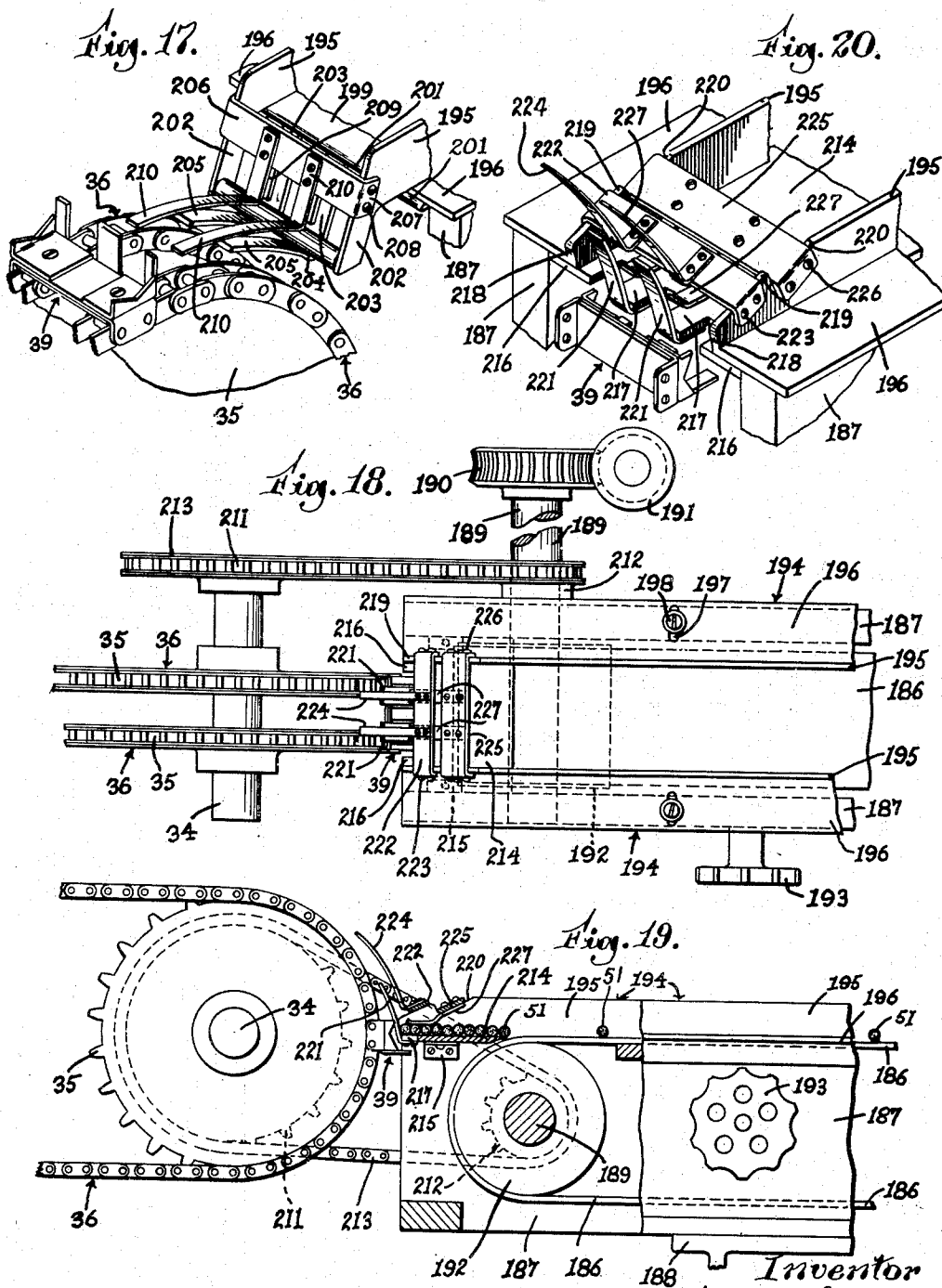
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MACHINE FOR TREATING CIGARETTES

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,322,747

MACHINE FOR TREATING CIGARETTES

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Application December 27, 1937, Serial No. 181,736

20 Claims. (Cl. 131—88)

The present invention relates to cigarette machines and more particularly to machines for applying treating material to one or both ends of a cigarette after delivery from a cigarette-making machine.

In U. S. Patent No. 2,190,107, granted on February 13, 1940, upon the application of Walter B. Pohle, there are disclosed methods of providing one or both ends of a cigarette with a treating fluid which forms there a water-resistant, porous cake or plug of bound tobacco fibres and particles. The primary purpose of thus treating a cigarette is the double one, so far as smoking is concerned, of preventing loose particles of tobacco from coming off on the smoker's tongue or in his mouth and also of retaining within the cigarette the fine tobacco dust which otherwise passes out with the smoke and is a source of irritation to the delicate membranes of the smoker's mouth, throat, and lungs. It may also be said that when cigarettes so treated are not being smoked, the particle and dust retention provided by the caking prevents bits of tobacco from being deposited in a box, jar, tray, or the like for holding cigarettes or in a smoker's pocket or handbag as when an opened package is carried there.

Bearing these treating purposes in mind, it is the principal object of the present invention to provide a machine which practices methods brought out in the said Pohle patent for applying treating fluid to one or both ends of a cigarette. The treating fluid itself preferably includes binder material carried by an evaporable solvent, but may be of any nature or composition suitable for the purpose. The present invention differs radically from the Pohle apparatus disclosure in that embodiments of the present invention treat individual cigarettes while by the Pohle apparatus the treating fluid is applied to a continuously formed rod prior to the operation of the cigarette cutting-off mechanism.

To the accomplishment of the above-named principal object and of such other objects as may hereinafter appear, the present invention resides in certain constructions, combinations, and arrangements of parts, all fully described hereinafter and then pointed out broadly and in detail in the appended claims, possessing advantages which will be readily apparent to those skilled in the art.

The various features of the present invention will be readily appreciated from inspection of the accompanying drawings, illustrating the best

forms of the invention at present known to the inventor, in which

Figure 1 is a view of the machine in front elevation;

5 Fig. 2 is a view of the machine in plan, the source of fluid supply not being shown;

Fig. 3 is a view of the machine in right side elevation, cut off at the top along the line 3—3 of Fig. 1;

10 Fig. 4 is a detail view in elevation, partially in section, taken along the line 4—4 of Fig. 3;

Fig. 5 is a detail view in sectional elevation taken along the line 5—5 of Fig. 3;

15 Fig. 6 is a detail view in perspective of one of the cigarette cradles;

Fig. 7 is a detail view in perspective of the lower end of the cigarette stack chute, the cradled cigarette being shown in the position occupied when it is about to receive treating fluid;

20 Fig. 8 is a detail view in right side elevation taken along the line 8—8 of Fig. 7, the cigarettes being shown in the position they occupy just before the cradle withdraws the lowermost cigarette from the stack;

25 Fig. 9 is a view similar to Fig. 8, the cradle being shown in the position occupied shortly after it has withdrawn the lowermost cigarette from the stack;

30 Fig. 10 is a detail view in sectional plan taken along the line 10—10 of Fig. 5, the applicator being shown in the act of applying treating fluid to a cigarette end;

35 Fig. 11 is a view similar to Fig. 10, the applicator being rotatively spaced 90 degrees from its Fig. 10 position;

Fig. 12 is a detail view in sectional elevation, similar to the upper portion of Fig. 5, but showing the applicator in the form of a nozzle having its valve open;

40 Fig. 13 is a detail view in sectional plan taken along the line 13—13 of Fig. 12, the nozzle valve being shown about to close;

Fig. 14 is a detail sectional view taken along the line 14—14 of Fig. 12;

45 Fig. 15 is a detail view in plan showing an embodiment of the present invention operatively connected to a cigarette-making machine and adapted to receive cigarettes directly therefrom;

50 Fig. 16 is a detail view in right side elevation, partially in section, of the apparatus shown in Fig. 15;

Fig. 17 is a detail view in perspective showing the cigarette holder and associated parts of the Fig. 15 embodiment of the present invention;

55 Fig. 18 is a detail view in plan showing a differ-

ent embodiment of the present invention operatively connected to a cigarette-making machine and adapted to receive cigarettes directly therefrom;

Fig. 19 is a detail view in right side elevation, partially in section, of the apparatus shown in Fig. 18; and

Fig. 20 is a detail view in perspective showing the cigarette holder and associated parts of the Fig. 18 embodiment of the present invention.

Referring to the drawings, the embodiments of the present invention illustrated in Figs. 1-14 are provided with a prime mover which comprises an electric motor 20 (Figs. 1, 2, and 3) to the rotor 21 of which the rear end of a drive shaft 22 is operatively connected by means of a suitable coupling 23. Adjacent its forward end the drive shaft 22 is suitably journaled in a standard 24 (Figs. 1, 2, and 3), thrust bearings 25 and 26 being mounted on the drive shaft at the front and rear, respectively, of the standard. The forward end of the drive shaft carries a hand wheel 27 for manual rotation when desired, and completing the above-described structure is a worm 28 mounted fast on the drive shaft adjacent the thrust bearing 26. The motor 20 and the standard 24 are suitably mounted on a table T, as indicated in Figs. 1, 3, and 4.

The worm 28 meshes with and rotates counter-clockwise a worm gear 29 secured to a shaft 30 which is suitably journaled in spaced standards 31 (Figs. 1, 2, and 3) located forwardly of the machine and at opposite sides thereof on the table T, and secured to the shaft 30 so as to be located between the standards 31 are a pair of spaced sprocket wheels 32. At the rear of the machine (Figs. 2 and 3) there are provided spaced standards 33, like the standards 31, in which is suitably journaled a shaft 34 at the level of the shaft 30. A pair of spaced sprocket wheels 35, like the sprocket wheels 32, are mounted on the shaft 34 between the standards 33 so as to be aligned with the sprocket wheels 32, respectively, and a pair of endless chains 36 (Figs. 1, 2, 3, and 7) having the usual pins 37, cylinders 38, and plates 38A (Figs. 3, 7, 8, and 9) extend lengthwise of the machine so as to pass around and be supported in spaced relation by the sprocket wheels. By reason of the above construction it will be seen that the upper runs of the chains 36 move horizontally in a forward direction.

The function of the chains 36 is the double one of supporting a series of cradles each adapted to hold a cigarette and of transferring the cradled cigarettes forwardly along the machine for successive presentment to treating fluid applying means and thereafter for discharge from the machine. To the first of these ends the illustrated embodiments of the present invention are provided with four such cradles (Figs. 1-9), indicated generally by the numeral 39 and all identical and equally spaced apart. With particular reference to Figs. 6, 7, 8 and 9 each cradle 39 is, merely for purposes of illustration, shown as being provided with a base plate 40 substantially as long as the distance transversely of the machine between the outer chain plates 38A, while resting flatwise on the base plate 40 is a plate 41 the opposite ends of which extend beyond the ends of the plate 40 and depend at an angle of 90 degrees so as to form ears 42 which are the same size as a chain plate 38A and form substitutes therefor at the outer sides of each chain, as indicated, best in Figs. 4 and 7. Openings 43 (Fig. 6) are provided to receive the outer ends of the

chain pins 37 to secure the plate 41 to the chains.

Supported by the opposite end portions of the plate 41 are cigarette-supporting members each comprising an inwardly directed base plate portion 44 resting flatwise on the plate 41 and an upstanding ear 45 aligned substantially with the adjacent depending ear 42. The upstanding ears 45 are each provided with an obtuse V-notch 46 (Fig. 6) the rearward incline of which preferably extends upwardly to a greater height than does the forward incline, which latter preferably has a rounded top. The supporting members 44-45 are removably secured to the plate 41 by screws 47 which also serve to secure the base plate 40 to the plate 41, and the plate portions 44 are spaced apart on the plate 41 a distance substantially less than the length of a cigarette, as indicated in Figs. 1, 2, 4, 5, and 7. Completing the structure of each cradle 39 are three fingers 48, 49, and 50 which are integral with the plate 40 and are upstanding at its rear. The finger 49 is relatively wide and is located centrally of the rear of the cradle, while the fingers 48 and 50 are relatively narrow and are spaced from the finger 49 so as to stand at the opposite ends of the cradle, adjacent the respective notched ears 45.

With the above-described construction for each cradle, it will be seen that the illustrated embodiments of the present invention are provided with mechanism whereby the cradles 39 pursue an endless circuit on the chains 36, traveling horizontally and forwardly with the upper runs of the chains and horizontally and rearwardly with the lower runs of the chains. A cigarette 51 supported by a cradle on the upper chain runs is carried therealong forwardly (to the left, viewing Figs. 2 and 3) and is discharged to some suitable receiver (not shown) as the cradle approaches the position shown at the left in Figs. 2 and 3.

In order to supply each cradle 39 with a cigarette 51, for transfer along the upper runs of the chains 36 so that one or both ends of the cigarette may receive treating fluid, it is contemplated that in the illustrated embodiments of the present invention the cigarettes are received by the cradles either after the latter have reached to top horizontal chain runs, i. e., are at their uppermost level, or before they have reached their uppermost level, as, for example, while the supporting chain portions for the cradles 39 are still engaged with the sprocket wheels 35.

To achieve this first type of receiving, the embodiments of the present invention illustrated in Figs. 1-14 are provided rearwardly on opposite sides with spaced upright braces 52 (Figs. 2 and 3) secured at their lower ends to the standards 33, respectively, and secured at their inwardly bent upper ends to the opposite sides of the lower portion of a cigarette stack holding mechanism so as to form a support for it. The stack holding mechanism, indicated generally by the reference numeral 53 (Figs. 1, 3, 7, 8, and 9), is provided with two upright frame members 54 symmetrically constructed, each frame member having throughout its length a cross section such as to provide (Figs. 2, 3, and 7) a transversely extending portion 55, a forwardly extending portion 56 integral with the portion 55 at its outer edge, and a rearwardly extending portion 57 integral with the portion 55 at its inner edge. The frame members 54 are equally spaced apart throughout their length, the braces 52 are secured to the rearwardly extending portions 57, and the front edge face of each of the forwardly extending

portions 56 is provided with a vertical transverse plate 58 the inner edge of which extends inwardly of the frame portion 56 as indicated in Figs. 2 and 7. The distance between the rear face of the plate 58 and the front face of the transverse frame portions 55 is such as to be only slightly greater than the diameter of a cigarette, and in a similar manner the distance between the inner faces of the forwardly extending frame portions 56 is only slightly greater than the length of a cigarette. By reason of this construction, it will be seen that there is provided what is in effect a chute in which a stack of horizontal cigarettes may be placed, as indicated in Figs. 1, 2, 7, 8, and 9, and down which they may move while each remains in a horizontal position. The frame members 54 and plates 58 may extend upwardly any suitable distance, while their downward termination, as indicated best in Figs. 8 and 9, is preferably such as to be just cleared by the cradle fingers 48, 49, and 50 when the cradles 39 are on the upper runs of the chains 36.

In order to support from below the cigarette stack in the chute, the embodiments of the present invention illustrated in Figs. 1-14 are provided with a pair of supporting fingers 59 (Figs. 7, 8, and 9). Each of the fingers 59 comprises a rear vertical portion 60 (Figs. 8 and 9) secured to the rear face of the lower end of a transverse frame member portion 55, a forwardly extending portion 61 underlying its associated frame portion 55, a downwardly and forwardly curved stack-supporting portion 62 underlying the chute proper, i. e., the interior of the chute, and a forwardly and downwardly extending portion 63 terminating at a point slightly spaced above the level of the cradle base plate portions 44 (see Fig. 9) as a cradle rests beneath the fingers 59 on the upper runs of the chains 36. Inasmuch as the fingers 59 are largely below the level of the top of the upright cradle fingers 48, 49, and 50, the fingers 59 are secured to the frame portions 55 in such manner as to be located between the central finger 49 and the adjacent end cradle finger 48 or 50, as the case may be, thereby clearing the cradle 39 as it passes by them.

As indicated in Figs. 8 and 9, the curved portion 62 of each finger 59 is preferably so positioned downwardly with respect to the bottom of the frame members 54 and the plates 58, i. e., with respect to the bottom of the chute, that only the lowermost cigarette of a stack in the chute extends below its bottom. As also indicated in Figs. 8 and 9, the curvature of the curved finger portions 62 is substantially the same as that of a cigarette so that the weight of the stack is distributed partially around the circumference of the lowermost cigarette instead of only along its bottom portion and so does not flatten said bottom portion as would be the case were the finger portions 62 flat instead of curved as shown.

But while it is desirable that the finger portions 62 have the curvature described, it is also desirable that the weight of the stack not cause the lowermost cigarette to be thrust forwardly along the finger portions 63, an action which the curvature of each finger portion 62 more or less invites. To prevent this result, the embodiments of the present invention illustrated in Figs. 1-14 are provided with a construction which acts on the upper part of the lowermost cigarette at a point generally opposite its engagement areas with the finger portions 62, and which also acts on cigarettes above the lowermost one.

Describing this last-named structure in detail, and with reference to Figs. 7, 8, and 9 in particular, a flat plate 64 extends transversely across the vertical chute plates 58 at their lower ends and engages them flatwise. Across the lower portion of the plate 64 there extends transversely an intermediate flat plate 65 coterminous with the plate 64, and registering with the intermediate plate 65 is a forward flat plate 66. These three plates are secured in position by means of screws 67 which are threaded through the vertical chute plates 58 and into the forwardly extending frame portions 56. Gripped in interposition between the plate 64 and the intermediate plate 65 are two depending flat springs 68, substantially as wide as the fingers 59 and aligned with them, respectively, so as to clear the cradles 39. With particular reference to Figs. 8 and 9, below the plates 64 and 65 each spring 68 is provided with a reverse curve, the first part of which extends rearwardly and downwardly and the terminating part of which extends downwardly and forwardly. By reason of this construction, the first part of the reverse curve of each spring 68 engages the next to the bottom cigarette 51 and exerts a slight rearward and upward pressure upon it; the point of reversal of the curve is substantially between this cigarette and the lowermost one; and the second or forwardly curving part of the reverse curve of each spring 68 engages the periphery of the lowermost cigarette at a point somewhat below its top so as to exert a slight pressure more or less rearwardly and downwardly. By reason of the slight rearward and upward pressure which the first reverse curve part of each spring 68 exerts on the next to the bottom cigarette, it will be seen that any tendency of the weight of the stack to flatten the top portion of the lowermost cigarette is counteracted. The springs 68 have a flexibility such that the lowermost cigarette may be easily withdrawn, as will be described, and so as to offer no impedance to the downward movement of the stack after the withdrawal, but are of sufficient stiffness so that they tend to prevent any action which the weight of the stack might have to dislodge the lowermost cigarette forwardly from the curved finger portions 62 were no springs 68 present. Cooperating with the springs 68 in the performance of this last-named function is a flat spring plate 69 clipped over the top of the transverse plate 64 so as to depend rearwardly thereof in the space between the frame plates 58 and in engagement with several of the lower cigarettes in the stack, terminating downwardly at about the median line of the next to the bottom one. This spring plate 69, like the springs 68, exerts a slight rearward pressure, but not enough to impede the downward movement of the stack.

Completing the above-described structure, but performing a function which will be later described, are two additional flat springs 70, the rear portions of which are upstanding and are interposed between the intermediate plate 65 and the forward plate 66 and, like the springs 68, are maintained in position by the squeezing pressure exerted by reason of the screw mounting of the plates 64, 65, and 66. The springs 70 are substantially as wide as the fingers 59 and the springs 68, and register with them so as to clear the cradles 39, but extend above and forwardly of the finger portions 63, as indicated in Figs. 7, 8, and 9, and normally in a slightly more downward direction.

Since the preceding paragraphs have been devoted to the mounting and the transfer movement of the cradles 39 and to the elements for supporting a stack of cigarettes 51 for reception by the cradles, there will now be described the coaction of these mechanisms to effect the successive withdrawal of cigarettes from the chute and their transfer forwardly along the machine. It should be borne in mind that when the motor 20 is in operation, the cradles 39 pursue an endless circuit, moving forwardly on the top runs of the chains 36 with the upstanding fingers 48, 49, and 50 just clearing the bottom of the chute provided by the frame members 54 and the vertical plates 58. With reference to Figs. 2 and 3, it will be seen that the stacked cigarettes are located forwardly of the point where a cradle 39 first reaches a horizontal position on the upper runs of the chains, thereby providing that each cradle approaches the stacked cigarettes from the rear. As the operation of each cradle is the same as that of the others, a description of the operation of one is deemed sufficient for all.

Referring now particularly to Fig. 8, it will be seen that as each cradle 39 approaches the cigarette stack, the aligned stack-supporting fingers 59 and springs 68 and 70 lie partially below the level of the top of the cradle, but as the cradle fingers 48, 49, and 50 are spaced apart as described above, these supporting fingers and springs do not stand in the path of any cradle portion. The lowermost cigarette 51, however, presents a different situation, since in addition to lying below the top level of the cradle, it presents a continuous transverse front which does stand in the way of the cradle fingers. As a consequence, when a cradle moves forwardly, that is, to the left of its Fig. 8 position, there is initially an engagement of the lowermost cigarette by the cradle fingers, immediately followed by a pushing action by these fingers which forces the lowermost cigarette forwardly from beneath the bottom of the stack, i. e., from the curved finger portions 62. This pushing by the cradle fingers 48, 49, and 50, acting through the cigarette, results in the forward flexing of the depending flat springs 68 so that the pushed or withdrawn cigarette moves under them. As soon as this occurs, the stack itself descends to make lowermost the cigarette that just previously was the next to the bottom one, and the depending springs 68 flex back to hold this cigarette in place on the curved finger portions 62, ready for withdrawal by the succeeding cradle 39 in the manner described above.

It has been brought out above that when a cradle 39 becomes positioned on the upper runs of the chains 36, the curved stack-supporting finger portions 62 and also the finger portions 63 are spaced above the cradle base plate portions 44. Since the finger portions 63 extend forwardly and downwardly in this spaced relation, it will be seen that after the lowermost cigarette 51 has been withdrawn from the stack, i. e., from the supporting curved finger portions 62, the support for the withdrawn cigarette becomes initially the finger portions 63 and not the cradle 39, and that this support by the finger portions 63 continues throughout their extent as the cigarette is pushed along them. Since the finger portions 63 terminate forwardly only slightly above the level of the cradle base plate portions 44, as indicated in Fig. 9, it will be further seen that when the cradle has moved forwardly a sufficient amount,

the cigarette rides off the finger portions 63 and passes to the notches 46 in the upstanding cradle ears 45 so as to be supported thereby during the further progress of the cradle and until discharge from the machine.

If the apparatus is actuated manually, as by the wheel 27, or if the motor 20 is driven so slowly that each cradle 39 slowly approaches the stack, slowly withdraws a cigarette 51 therefrom, and slowly transfers it forward, the above-described structure is sufficient to effect a continued engagement of the withdrawn cigarette with the finger portions 63 and thereafter the passage of the cigarette to the notches 46 as stated above. The reason for this lies in the fact that since the cradle fingers 48, 49, and 50 would strike the lowermost stacked cigarette with a minimum of force, there would not be imparted to the cigarette sufficient momentum to cause its being thrown forwardly and beyond the portion of the cradle 39 lying ahead of the fingers 48, 49, and 50.

It is contemplated and intended, however, that the embodiments of the present invention illustrated in Figs. 1-14 be operated at a rapid rate, a rate in keeping with the speed of present day cigarette-making machines, if desired. As this provides a different momentum situation for the successively withdrawn cigarettes, the above-mentioned springs 70 are provided so that upon withdrawal from the bottom of the stack, each cigarette strikes the under faces of the springs 70 as an abutment and so is prevented from being thrown forwardly or out of the machine. The action of the springs 70 is best indicated in Fig. 9, showing that any upward movement of the cigarette is prevented. It will also be noted, however, with reference to Fig. 9, that the springs 70, in addition to their functioning to prevent an upward or forward throw of a withdrawn cigarette, also function, by reason of their downward inclination normally (Fig. 8) in slight convergence towards the finger portions 63, to lightly press the cigarette against the finger portions 63, thereby steadying it with reference to the cradle fingers 48, 49, and 50 and insuring that it remains in engagement with them, i. e., extending transversely of the machine as is intended. It will also be appreciated from consideration of the structure, shown in Figs. 7, 8, and 9 that since the springs 70 extend forwardly for a greater distance than do the finger portions 63, after a withdrawn cigarette has ridden off the finger portions 63 the springs 70 continue to engage the top of the cigarette, not only pushing it down the rearward incline of the notches 46 so that the cigarette reaches the bottom of the notches but also continuing in engagement with the cigarette on the moving cradle for an interval after it reaches the bottom of the notches so as to insure its being steadied there in proper position. By reason of the above-described construction, it will be seen that the springs 70 and the finger portions 63 form a way to guide each withdrawn cigarette during its movement under the influence of the cradle fingers 48, 49, and 50, and that the cigarette is properly cradled in the notches 46 for further progress after leaving the influence of the springs 70.

Shortly after this cradling of a cigarette in the notches 46 and during the continued transfer of the thus cradled cigarette, treating fluid is applied to one or both of its ends to form there the desired water-resistant, porous cake or plug of bound tobacco particles and fibres. Speaking very broadly, the structure for effecting this

application of treating fluid comprises a source of fluid supply, applying means, and means for actuating the applying means. More specifically, the illustrated embodiments of the present invention show the provision of cup-like, fluid-holding rotors located one at each side of the machine and provided peripherally with applicators for depositing treating fluid on the ends, respectively, of the cradled cigarettes during their successive transfer, the speed of the transfer of the cigarettes and the speed of rotation of the rotors being correlated so that as the cradled cigarettes successively reach a certain point on the machine during transfer, the applicators are also at said point, registering with the ends of the cigarettes to apply the fluid.

Describing the details of the above-mentioned structure, and referring to Figs. 1, 3, 4, and 5, the illustrated embodiments of the present invention are provided with spaced blocks 71 suitably mounted on the table T and located at opposite sides of the machine more or less at its mid-portion. Each block 71 forms a support for a bifurcated standard 72 the nature of which is best shown in Figs. 4 and 5, the two standards being oppositely disposed and of identical and preferably integral construction. Referring particularly to Fig. 5, each standard comprises a base 73 having a flange 74 and a vertical passage 75, an upwardly and inwardly extending strut 76, a hub 77 at the upper end of the strut 76, a second strut 78 extending upwardly and outwardly from the hub 77, and a vertically disposed sleeve 79 carried by the upper end of the strut 78 and provided with a vertical cylindrical passage 80 of greater diameter than the passage 75 in the base 73 but aligned with it. The base 73 is secured to its block 71 by means of bolts 81 (Figs. 1, 3, 4, and 5) which are received in slots 82 (Figs. 4 and 5) formed in the flange 74 and which extend transversely of the machine so that the spacing between the two standards 72 may be varied for the accommodation of cigarettes of different lengths, as will be described. Mounted fast in the passage 75 (Fig. 5) by means of a set screw 83 is a vertical rod 84 the upper end of which extends throughout the length of the sleeve passage 80, as indicated in Fig. 5.

The top of the sleeve 79 is horizontal and supportingly engages a boss 85 (Fig. 5) formed on the bottom of a circular cup 86 for holding treating fluid, the boss and the cup bottom being provided with a hub passage 87 through which the rod 84 upwardly extends and is provided within the cup with a flat plate 88 (Figs. 5, 10, and 11). Each cup is provided with an upstanding annular outer wall 80 to which a cover 90 (Figs. 1-5) is secured by means of screws, a gasket 91 (Fig. 5) being interposed between the cover and the top of the wall. Each cup is also provided with an inner annular wall 92 slightly lower than the wall 80 and spaced therefrom so as to form an annular passage or chamber 93 therebetween, and as shown in Fig. 5 the plate 88 is spaced inwardly from the wall 92. The cups 86, like the bifurcated standards 72, are of identical construction, thereby insuring that they are supported in alignment by the sleeves 79, i. e., are supported at the same level, which level is more or less that of the cradles 39 as they move forwardly on the top runs of the chains 36 (Figs. 1, 3, 4, and 5). With reference to these same figures it will also be seen that the position of the blocks 71 is such that the cups 86 are located adjacent the opposite ends, respectively, of the

cradles 39 as they move past the cups, and are therefore located more closely to the opposite ends of the cradled cigarettes.

Depending from the boss 85 (Fig. 5) each cup 86 and integral therewith is a cylinder 94 which is journaled in the sleeve 80 and has its interior wall below the hub passage 87 spaced from the rod 84, and the cylinder 94 extends slightly beyond the bottom of the sleeve 79 and is provided with a depending reduced portion 95 forming a shoulder 96 which a downwardly directed bevel gear 97 abuts. The gear 97 may be held against rotation on the reduced portion 95 by means of a Woodruff key 98 and is maintained in position vertically by means of a collar 99 threaded on the upper end of the reduced portion 95. Packing 100 is provided at the top of the interior of the cylinder 94 to prevent fluid in the cup 86 from leaking down through the hub passage 87, and a gland 101 engaging and interposed between the rod 84 and the interior wall of the cylinder 94 serves to hold the packing 100 in place. As shown in Fig. 5, the bottom of the gland 101 extends below the bottom of the cylinder reduced portion 95 and is supported by the upper face of an inverted cap 102 threaded on the reduced portion 95.

It is intended that the cups 86 be rotated simultaneously during the movement of the chains 36 and the cradles 39 carried thereby, and to this end a gear train is provided which in the embodiments of the present invention illustrated in Figs. 1-14 is operatively connected to the motor 20. Describing this drive construction more in detail and with the reference to Figs. 4 and 5, a horizontal shaft 103 is journaled in the hubs 77 so as to extend transversely across the machine, and splined to the opposite ends of the shaft 103 so as to mesh with the bevel gears 97, respectively, are bevel gears 104 (Figs. 3, 4, and 5) each adjustably held in place axially of the shaft 103 by means of a set screw 105. Between the hubs 77 a gear 106 (Figs. 2, 3 and 4) is non-rotatably applied to the shaft 103, and the gear 106 meshes with an idler gear 107 (Figs. 2 and 3) mounted on a shaft 108 the ends of which are journaled in lugs 109 (Fig. 3) extending forwardly from the hubs 77. The idler gear 107 meshes with a large spur gear 110 (Figs. 1, 2, and 3) mounted on the shaft 30 between the sprocket wheels 32 and held in place by a set screw (not shown).

By reason of the above-described construction it will be seen that when the motor 20 is in operation, the train comprising the gears 106, 107, and 110 and the pairs of bevel gears 97 and 104 serves to rotate the cups 86 at equal speeds and that this rotation of the cups takes place simultaneously with the movement of the chains 36 and the cradles 39. Since the bevel gears 104 are disposed outwardly at the opposite ends of their shaft 103 and face the bevel gears 97, respectively, it will also be seen that the bevel gears 97, and therefore the cups 86, rotate in opposite directions. Stated in another way, by reason of the gear train above described the cup 86 at the right side of the machine is rotated in a counterclockwise direction and the cup 86 at the left side of the machine is rotated in a clockwise direction, thereby providing that the cup portions adjacent the cradled cigarettes 51 as they move past the cups move in the general direction of the cigarettes themselves.

In order to provide the cups with treating fluid it is deemed preferable in the illustrated embodiments of the present invention that the cups

themselves not be the ultimate source of supply during the operation of the machine but that such source should be separate from the cups. To this end, the illustrated embodiments of the present invention are provided with a suitable elevated tank or container 111 (Fig. 1) adapted to hold the treating fluid, and leading from the bottom of the tank 111 so as to support it is a vertical pipe 112 the lower end of which is received by the inlet end of a shut-off valve 113. A short pipe 114 (Figs. 1, 3, and 4) depends from the outlet end of the valve 113 and is received by the vertical arm of an inverted T 115. Leading from the right horizontal arm of the T 115 is a horizontal pipe 116 having an elbow 117 connected to its outer end, and depending from the elbow 117 is a pipe 118 to which the inlet end of a shut-off valve 119 is connected. The lower or outlet end of the valve 119 connects with a pipe 120 the lower end of which is threaded into a coupling member 121 (best shown in Fig. 4) having a concave lower face, and engaged with this face is the convex face of a second coupling member 122 the internal diameter of which is preferably greater than that of the member 121. A retaining collar 123 abutting a shoulder formed beneath the convex face of the member 122 and threaded on the member 121 holds the two members together with their concave and convex faces, respectively, in engagement.

Threaded in the lower end of the coupling member 122 is the upper end of a pipe 124, the lower portion of which extends into the cup 86 (Fig. 5) and terminates in a horizontal flange 125 (Figs. 5, 10, and 11) which rests on the plate 88 inside the cup at the top of the rod 84. The flange 125 is provided on its under face with channels 126 to permit the flow of fluid from the pipe 124 to the interior of the cup, and to permit the ready flow of fluid to the annular chamber 93 of the cup, the wall 92 is provided with openings 127 adjacent the cup bottom. In extending into the cup 86 the pipe 124 is received in a vertical passage 128 (Fig. 5) formed in the cover 90 and in an integral annular boss 129 depending therefrom into the cup so that the illustrated cover construction gives the pipe 124 maximum lateral support. Adjacent the top of the cover the passage 128 is provided (Fig. 5) with an enlargement 130, and rising above the top of the cover is an integral annular boss 131 forming interiorly a continuation of the enlargement 130. Packing 132 received by the enlargement 130 and by the boss 131 to prevent the leakage of fluid from around the pipe 124 is held in place by a gland 133, and the gland is pressed against the packing 132 by means of a flanged collar 134 threaded on the boss 131.

The above remarks about the supply of fluid to the cups 86 have been concerned chiefly with the elements which form a conduit portion connected to the right arm (Fig. 4) of the T 115. However, the elements which form a conduit portion connected to the left arm of the T 115 are identical, except in one particular, with those above described, so that it will be understood that the left hand cup receives treating fluid from the container 111 in substantially the same manner as does the right hand cup.

The difference between conduit elements at the opposite sides of the horizontal arms of the T 115 is occasioned by the fact that since it is intended that the standards 72 be variably positioned toward and away from each other on their blocks 71, and since this variable positioning ne-

cessitates a corresponding variance in the position of the cups 86, it is necessary that the horizontal conduit portion be capable of shortening or elongation, as it were, to make movement of the standards 72 possible. To achieve this end, a short horizontal pipe 135 (Figs. 1 and 4) extends from the left arm of the T 115 and its free end is threaded into a gland 136, while slidably received within a retaining collar 137 threaded on the gland 136 is a horizontal pipe 138. Packing 139 surrounding the pipe 138 is held in place by the collar 137, and the end portion of the pipe 138 extending beyond the collar 137 is received by an elbow 140 like the elbow 117. With the above construction it will be seen that these elements perform the same conduit function, so far as material flow is concerned, as does the pipe 116, but that by reason of the packed and sliding fit of the pipe 138 in the collar 137, the above-described horizontal conduit portion can be shortened or elongated transversely of the machine, thereby permitting a change of position of the standards 72 on their blocks. There may thus be at all times a free flow of fluid from the container 111 to the cups 86.

In order to effect the transfer of treating fluid from the cups 86 to one or both ends of a cradled cigarette 51 as it moves past the cups, the present invention contemplates that the cups be each provided with an applicator construction. Merely for purposes of illustration and not of limitation, each cup 86 is herein shown as having one such construction. While any applicator arrangement may be utilized which is suitable for the purpose, I have shown herein two types as being representative, a wetted wick type being shown in Figs. 1-5, 10, and 11 and a nozzle type being shown in Figs. 12 and 13. These two types have certain common structural features, and the wick type will be described first.

Referring to Figs. 5, 10, and 11, the outer wall 89 of each cup 86 is provided with a horizontal passage open at each end and comprising three parts, a relatively narrow cylindrical portion 141 communicating with the annular chamber 93, a threaded cylindrical portion 142 wider than the portion 141 and extending forwardly thereof, and a still wider front cylindrical portion 143 terminating at the exterior of the wall 89 and having an annular base which forms a seat. The three passage portions have a common longitudinal axis, which axis is at the level of the longitudinal axis of the cradled cigarettes, as indicated best in Fig. 5.

Mounted in the wall passage above described is a wick holder 144 the body of which comprises a central portion 145 threaded in the passage portion 142, a rear cylindrical portion 146 received in the passage portion 141, and a forward portion 147 seating on the base of the passage portion 143. The holder 144 is also provided with an axial fluid passage 148 (Figs. 5 and 11) terminating at its rear end in a recessed frusto-conical valve seat 149 communicating with the annular chamber 93 and terminating at its forward end in a boss 150 the interior of which is provided with a frusto-conical depression 151 the smaller base of which merges into the axial passage 148. Interposed between the boss 151 and the forward portion 147 the holder may be provided with a flange 152 of preferably hexagonal contour to facilitate threading the holder in the cup wall 89.

Completing the above construction is the wick 153 itself which may be made of any suitable

and preferably fibrous material so as to permit capillarity of the treating fluid, and which comprises a rear tapering portion received in the frusto-conical depression 151 at the front of the holder 144 so as to absorb fluid flowing in the axial passage 148 and a forward dome of smaller diameter than the base of the tapered portion so as to present a shoulder (Figs. 5 and 11) at the mouth of the boss 150 for abutment by a retaining collar 154 threaded on the boss to retain the wick in place. The dome portion of the wick by capillarity absorbs fluid from the rear of the wick and protrudes forwardly from the central portion of the collar 154. It will also be noted that the center of the wick is at the level of the longitudinal axis of the cradled cigarettes, as shown in Fig. 5, and the dome has a diameter appreciably less than that of a cigarette.

It having been shown above that when the motor 20 is in operation, the train comprising the gears 106, 107, and 110 and the pairs of bevel gears 97 and 104 serves to rotate the cups 86 at equal speeds and that this rotation occurs simultaneously with the movement of the chains 36 and the cradles 39, it seems desirable to elaborate on this subject matter at this point, rather than later, in view of the position of the above-described wick structure in relation to the cups 86. It is intended that as the cups continuously rotate, the wicks 153 and their holders 144 repeatedly move into and out of alignment. While it will be seen that this alignment occurs alternately inwardly and outwardly of the machine, it is with the inward alignment that the illustrated embodiments of the present invention are concerned. Moreover, it is also intended that whenever the wicks 153 are thus inwardly aligned, a cradled cigarette 51 shall be both aligned with and engaged by them (Figs. 1-5) so as to receive treating fluid, receiving it at both ends if the shut-off valves 119 are both open, and receiving it at only one end if one of these valves is closed.

So far as repeated cigarette and wick alignment in a horizontal plane is concerned, the manner of its achievement has already been described in that the axial levels of the cradled cigarettes 51 and the wicks 153 are the same, as shown in Figs. 1, 4, and 5. Alignment and engagement in a vertical plane, however, are dependent upon several factors. Initially, the cups 86 themselves must be so positioned relatively to each other that the wicks 153 are capable of repeated alignment as the cups rotate, and this may be accomplished most easily during the assembling of the machine. To illustrate this, let there be considered an assembling stage in which the spur gear 110 is loose on the shaft 30 and, with reference to Fig. 4, the right hand standard 72, its associated gearing, cup mechanism, and piping through the collar 137, which preferably is loose, are assembled as a unit and are mounted on the right hand block 71 with the bolts 81 loose but in position. So far as the left hand side of the machine (Fig. 4) is concerned, let the left hand standard 72, its associated gearing excluding the bevel gear 104, and the cup mechanism and piping through the horizontal pipe 138 be considered as assembled as a unit but not as yet assembled with the remainder of the machine. Let the left hand bevel gear 104 also be considered as removed from the machine. With this assembly stage existing, the left hand standard 72 and associated parts are

placed on the left hand block 71 and the unit is moved toward the right hand standard 72 until the horizontal pipe 138 enters the collar 137 and the left hand end of the shaft 103 enters the journal in the left hand hub 77 but does not extend beyond its outer or left hand (Fig. 4) face. With the various parts in this condition, the cups 86 are manually rotated until the wicks 153 are in inward alignment, and when this has been done the left hand bevel gear 104 is meshed with its bevel gear 97 in such manner as to be in position to receive the shaft 30 upon further movement of the left hand standard 72 to the right (Fig. 4), whereupon, without changing the wick alignment, the left hand standard is so moved until the parts assume substantially the position shown in Fig. 4. The left hand bolts 81 are then put in place, but are not tightened, and since it is intended that the aligned wicks slightly grip the opposite ends, respectively, of a cigarette aligned with them, the positions of both standards 72 are adjusted so that the standards are equally spaced from the longitudinal center line of the machine and so that the distance between the aligned wicks is slightly less than the length of the cigarettes to be treated. By reason of this adjustment of the standards 72 it will be seen that the proper spacing between the aligned wicks 153 may be effected for any given length of cigarette to be treated, and once the desired spacing is achieved, the collar 137 is tightened on the gland 136 and the bolts 81 are tightened on the blocks 71. Thereafter the left hand set screw 105 is tightened and the spur gear 110 is made fast on the shaft 30, and with the above assembling acts completed, it will be seen that if the spur gear 110 is thereafter continuously rotated, the cups 86 will rotate in such manner that the wicks 153 will repeatedly move into and out of alignment.

When the repeated alignability and spacing of the wicks 153 has been arranged for, there remains the matter of insuring that whenever the wicks are aligned inwardly of the machine, a cradled cigarette 51 is aligned with and engaged by them. It being remembered that for purposes of illustration only and not of limitation the chains 36 are herein shown as carrying four equally spaced cradles 39, this wick and cigarette alignment and engagement is made possible by causing the gear train 106, 107, 110, 97, and 104 to have such net speed at the cups 86 that while the chains 36 are making one complete circuit each cup is making four complete revolutions. With the correlation of chain speed and cup speed thus provided, the adjustment of the machine for repeated cigarette and wick alignment and engagement is effected by rotating the hand wheel 27, while the spur gear 110 is loose on the shaft 30 as stated above, until a cradled cigarette is properly aligned with and engaged by the aligned wicks, after which the spur gear 110 is made fast on the shaft 30. As a result, when the motor 20 is in operation, a cradled cigarette will be aligned with and engaged by the wicks 153 whenever the wicks themselves are aligned inwardly of the machine, and there will be no wick and cigarette alignment, and no cigarette will pass by the cups, when the wicks are aligned outwardly of the machine. It will also be appreciated that since the spacing between the wicks 153 when inwardly aligned is slightly less than the length of a cigarette, the wicks will initially engage the cigarette ends at a point slightly

in advance of the cigarette and wicks alignment point and will likewise not leave contact with the cigarette ends until the cigarette has progressed slightly forwardly of said alignment point. The wicks thus engage the cigarette ends during the movement of the former along a small arc in the general direction of transfer of the cigarettes. In connection with this last, attention is called to the fact that the radius from a cup axis of rotation to the front of a wick need not be greater than the radius from a cup axis of rotation to the outside edge of the front face of a wick-retaining collar 154. The first radius may even be slightly less, without causing the collars to engage the cigarette ends, for it will be realized that as each cigarette moves toward the cigarette and wicks alignment point, those edge portions of the collars 154 which are nearest the cigarette are in advance thereof and are also moving forward, and that as a cigarette moves away from the cigarette and wicks alignment point, the opposite edge portions of the collars 154 are rearward of the cigarette, which is moving away from them.

Referring again to the above-described construction for the cup and wick elements and the conduit system by which the treating fluid flows to the wicks 153 from the container 111, it will be seen that in the absence of further structure the fluid in each annular cup chamber 93 would continuously flow into its associated holder axial passage 148 and as a consequence would present a continuous and even supply of fluid for capillary absorption by the wick 153 itself. The wicks thus would tend to have a constant wetness, i. e., would continuously carry a substantially constant quantity of treating fluid, a portion of which would be transferred to the cigarette ends when the wicks touch them as has just been described. This fluid portion so transferred would, of course, constantly be replenished by further capillarity.

There are certain factors, however, which make this simple mode of operation undesirable, one of them arising when the treating fluid has such composition as to contain a volatile solvent. Where this is the case, the wick feeding operation above referred to is wasteful of fluid, for each wick 153 engages a cigarette end during only a small arc of the 360 degree rotation of its cup and as a result the solvent on the surface of the wick is exposed to the air for evaporation during the major portion of its travel. This situation would be true whether each cup carried only one wick or a plurality thereof, and while this evaporation would be minimized by making the wicks of such material as to permit only relatively slow capillarity, the danger then arises of having the wick capillarity so slow that while sufficient for proper successive applying operations with the cups 96 rotating at a given speed, it would be insufficient for proper successive applying operations when the cups rotate at a higher speed. Speed of rotation of the cups 86, i. e., the number of fluid applications per unit time, is thus a second factor influencing the nature of the arrangement for the wicks 153. A third factor is centrifugal force. Since it is desirable that the wicks 153 be made of material permitting high capillarity so that they will have a sufficient constant wetness when the cups 86 are rotating very rapidly, the danger arises that the centrifugal force produced by such rapid cup rotation would tend to throw off free fluid from the wicks and thus result in a waste of fluid as well as in a

throwing of it upon machine parts and even upon the moving cigarettes themselves.

To prevent these results, i. e., an insufficient wetness of the wicks 153 for the speed desired of successive applying operations, or a waste of treating fluid by evaporation or throwing, it is contemplated that in the embodiment of the present invention illustrated as having wick type applicators, the wicks be of material such as to permit rapid capillarity so that the machine can be operated rapidly and that to offset the undesired effects of such capillarity the flow of fluid to the wicks be cut off during part of the rotation of the cups 86. To this end, and referring to Figs. 5, 10, and 11, mounted slidably in a passage 155 (Figs. 10 and 11) formed in the cup wall 92 and axial with the passage 148 in the wick holder 144 is a valve 156 the forward end of which has a frusto-conical surface 157 adapted to seat in the frusto-conical recess 149 at the rear of the holder portion 146. Rearwardly the valve 156 is provided with a frusto-conical cam roll 158 integral therewith with its smaller base directed forwardly, and behind the roll 158 is an integral guide pin 159 slidably received in a passage 160 formed in the cover boss 129. As best shown in Fig. 11, a spring 161 coiled about the valve pin 159 and interposed between the boss 129 and the cam roll 158 serves to maintain the valve normally closed to shut off the flow of fluid from the chamber 93 to the axial passage 148 and the wick 153. Completing this structure is a needle 162 integral with the valve member 156 and extending forwardly therefrom within the axial passage 148 to terminate in a blunt end portion which penetrates the tapered rear end of the wick 153 when the valve is closed (Fig. 11).

In order to open the valve and thus permit the flow of treating fluid along the axial passage 148 to the wick 153, the plate 88 which is fast to the top of the stationary rod 84 is provided at its free end portion with an upstanding ridge 163 on the inner face of which are formed three cam surfaces A, B, and C sloping in a manner complementary to the slope of the frusto-conical surface of the cam roll 158. With reference to Fig. 11, in which the cup 86 is shown moving counter-clockwise but with the cam roll 158 not yet having reached the plate 88, the cam surface A begins at the front of that end of the ridge 163 which is nearest the roll 158 and curves inwardly along the ridge a short distance where it merges with the cam surface B. This surface has a curvature of uniform radius with respect to the axis of rotation of the cup 86 so as to constitute a dwell and preferably extends more than a third of the length of the ridge, after which it merges into the cam surface C which curves outwardly to the front of that end of the ridge which is farthest from the roll 158 in its Fig. 11 position. By reason of this construction, as the cup rotates from its Fig. 11 position in a counter-clockwise direction the cam roll 158 is initially pressed forwardly by the spring 161 so that the valve 156 is closed, but the roll 158 begins to move rearwardly against the yielding resistance of the spring 161 as soon as the roll strikes the cam surface A, thereby causing the valve 156 to become unseated and the holder axial passage 148 opened. Further rotation of the cup 86 causes the roll 158 to move farther back until it engages the cam surface B, along which it dwells with the valve in fully opened position, until reaching the cam surface C, at which point the forwardly receding curvature of this surface permits the

spring 161 to push the roll 158 forwardly until the valve 156 is closed as soon as the roll passes off the end of the surface C.

It will be noted that the plate 88 is not located so that the ridge 163 is disposed symmetrically on opposite sides of a line represented by the aligned axes of the cigarette 51 and the wicks 153 (Fig. 10), but instead is so positioned that the center of the surface C is substantially at said line. The reason for this construction lies in the fact that very shortly after a moving cradled cigarette and the moving wicks pass the point (Fig. 2) where the axes of the cigarette and the wicks are aligned, the wicks move away from the adjacent cigarette ends, thereby rendering unnecessary any further feed of fluid to the wicks for that particular cigarette. Conversely, it is desirable that the valves 156 begin to open relatively far in advance of the alignment point (Fig. 2) of the axes of the cigarette 51 and the wicks 153, so that by the time said alignment point is reached the valves 156 have become fully opened and have remained so for an interval to permit sufficient fluid to enter and flow along the axial passages 148 so that by absorption and capillarity the wicks are provided or replenished with fluid for application to the approaching cigarette ends.

While the plate 86 and the ridge 163 have been illustrated and described as having the particular location and the particular cam surfaces A, B, and C, set forth, I wish it clearly understood that these particulars have been shown merely for purpose of illustration and not of limitation. The head of the fluid, the viscosity of the fluid, the speed with which the wick material permits capillarity, and the speed of rotation of the cups 86 are all factors which influence the rate at which fluid should flow along the axial passages 148 and the time during which the valves 156 should be opened, and while the illustrated plate, ridge, and cam surface constructions are well suited for one use of the present invention, changes in the factors mentioned above may make it desirable to make changes in the nature, extent, or contour of the elements just named, which changes obviously would be within the scope of the present invention. To facilitate any desired shift in the position of the plate 88, the portion of each rod 84 exposed between a standard base 73 and the associated cap 102 may be provided with wrench grooves 164 (Fig. 5).

While the embodiment of the present invention so far described has been characterized by having wick type fluid applicators, it is also contemplated, as stated above, that an embodiment may be provided with nozzle type applicators. To this end, and referring to Figs. 12 and 13, each of the standard sleeves 79 may support a cup 165 which is somewhat smaller in diameter than the cups 86, if desired, and is provided with a thinner outer wall 166, but which in other respects is so effectively identical with corresponding structural features associated with the cups 86 that in Figs. 12 and 13 the reference numerals of Figs. 5, 10, and 11 have been used coupled with A to make this correspondence more readily appreciable.

The outer wall 166 of each cup 165 is provided with a passage 167 into which is threaded one end of a tubular nozzle member 168 provided with a cylindrical passage 169 axially aligned with the passage 155A in the annular inner wall 92A and with the passage 160A in the cover boss

129A, and threaded to the forward end of the nozzle member 168 is a nozzle 170 having a frusto-conical front the smaller base of which is forward and presents a face having a diameter appreciably less than that of a cigarette. The nozzle 170 is provided with a forward recess 171 having a rounded bottom from which a passage 172 extends rearwardly in alignment with the axial passage 169 and terminates in a seat. Passages 127 A at the bottom of the inner wall 92A permit the ready flow of fluid from the pipe 124 and channels 126 into the annular chamber 93A, as is the case with the passages 127 shown in Figs. 5, 10, and 11. By reason of this construction the cups 165 are each provided with a nozzle structure the delivery passage of which communicates with the annular chamber 93A in its associated cup, thereby providing for the flow of fluid from each cup for discharge by way of its nozzle passage 172 and the recess 171. As a matter of structure, it should be pointed out that the radius extending from the axis of rotation of each cup 165 to the front face of its nozzle 170 preferably is substantially the same as the radius extending from the axis of rotation of each cup 86 to the front of its wick 153 so that the nozzles 170 engage the cigarette ends, respectively, while the cups 165 rotate, in the same manner as has been described above for the wicks 153.

In order to control the flow of liquid through each nozzle passage 172 and recess 171, the embodiment of the present invention shown in Figs. 12 and 13 is provided with a valve 173 which is structurally similar to the valve 156. Its needle 174, however, differs from the needle 162 in the two respects that the forward end of the needle 174 is conical so as to seat at the rear end of the nozzle passage 172, and intermediate its ends and within the passage 172 the needle 174 is provided with a block 175, preferably square in cross section as shown in Fig. 14, which tends to exert a pushing effect upon the fluid ahead of it as the valve 173 closes, and the side edges of which engage the axial passage 172, thereby guiding the needle 174 in its movements while permitting the flow of fluid through the passage 172 and insuring that the needle 174 always seats properly. Rearwardly the valve 173 is provided with a cam roll 158A and a pin 159A which slides in the passage 160A and around which a spring 161A is coiled, these last elements being structurally and operatively identical with the corresponding elements in Figs. 5, 10, and 11.

As is the case with the valves 156, it is contemplated that each valve 173 be cam actuated, and to this end the rod 84 is provided inside its cup 165 with a horizontal plate 176, similar to the plate 88, the free end of which terminates adjacent the cup wall 92A and is provided with a ridge 177. This ridge has cam surfaces D, E, and F which are successively engaged by the cam roll 158A during the rotation of the cup 165 to initially cause the roll 158A to recede and open the valve 173, then to dwell in receded position so that the valve remains open, and then to permit the roll 158A to move forward under the influence of the spring 161A until the valve is closed, respectively, all in a manner similar to the action of the cam surfaces A, B, and C on the roll 158.

It will be appreciated, however, that the application of treating fluid by means of nozzles on rotating cups presents an applying situation

which differs in an important respect from the application of fluid by means of wicks on rotating cups. This arises by reason of the action of centrifugal force, and is based on the fact that whereas the wicks present merely wetted surfaces to the cigarette ends and bodily absorb and hold fluid, thereby providing an obstruction, as it were, to prevent the discharge of a body of fluid from the holder axial passages 148, this situation does not exist with the use of the nozzles 170, for so long as the valves 173 are open the centrifugal force generated by the rapid rotation of the cups 165 augments the head of the fluid and results in the free and direct ejection of a body of fluid from the nozzles. It will therefore be seen that if the ridge 177 had the extent and contour of the ridge 163, there would be ejected from the nozzles 170 a relatively great quantity of fluid in a free condition, more than would be present at any given time as a film on the surface of the wick domes by reason of the inherent nature of wick action, and hence more than would be needed to treat the cigarette ends properly. As a consequence, in the embodiment of the present invention illustrated in Figs. 12 and 13, the amount of fluid discharged is cut down in one manner by giving the ridge 177 a considerably less extent than the ridge 163, as will be seen by comparing Fig. 13 with Figs. 10 and 11.

The above remarks are directed to that control over the nozzle discharge which is represented by the mere duration of valve 173 actuation, but further factors for control are the location of the discharge and the nature of valve actuation, i. e., the time during which the valves 173 are moving open or moving closed. The location of the discharge is of importance in view of the two facts that the cups 165 are rotating when the discharges from the nozzles 170 occur and that while the nozzles are moving towards a position of alignment inwardly of the machine, a cradled cigarette is also moving toward them for simultaneous alignment and engagement therewith. Because the cups 165 are rotating when the nozzle discharges occur, each discharge assumes an arcuate course, thereby raising the two problems of not having the discharges flung wide of or beyond the approaching cigarette, as would be the case if the discharges began when the nozzles were 90 degrees rotatively away from the cigarette, for an absurd example, and of not having the valves 173 open after the cigarette and nozzles alignment point has been reached, it being remembered that very shortly thereafter the cigarette ends and the nozzles move away from each other. This last matter is taken care of by so locating the plate 176 that as the nozzles and cigarette become aligned, the cam roll 158A rides off the cam surface F of the ridge 177, so that the valve 173 is closed as soon as the alignment and engagement point is reached. The first problem is taken care of by making the ridge 177 sufficiently short so that when the cam roll 158A first strikes the cam surface D, the nozzles 170 and the approaching cigarette 51 are moving in the same general direction, i. e., are almost aligned although not yet actually so. With such operation the direction of fluid discharge is initially directed at the centers of the ends of the approaching cigarette, and continues so since the cigarette continues to move in the path of discharge as the cups 165 continue to rotate.

The precise curves which the cam surfaces D, E, and F are to have and the extent of the dwell

surface E are dependent upon the head of the fluid, the viscosity of the fluid, and the speed of rotation of the cups 165, as is the case with the cam surfaces A, B, and C, so that within the scope of the present invention changes may be made in the nature, location, or contour of the surfaces D, E, and F and the ridge 177 in accordance with different operating conditions. It may be stated, however, that the surface D, which is the one first engaged by the cam roll 158A, preferably has a relatively great extent so that the nozzles 170 are much nearer the cigarette ends when the roll has reached the dwell surface E than when the roll initially rides on the cam surface D, thereby providing a delay in the full opening of the valves 173 and hence a delay in the reaching of full volume of the discharges. On the other hand, the cam surface F is preferably relatively short in extent, thereby causing the valves 173 to become quickly closed so as to take advantage of the fluid pushing effect of the needle blocks 175 to hasten the discharge as the cigarette and nozzles alignment point is being reached.

The illustrated embodiments of the present invention preferably are provided with two further features of structure to increase their efficiency and make for smooth and uniform operation. In the use of endless chains with machinery in general, there is a certain amount of vibration both vertically and laterally, and while this vibration may not be objectionable when the sole function of the chains is to act as a drive, such vibration, however slight, may be objectionable when the chains also function to support work pieces, particularly when the work pieces are cigarettes, which are light objects, and when their opposite ends must be aligned with fluid applicators during travel on the chains.

In order to offset any chain vibration, which might throw the cigarettes and applicators out of horizontal alignment, it is contemplated in the illustrated embodiments of the present invention that the chains 36 be constrained to a horizontal path in the vicinity of that point on the machine where fluid application to the cigarette ends occurs, thereby insuring that if there is vertical vibration elsewhere in the chains it does not exist where fluid is applied. To this end the hub lugs 109 are each provided with an upstanding lug 178 (Figs. 3 and 4) which is located below its adjacent chain run and which carries a plate 179, preferably about one eighth of an inch thinner than the spacing between the plates 38A of the chain runs as indicated in Fig. 4. The two plates 179 are horizontally disposed so as to function as rails on the tops of which the chain cylinders 38 rest, and have such height that the level of the axis of a cradled cigarette 51 is the same as that of the wicks 153 or the nozzles 170. By reason of this construction plus the further fact, shown in Fig. 3, that the rails 179 extend forwardly and rearwardly of the point where fluid is applied to the cigarette ends, it will be seen that as each cradle 39 approaches the fluid applying point, its supporting chain portion becomes vertically steady, if it were not so before, so that each cradled cigarette approaches, engages, and then leaves the wicks 153 or the nozzles 170 while being transferred along a horizontal path at the proper level. As a practical matter it will be found preferable that the left hand rail 179 (Fig. 4) not be mounted on its lug 178 until after the assembling operations for in-

surings alignment of the wicks 153, set forth above.

In serving to constrain the upper runs of the chains 36 to a horizontal path in the vicinity of the point of fluid application to the cigarette ends, to prevent vertical chain vibration there, the rails 179 by reason of being located between the plates 38A of the chains 36 also limit any tendency which the chains may have to vibrate horizontally. Cooperating with this latter action the present invention contemplates the use of a guideway located adjacent the opposite sides of the path taken by the cradled cigarettes, the purpose of the guideway being to prevent the cigarettes from shifting in the cradles 39 to any extent laterally under the influence of what lateral vibration the chain runs may have. To this end, and referring to Figs. 1, 2, and 3, each front standard 31 is provided with an upright arm 180 and each rear standard is provided with a similar upright arm 181, and the pairs of these arms at opposite sides of the machine have secured thereto vertically disposed and longitudinally extending plates 182. The plates 182 have such width that their tops and bottoms extend above and below, respectively, the path taken by each cradled cigarette as a whole (Figs. 1 and 3), and as the plates are located adjacent the outer sides of the respective chain runs and extend substantially throughout the length of the machine, they form guide walls adjacent the sides of the cigarette path for limiting any lateral movement of the cigarettes substantially from the time each is withdrawn from the curved stack-supporting finger portions 62 until discharge from the machine. In view of the fact (see Figs. 1, 2, and 4) that the guideway plates 182 are so located with respect to the path of the cradled cigarettes as, in effect, to chord across the arc taken by the wicks 153 or the nozzles 170 in approaching, reaching, and leaving the fluid application point, each plate 182 is provided with a recess 183 (Figs. 2, 3, and 4) of such length and depth as to give complete wick and nozzle clearance. In order to limit any lateral vibration which the plates 182 themselves may exhibit, it is contemplated that they be connected together, and to this end are provided (Figs. 1, 2, and 3) with inverted channel-shaped clips 184 which extend across and above the chains 36 and which rest on the tops of the plates 182 with the depending arms of the rearward clip hugging the plates 182, respectively, and the depending arms of the forward clip hugging the uprights 180, respectively, and secured thereto. In order to prevent any tendency of a cradled cigarette that has received treating fluid from being dislodged vertically as it approaches the point of discharge from the machine, the clips 184 may be provided with longitudinally extending flat strips 185 the inner ends of which, located adjacent the fluid application point, are preferably somewhat upturned. As a matter of manufacture, the clips 184 and the strips 185 may conveniently be an integral stamping.

In view of the fact that the functions of the various parts of the mechanisms illustrated in Figs. 1-14 have been explained above, it is not deemed necessary to recite here in any detail the operation of these embodiments as a whole. Attention may, however, be called to certain items. Since the rails 179 are thinner than the transverse distance between the plates 38A of each chain 36, it will be seen that when the rails 179 are engaging the inner chain plates, as in Fig. 4,

the machine is illustrated as set up for treating cigarettes of relatively short length. For treating cigarettes of relatively long length, the standards 72 would be spaced apart farther than shown, resulting in the rails 179 being located between the chain plates 38A or engaging the outer plates.

The chute formed by the frame members 54 and the vertical plates 58 may be filled and replenished with cigarettes manually or by some suitable feeding device, and with this arranged for and the container 111 provided with fluid, the apparatus is ready for operation. Both or only one end of the cigarettes may be treated by opening both or only one of the shut-off valves 119, since these valves control the flow of fluid to the cups and hence to the wicks 153 or the nozzles 170. When the motor 20 is turned on, the cups 86 or 165 rotate at equal speeds and simultaneously and in timed relationship with the movement of the chains 36. Since the rods 84 and their cam plates 88 or 176 remain stationary, rotation of the cups causes the cam rolls 158 or 158A to strike the cam surfaces so that the valves 156 or 173 are opened and closed as desired, and while cup rotation is going on, causing the wicks or nozzles to repeatedly move into and out of a position of alignment inwardly of the machine, the cradles 39 are successively withdrawing cigarettes from the bottom of the chute and are successively presenting them to the wicks or nozzles as they become aligned, with the ends of the cigarettes tangentially disposed to the wicks or nozzles and aligned therewith for the reception of treating fluid, after which the cradles transfer the cigarettes along the machine for discharge in a treated condition. Upon being applied to the cigarette ends, the fluid is absorbed thereby and spreads through the tobacco fibres by capillarity, that is, by what may be called the physical power of imbibition which juxtaposed or clustered fibres present, with the result that the cigarette ends become provided internally of the paper wrapper with the desired water-resistant and porous plug or cake of bound tobacco fibres. It is to be noted, however, that since the diameter of each wick 153 and nozzle 170 front face is less than that of a cigarette, no fluid is applied to the wrapper, so that it is not discolored or wrinkled or otherwise changed from its normal appearance.

By insuring that the fluid in the containers 111 never recedes below a given level, a definite minimum head of fluid always may be maintained, and the cups 86 or 165 are thus always full and in readiness for the flow of fluid when the valves 156 or 173 are opened. When the wick type of applicator is used, it may be stated that the repeated movements of the needles 162 into and out of engagement with the rear end of the wicks 153 serves to repeatedly tamp the wick ends, thereby maintaining the form of the wicks despite their wet condition and insuring that the wetted fibres do not expand rearwardly into the axial passages 148. The needles 162 also serve to agitate the fluid in the axial passages 148, thereby preventing any fluid clogging tendency, and the same statement may be made with respect to the needles 174, the blocks 175, and the axial passages 169 of the nozzle constructions.

By providing a sufficiently greater rotative speed for the cups 86 or 165, it will be seen that the chains 36 may be provided with more than the illustrated four cradles 39, thereby resulting in the treatment of a greater number of cigarettes

in a given time interval without increasing the speed of the chains. To the same end, the rotative speed of the cups 38 or 165 need not be increased, but instead the cups may be provided with a plurality of applicators while the chains are provided with a correspondingly greater number of cradles. This also makes for increased production without increasing chain speed. On the other hand, whatever the number of cradles and applicators there may be, if it is desired to speed up the chains, it will be seen that cup speed will also be increased automatically and always in timed relationship to the chain speed, this arrangement also making for an increase in the number of cigarettes treated in any given time interval.

The cigarette chute above described is, in its broadest aspect and considered with associated parts, a support in which one or more cigarettes are placed for withdrawal by the cradles 39. But the chute-type support described above represents only one general type which may be used, and is characterized by the fact that it may have no immediate connection with the operation of a cigarette-making machine, i. e., the cigarettes which are in it may or may not be fed thereto directly from a cigarette-making machine, and the replenishing of the supply in the chute may or may not have any connection with the rate at which cigarettes are made by or fed from a cigarette-making machine. In order, therefore, to show that the present invention may be embodied in structure intended primarily for use in immediate connection with a cigarette-making machine, in Figs. 15-20 I have shown other support embodiments. While these will be described in detail, it may be stated here that they are designed to receive cigarettes directly as they come from a cigarette-making machine and support them for withdrawal by the cradles 39 and for the application of treating fluid as explained above. It should also be pointed out that in the Figs. 15-20 embodiments, the chute and associated supports, fingers, and springs of the Figs. 1-14 embodiments are entirely removed, and the table T is so located with respect to the cigarette-making machine that the sprocket wheels 35 and adjacent chain portions 36 are in the immediate vicinity of the delivery end of the cigarette-making machine.

Those familiar with present day cigarette-making machines, particularly those made by the American Machine & Foundry Company, will recognize certain parts thereof in Figs. 15, 16, 18, and 19. As these features of structure are well known, they may be briefly identified as the endless belt 186 located at the front or cigarette-gathering end of the machine and by which the cigarettes are transferred away from the "catcher" (not shown); the spaced frame walls 187 between which the belt 186 extends; the frame plate 188 upon which the frame walls 187 are supported; the shaft 189 journaled in the frame walls 187; the worm gear 190 and worm 191 by which the shaft 189 is driven through suitable connections from the prime mover of the machine itself; the belt-driving pulley 192 fast on the shaft 189 and around which the left hand or delivery end of the belt 186 passes; and the hand wheel 193 by which the tension of the belt 186 is adjusted. This construction is provided with a guide structure of the type indicated at 194 which may be located at each side of the belt 186 and at right angles to which the belt-carried cigarettes 51 are trans-

ferred. The guides 194 are of angle construction and comprise upright portions 195 forming guide walls adjacent the ends of the moving cigarettes and horizontal portions 196 resting on the tops of the frame walls 187 so as to slightly overlap the edge portions of the belt 186 and provided with slots 197 which receive studs 198 for adjustably holding the guides 194 in place. Except for their delivery ends, which will be described, the guides 194 preferably have the usual standard construction and operation. As is well known, cigarettes transferred from the "catcher" by the belt 186 are received by a table or platform support along which they roll and from which they are gathered preparatory to packing, and as will be appreciated from inspection of Figs. 15-20, the present invention contemplates for embodiments thereof certain changes in the delivery end of the guide structures 194 and in the usual table or platform support, to the end that the cradles 39 may receive the cigarettes 51 directly as they come from the making machine, this in contrast to the cradle-reception from a chute-support of the type exemplified in Figs. 1, 2, 3, 7, 8, and 9.

Referring to Figs. 15-17, in place of the usual table or platform support along which in present day cigarette-making machines the fed cigarettes roll from the delivery end of the belt 186, the illustrated embodiment of the present invention is provided with a bridge 199 comprising a flat plate extending between the frame walls 187 and secured thereto by suitable brackets 200 at the usual level, i. e., with the top surface of the bridge 199 slightly below the level of the top surface of the upper run of the belt 186 where it begins to bend downwardly around the pulley 192. As will be seen from inspection of Fig. 15, the edge of the bridge 199 adjacent the belt 186 is given the usual upward knifing, thereby permitting the top surface of the plate at this edge to be almost in contact with the belt 186, and the marginal portions of the bridge 199 are overlapped by the horizontal guide portions 196. The delivery or left edge 201 of the bridge 199 preferably extends slightly beyond the adjacent ends of the frame walls 187 and the horizontal guide portions 196, and is downwardly curved, as indicated. By reason of this construction, the bridge functions as does an ordinary platform or table in present day cigarette-making machines to provide for the ready rolling transfer to the top of the bridge of cigarettes successively fed thereto by the belt 186. It will be appreciated, however, from Figs. 15 and 16 that the length of the bridge 199 is preferably somewhat less than that of the usual table or platform on cigarette-making machines. The reason for this lies in the fact that it is intended with the instant embodiment of the present invention that the successively fed cigarettes 51 should not remain on the bridge 199 for collection in the usual manner, but should roll or fall off the rounded delivery edge 201, a matter which will be taken up in detail infra.

Turning now to the delivery end of the guides 194, it will be seen (Figs. 15 and 17) that their upright portions 195 do not terminate in the usual manner but instead comprise elongations 202 which are in the same planes, respectively, as the guide portions 195 but which extend downwardly and forwardly over the delivery edge 201 of the bridge 199 to a point below its level and adjacent the sprocket wheels 35 and the chain portions thereon. The elongations 202 thus form

continuations of the guide portions 195, for it is intended that they constitute a way between the sides of which the cigarettes drop from the bridge 199 just as the guide portions 195 constitute a way along which the cigarettes are successively fed along the belt 186 and the bridge 199.

In order to receive the cigarettes 51 which drop from the bridge 199, as will be described, the embodiment of the present invention illustrated in Figs. 15-17 is provided with a pair of spaced fingers 203 constructed to catch each cigarette and arrest its fall. Referring particularly to Figs. 16 and 17, each finger 203 is made of flat material and is suitably secured to the under face of the bridge 199, and from the delivery edge 201 the fingers 203 each extend downwardly and forwardly to form inclines in a common plane. At their bottoms the inclines merge into forwardly and upwardly curved portions 204, respectively, each having substantially the same curvature as that of a cigarette, and the curved portions 204 in turn merge into upwardly and forwardly extending curved portions 205. With this construction, a cigarette dropping off the bridge delivery edge 201 rolls down the inclined portions of the fingers 203 between the guide elongations 202 and comes to rest in the curved bottoms 204.

While in the preceding sentence reference has been made to a cigarette rolling down the inclines of the fingers 203, in the operation of the cigarette-making machine there may frequently be at a given time more than one cigarette supported by the fingers. It being desirable when the fingers 203 are thus supporting a plurality of cigarettes that the axes thereof at least adjacent the curved bottoms 204 will be in a plane, i. e., that the cigarettes will lie along the inclines, it is contemplated that the fingers 203 be associated with members which cooperate therewith to form a way insuring this result.

To this end, the forward inclined edges of the guide elongations 202 are engaged by the opposite ends of a flat crossbar 206 provided with ears 207 which are bent over into engagement with the outer faces of the elongations 202 and are removably held in place by screws 208. Depending from the rear face of the crossbar 206 are a pair of spaced plates 209 the lower portions of which are bent rearwardly and then downwardly and forwardly in parallelism with the inclined portions of the fingers 203 and are spaced from them slightly more than the diameter of a cigarette. They may be slightly wider than the fingers 203 and are aligned with them, and they terminate at a level above the top of a cigarette resting on the curved finger portions 204, preferably at about the mid-point of a cigarette lying upon the lowermost one, as indicated in Fig. 16. By reason of the parallelism and spacing between the plates 209 and the inclined portions of the fingers 203, it will be seen that the above-described construction insures that when a plurality of cigarettes lies along the fingers 203 from the curved portions 204 thereof upward, these cigarettes will have their axes substantially in a plane.

Completing the above-described structure are two springs 210 which may be somewhat narrower than the fingers 203 and the plates 209, but aligned with them, these springs being secured at their upper ends to the front face of the crossbar 206. As shown best in Figs. 16 and 17, the springs extend downwardly from the crossbar 206 substantially parallel with the inclined portions of the fingers 203, and then are

bent at a point above the level of the cigarette 51 lying in the curved finger portions 204, from which point the fingers 210 are arched forwardly so as to terminate ahead of the finger portions 205 and extend convergently toward them.

If comparison be now made between Figs. 15-17 on one hand and Figs. 7-9 on the other, it will be seen that the structure described in the paragraphs just above has certain functional identities with structure shown in these last named figures. For one thing, it will be noted that just as the curved finger portions 62 support the lowermost cigarette in the stack above it, so do the curved finger portions 204 support the lowermost of what plurality of cigarettes there may be extending upward along the inclined portions of the fingers 203. For another thing, it will be noted that just as the upright frame member portions 55 and 56 and the vertical plates 58 form a chute for the stack of cigarettes overlying the curved finger portions 62, so do the plates 209 and the inclined portions of the fingers 203, together with the guide elongations 202, form a chute for the cigarettes that fall off the bridge delivery edge 201.

But the similarities stated above do not end here. It will also be seen that the fingers 203 are spaced apart (Figs. 15 and 17), and the plates 209 are likewise so spaced, in the same manner as is the case with the fingers 59 and the springs 68 in Fig. 7; that the curved finger portions 204 have substantially the same spacing from the chains 36 as is the case with the curved finger portions 62; and that just as the frame members 54 and the vertical plates 58 are sufficiently spaced from the top horizontal chain runs so as to terminate above the level of the tops of the cradle fingers 48, 49, and 50 when the cradles 39 are horizontal, so are the lower edge of the crossbar 206 and the delivery edge 201 of the bridge 199 similarly spaced from the chains 36. In fact, there are but two important structural differences between the above-described subject matter in Figs. 15-17 and the same in Figs. 7-9, and these are that in the latter figures the fingers 59 are associated with a horizontal portion of the chain runs while in Figs. 15-17 the fingers 203 are associated with a curved portion, and that, following from this latter positioning, the finger portions 205 and the springs 210 are curved towards the chains 36 whereas the finger portions 63 and the springs 70 are straight but extend downwardly. These differences are only structural, however, and not functional, for the finger portions 205 and the springs 210 have substantially the same spacing throughout from each other and from the plates 44 of a cradle 39 passing under them as is the case with the finger portions 63, the springs 70, and a cradle 39 in Figs. 7-9, and perform along curved lines the same functions which the finger portions 63 and the springs 70 perform linearly.

While the sprocket wheels 35 and the chains 36 may be driven in the Figs. 15-17 embodiment from a source independent of the cigarette-making machine, it is preferred that the chains 36 be operatively connected to the making machine drive itself, thereby providing for a constant correlation between the speed of feed of the belt 186 and the speed of travel of the chains 36 and the cradles 39. To achieve this end, the shafts 34 and 189 may be furnished with aligned gears 211 and 212, respectively, with a suitable chain 213 passing around and operatively connecting them.

The feeding of successive cigarettes to the curved finger portions 204 for successive withdrawal and transfer by the cradles 39 involves no real departure from the mode of feeding cigarettes to the collecting table or platform in cigarette-making machines generally. The rolling of cigarettes from the belt 186 to the table or platform in present machines is utilized without change in the Figs. 15-17 embodiment of the present invention, and what difference there is is more a matter of addition than of substitution.

Beginning with the two facts that as the belt 186 receives made cigarettes from the "catcher" they are carried along the belt in quite regular spaced relationship and that the speed of the belt gives to each cigarette a momentum that causes it to roll along the receiving table or platform, there are several ways in which the curved finger portions 204 may successively receive cigarettes from the belt 186. For one mode of operation the bridge 199 may be sufficiently short so that the momentum imparted to each cigarette by the belt 186 is sufficient to cause it to roll the entire length of the bridge, to and over the delivery edge 201 thereof, and so to the curved finger portions 204. This method of operation, however, while within contemplated use, has the disadvantage that the proper length for the bridge 199 is too closely tied up with the speed of the belt 186, it being remembered that different belt speeds give the fed cigarettes different momenta, and hence different rolling distances. As a consequence, if the bridge 199 has a length adapted for the momentum imparted by a belt moving at its greatest speed, a slowing up of the belt may cause the cigarette to stop short of the delivery edge 201, while a bridge length adapted for the momentum imparted by a relatively slow belt might be too short when the speed of the belt is increased, as the cigarettes would then be impelled along the bridge with greater force than necessary to cause them to roll properly off the delivery edge 201 and down the inclined portions of the fingers 203.

It is only this very last mentioned operation, however, which is to be avoided, and therefore the bridge can be given such length that in intended use the momentum imparted by the belt 186 will not cause a given cigarette to roll the full length of the bridge 199. With this arrangement a given cigarette stops short of the delivery edge 201, but is thereafter pushed over the delivery edge by the impact of the next cigarette fed by the belt 186 and rolling along the bridge. In this operation, the second cigarette will stop short of the edge 201 until pushed thereover by the impact given it by the next succeeding cigarette fed by the belt, and this successive pushing and dropping of cigarettes from the delivery edge 201 may continue as long as the belt 186 is in operation. It is also contemplated that two or more than two cigarettes may be on the bridge 199 before a succeeding cigarette causes the first there to be pushed off.

The preceding mode of operation is more desirable than the first as a general rule, but it does have the disadvantage (also exhibited in the first) that if there are particles of tobacco on the bridge 199, a given cigarette striking them may be deflected, resulting in destroying the regularity of position and movement of the succeeding cigarettes. It is realized that by having the guide portions 195 sufficiently near the cigarette ends any disturbance of intended cigarette

position may be minimized and practically eliminated, but to guard against mishap even under these conditions, a third mode of operation may be used. In this the bridge 199 is provided with a plurality of parallel and successively touching cigarettes, as indicated in Fig. 16, before the cigarette-making machine is set into operation, the row of cigarettes preferably extending from one end of the bridge to the other, and if desired the fingers 203 may also be provided with one or more cigarettes. Thus set up, the impact of a given belt-fed cigarette at the belt edge of the bridge 199 is transferred through the row of cigarettes thereon, causing the row to move along the bridge and also causing the cigarette at the delivery edge 201 to fall thereover and into the way formed by the plates 209, the elongations 202, and the inclined portions of the fingers 203. The successive feeding of further cigarettes by the belt is but a repetition of the operation just described, and results in the successive presentation of cigarettes to the curved finger portions 204 for successive withdrawal and transfer away by the cradles 39. The effect of particles of tobacco on the bridge 199 is nil in the above-described mode or operation, for the deflection which a moving cigarette might exhibit by reason of the fact that a particle touches it at only a point is counteracted by the fact that that same cigarette is in juxtaposition to another cigarette which offers contact throughout its entire length.

In view of the foregoing, it will be appreciated that regardless of which of the above-described methods is used to cause cigarettes to drop off the bridge delivery edge 201, the withdrawal of a cigarette from the curved finger portions 204 involves fundamentally the same operation as is the case of the embodiments of the present invention shown in Figs. 7-9. As a cradle 39 approaches the lowermost cigarette 51 supported by the fingers 203, these fingers, the plates 209, and the springs 210 are so positioned as to clear the cradle fingers 48, 49, and 50, but this is not the case with the cigarette, which presents a continuous transverse front below the tops of the cradle fingers, as in Figs. 7-9. As a consequence the cradle fingers push the cigarette away from the curved finger portions 204 in a forward and upward direction for the chain portion carrying the cradle is as yet only moving towards the horizontal at the top of the sprocket wheels 35. After withdrawal from the curved finger portions 204, the immediate support for the pushed cigarette is not the cradle 39 alone but is also the curved finger portions 205, and the cigarette is pushed along these latter, which curve toward the level of the cradle plate portions 44, until the cigarette rides off them to the notches 46, all in a manner similar to the movement of a cigarette along the finger portions 63, as explained above. In order to prevent any throwing of a cigarette from a cradle 39 and the curved finger portions 205 upon its withdrawal from the fingers 203, which might result from the momentum caused by the rapidly moving cradle, the springs 210 function as an abutment for each withdrawn cigarette in the same manner that the springs 70 function, and in addition the springs 210 cooperate with the finger portions 205 to form a way in which the withdrawn cigarette is steadied as its cradle approaches the horizontal and also continue in engagement with the cigarette after it has ridden off the finger portions 205 to insure that the cigarette is pushed into and is steadied

in the notches 46 preparatory to being presented to the wick or nozzle applicators in the manner of presentation described for the embodiments shown in Figs. 1-14.

In stating above that the speed of the belt 186 and the speed of the cradles 39 are correlated, there of course was meant that every time a cigarette 51 is located in the curved finger portions 204 a cradle 39 is operative to take it away. Stated in another way, it is contemplated that with a given number of cradles on the chains 36 (four, for example only) the ratio between the gears 211 and 212 shall be such that these four successively moving cradles will withdraw the cigarettes successively from the finger portions 204 as fast as they are presented thereto. An increase or a decrease in the number of cradles will necessitate a changing of the gear ratio, but whatever the ratio, i. e., whatever the number of cradles 39, may be desired, cigarette presentation and withdrawal will still be correlated, and the cigarettes successively presented to the finger portions 204 will be successively withdrawn by the cradles 39 and thereafter successively presented to the fluid applicators. As a final correlation point, it is also to be noted that it is not necessary that a given cradle be in a given position of nearness to the fingers 203 when the cigarette-making machine is put into operation. The arrangement above described provides such a timed relationship between the successive dropping of cigarettes from the delivery edge 201 and the successive passing of the cradles 39 past the fingers 203, that no matter where the nearest cradle below the level of the fingers 203 may be, it will pass the fingers before the dropping down of the cigarette to be withdrawn by the next succeeding cradle.

It will be appreciated that when the standards 72 are moved on their blocks 71 to accommodate the applicators and the associated mechanisms to cigarettes of different lengths, a similar change should be made in the spacing between the guides 194. This is accomplished by first loosening the screws 208 and removing the crossbar 206, after which the studs 198 are loosened in the slots 197 to permit the position of the guides 194 to be changed. Thereafter the studs 198 are tightened and the guides 194 provided with another crossbar construction, differing from the crossbar 206 only in being longer or shorter, as the case may be.

The embodiment of the present invention illustrated in Figs. 15-17 is characterized by the fact that the cigarettes fed by the belt 186 are not supported for withdrawal by the cradles 39 directly from the bridge 199 itself but from the support afforded by the fingers 203 to which the cigarettes drop from the bridge. In Figs. 18-20, however, an embodiment is shown in which the fed cigarettes do not drop from the bridge but in which the bridge itself forms the support from which the cigarettes are directly withdrawn by the cradles.

Describing this construction in detail, the bridge 214 is similar to the bridge 199 in that it extends as a flat plate between the frame walls 187 to which it is secured by suitable brackets 215 at a level such that the top of the bridge is slightly below the level of the top surface of the belt 186 as in Figs. 15-17, and its edge adjacent the belt is upwardly knifed in the manner previously described for the bridge 199, and for the same purpose. Likewise, the marginal portions of the bridge are overlapped by the horizontal guide portions 196.

The rear or delivery end of the bridge 214 differs, however, from the same portion of the bridge 199, this construction being provided because it is intended, as best shown in Fig. 19, that the delivery end of the bridge shall lie adjacent the chains 36 so as to perform the function of the curved fingers portions 62 in Figs. 7-9 and of the curved finger portions 204 in Figs. 15-17. In order to achieve this result, and with particular reference to Fig. 20, the delivery end of the bridge 214 is provided with three spaced rectangular notches which cause the margins of the bridge to have side tongues 216, respectively, and therebetween two tongues 217, spaced from each other and from the marginal tongues 216, one at each side of the bridge center line. As will be appreciated from Figs. 18 and 20, the space between the tongues 217 is slightly wider than the width of a central cradle finger 49, the space between each pair of adjacent tongues 216 and 217 is slightly wider than the width of a cradle finger 48 or 50, and the tongues are spaced from each other so as to present openings which the cradle fingers 48, 49, and 50 may clear laterally. The tongues likewise have a length such that the tops of the cradle fingers will clear the bridge proper, and it will be seen that the construction thus described provides for the uninterrupted travel of the cradles 39 past the bridge 214, i. e., between the tongues 216 and 217.

The above differences between the structure of the bridges 199 and 214 being pointed out, it is also to be noted that the delivery ends of the guides 194 in Figs. 18-20 differ from the delivery ends in Figs. 15-17. Referring particularly to Fig. 20, it will be seen that since cigarettes do not drop from the bridge 214, the delivery ends of the upright guide portions 195 do not have downward elongations but terminate forwardly along an upstanding edge 218 which preferably is forwardly inclined. Above the edge 218 the guide portions 195 are each inclined rearwardly and upwardly along an edge 219 and are provided rearwardly thereof with a notch 220.

The construction so far described provides the bridge 214 which receives cigarettes fed thereto by the belt 186 and also the delivery end structure for the guide portions 195 between which the cigarettes travel on the bridge. It having been pointed out that the cradles 39 withdraw cigarettes from the delivery end of the bridge 214, there will now be described the further structure functioning during this operation.

Secured to the under face of each tongue 217 is the bent end of a finger 221, the major portion of which extends upwardly and is curved increasingly forwardly towards the chains 36 so that at its free end it is spaced therefrom only slightly more than are the cradle plate portions 44 from their supporting chain portions. By reason of this construction, it will be seen that the fingers 221 have the same spacial relationship to the chains 36 as is the case with the curved finger portions 205 in Figs. 15-17, the only difference being that the fingers 221 are lower down with respect to the sprocket wheels 35. As will be explained in detail later, the fingers 221 also play the same part as do the finger portions 63 and 205 in the withdrawal of cigarettes by the cradles 39.

In order to provide for the fingers 221 a spring construction which cooperates with them and functions as do the springs 70 and 210, the inclined edges 219 of the guide portions 195 are engaged by a flat crossbar 222 having ears which

are bent over into engagement with the outer faces of the guide portions 195 and are removably held in place by screws 223. Suitably secured to the front face of the crossbar 222 are the bent ends of a pair of springs 224, the major portion of each of which extends upwardly and curves forwardly convergingly with respect to the fingers 221. The springs 224 are aligned with the fingers 221, as indicated in Fig. 18, and may be narrower than the fingers if desired. It will be understood that the fingers 221 should not be appreciably wider than their tongues 217 so that the cradle fingers may clear the fingers 221 laterally as well as the tongues.

It will be noted that the feeding of cigarettes to the bridge 214 from the belt 186 differs in one respect from the feeding in Figs. 15-17, in that the fingers 221, by reason of being upstanding, present an abutment to prevent the passage of cigarettes from the delivery end of the bridge under belt-speed impetus. But although this is the case, it is not desirable, in one use of the Figs. 18-20 embodiment, that the bridge be of such length that a rolling cigarette would naturally stop short of the tongues 216 and 217, for it is necessary that a cigarette be at the delivery end of the bridge 214 and over the tongues in order that the cigarette be in position for withdrawal by the cradles 39. It is therefore contemplated, in one use of the embodiment in Figs. 18-20, that the bridge 214 have such length that the impetus given a cigarette by the belt 186 will cause it to roll all the way to the delivery end of the bridge, and that to offset any deflection or improper positioning at the delivery end by reason of impact with the upstanding fingers 221, means be provided which function in part to slow down the rolling and in part to prevent any backward movement or irregular position of the cigarette as the result of impact with the fingers 221.

To this end, a flat crossbar 225 engages the rearward inclines of the notches 220 and is provided at its ends with ears which are bent into engagement with the outer faces of the guide portions 195 and removably held in place by screws 226. Suitably secured to the under face of the crossbar 225 are a pair of springs 227 aligned with the fingers 221 and the springs 224, and as shown best in Fig. 19, the springs 227 are directed downwardly and then are curved so as to extend forward horizontally, being spaced from the bridge 214 a distance only slightly less than the diameter of a cigarette so as to lightly press against any that may be under them on the bridge, as indicated. The free ends of the springs 227 are upturned and terminate so as to extend only slightly over a cigarette overlying the delivery end of the bridge.

The springs 227 are relatively weak so that although they cooperate with the top of the bridge 214 to form a way through which each cigarette passes, they exert on a rolling cigarette only so much drag as will slow it down without stopping it, and since the ends of the springs extend forward sufficiently to engage a cigarette while it is engaged with the fingers 221, it will be seen that once a cigarette reaches the delivery end of the bridge 214 it is lightly held in engagement with the fingers 221, i. e., properly positioned over the tongues 216 and 217.

The above operation is described for the springs 227 as though cigarettes were being fed along the bridge 214 one at a time and in the usual spaced relationship by reason of the action of the belt

186, and it is indeed contemplated that the illustrated embodiment may be so used. It is also contemplated, however, that if the length of the bridge is such that a given belt impetus causes a cigarette to stop short of the fingers 221, the impact of the next cigarette, or of one succeeding that, will push the first to the desired position, while the springs 227 maintain them steady, as indicated in Fig. 19. However, the disadvantages stated above in these respects for the embodiments in Figs. 15-17 are to a certain extent possible here, and it is therefore preferred that the bridge 214 be provided with a row of cigarettes extending substantially throughout its length, as shown in Fig. 19, before the cigarette-making machine is actuated. With this mode of operation the springs 227 are preferably weaker than stated above, so as not to offset materially the row-moving impacts of cigarettes successively fed from the belt 186 which cause the cigarettes on the bridge to successively move into engagement with the fingers 221 and to overlie the tongues 216 and 217. As a matter of fact, in this last-described mode of using the Figs. 18-20 embodiment of the present invention, the way-forming function of the springs 227 is of minor importance except for the fact, not present when only one cigarette is on the bridge, that what pressure the springs exert downwardly on the cigarettes lying behind the one engaged with the fingers 221 serves to steady them against any agitation which the impact of the cradle fingers 48, 49, and 50 on the foremost cigarette might carry through to the cigarettes adjacent.

In view of the foregoing it will be seen that the operation of successively withdrawing cigarettes from the bridge 214 is substantially the same as in the embodiment in Figs. 15-17, regardless of what method is used to insure that cigarettes successively engage the fingers 221 and overlie the tongues 216 and 217 for withdrawal. The tongues do not interfere with the movement of the cradles 39 and therefore the cradle fingers engage the cigarette overlying the tongues and push it upwardly and forwardly. The cigarette is initially supported upon withdrawal both by the cradle fingers and by the fingers 221, and there is no danger of the cigarette being thrown upwardly and away from the cradle because of the abutment provided by the springs 224. During the continued transfer of each withdrawn cigarette, it rides on the fingers 221 toward the cradle plate portions 44 in the same manner as has been described above, being pressed thereagainst by the springs 224, and when the cigarette rides off the fingers 221 it is steadied and pressed toward the notches 46 by the fingers 224 as above stated for the fingers 70 and 210. A cigarette finally leaves the springs 224 in a steadied condition on its cradle, and is thus transferred along the horizontal portion of the top chain runs for the reception of treating fluid from the applicators as has been previously described.

The embodiment of the present invention shown in Figs. 18-20 exhibits the same correlation between the speed of the belt 186 and the speed of the chains 36 as explained above for Figs. 15-17, and is provided with the gears 211 and 212 and the chain 231 in the same way to achieve this result, the only difference being that with Figs. 18-20 the sprocket wheels 35 and the chains 36 are at a higher level and that the cradle fingers preferably engage the cigarettes

on the bridge 214 when the cradles have moved only slightly above a position where their fingers are horizontal. With the belt speed and the chain speed correlated for the particular number of cradles 39 which the chains 36 may carry, it will be seen that every time a cigarette has reached a point of engagement with the fingers 221 while lying on the tongues 216 and 217, a cradle 39 is at hand to withdraw it for the application of treating fluid. The only difference, in contrast to the operation of the Figs. 15-17 embodiment, is that with the bridge 214 covered with cigarettes, as shown in Fig. 19, it is desirable that a cradle 39 remove the cigarette at the delivery end before the remaining cigarettes receive the impact of the next successively fed cigarette coming from the belt 186, as is also indicated in Fig. 19. The reason for this is that this operation provides that gap between the fingers 221 and the then rearmost cigarette which the impact of the next belt-fed cigarette closes up ahead of the arrival of the next cradle.

When it is desired to use the Figs. 18-20 embodiment of the present invention to treat cigarettes of different lengths, adjustments are made in a manner similar to that stated above for Figs. 15-17. That is, the crossbars 222 and 225 are removed and the studs 198 loosened in the slots 197 to permit a change in the spacing between the guides 194, whereupon the studs are tightened and other crossbars mounted on the guides, these crossbars differing from those removed only by being longer or shorter.

Nothing herein contained is to be interpreted as limiting the scope of the present invention to use in connection with the particular constructions or the particular operations or both which have been set forth above. Various embodiments of the present invention and their operations have been described herein in considerable detail, but it is to be understood that this has been done only by way of illustration and not limitation. Changes may be made in the details explained above within the skill of the artisan without departing from the true scope of the actual invention, the characteristic features of which are set forth in the following claims which intentionally contain generic terms that are inclusive of various modifications.

What is claimed as new is:

1. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means operatively connected to said transferring means for applying treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said end portion at an area on said face spaced from the wrapper while the cigarette is being transferred along said extended horizontal path portion.

2. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means movable adjacent the cigarette in the general direction of its transfer along said extended horizontal path portion for applying treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said

end portion at an area on said face spaced from the wrapper while the cigarette is being transferred along said extended horizontal path portion.

3. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means mounted for continuous, non-reciprocal movement to apply treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said end portion at an area on said face spaced from the wrapper while the cigarette is being transferred along said extended horizontal path portion.

4. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means located substantially at the level of said path for applying treating material to the tobacco fibres of at least one end portion of said cigarette wholly internally of the wrapper thereof while the cigarette is being transferred along said horizontal path portion, said last named means being mounted for movement about a vertical axis into and out of engagement with only the end face of said cigarette end portion at an area on said face spaced from the wrapper to effect said treating material application.

5. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means located substantially at the level of said path for applying treating material to the tobacco fibres of at least one end portion of said cigarette wholly internally of the wrapper thereof while the cigarette is being transferred along said extended horizontal path portion, said last named means being mounted for rotary movement into and out of engagement with only the end face of said cigarette end portion at an area on said face spaced from the wrapper to effect said treating material application.

6. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of devices movable adjacent the cigarette in the general direction of its transfer along said extended horizontal path portion and adapted to grip the cigarette at its opposite end faces for an interval during said transfer along said extended horizontal path portion to apply treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said end portion at an area on said face spaced from the wrapper.

7. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means for applying treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof during said transfer along said extended horizontal path portion, said applying means including a treating material holder mounted for movement adjacent said path por-

tion and also including an applicator carried by the holder in stationary relation thereto and located substantially at the level of said path portion, said applicator being adapted to receive treating material from the holder and being movable with the holder into and out of engagement with only the end face of said cigarette end portion at an area on said face spaced from the wrapper to effect said treating material application while the cigarette is being transferred along said path portion.

8. In a cigarette machine, the combination with means for transferring a cigarette along a path, and means for positively constraining the transferring means to the horizontal for an extended portion of said path, of means for applying treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said end portion at an area spaced from the wrapper while the cigarette is being transferred along said extended horizontal path portion.

9. In a cigarette machine, the combination with means for transferring a cigarette, of means for applying treating material to the tobacco fibres of at least one end portion of the cigarette wholly internally of the wrapper thereof by engagement with only the end face of said end portion at an area on said face spaced from the wrapper while the cigarette is being transferred.

10. A cigarette machine such as set forth in claim 9 characterized by the fact that the applying means recited in said claim is movable adjacent the cigarette in the general direction of its transfer.

11. A cigarette machine such as set forth in claim 9 characterized by the fact that the applying means recited in said claim is operatively connected to the transferring means recited in said claim.

12. A cigarette machine such as set forth in claim 9 characterized by the fact that the applying means recited in said claim is mounted for continuous, non-reciprocal movement into and out of said engagement.

13. A cigarette machine such as set forth in claim 9 characterized by the fact that the applying means recited in said claim is mounted for rotary movement into and out of said engagement.

14. In a cigarette machine, the combination with devices each mounted for continuous, non-reciprocal movement in a horizontal plane and each adapted to apply treating material to the tobacco fibres of an end portion of a cigarette wholly internally of the wrapper thereof by en-

gagement with only the end face of said end portion at an area on said end face spaced from the wrapper, of means for presenting a cigarette to said devices during said movement thereof to effect said engagement.

15. A cigarette machine such as set forth in claim 14 characterized by the fact that the continuous, non-reciprocal movement of the devices recited in said claim is rotary movement.

16. In a cigarette machine, the combination with devices mounted for movement simultaneously into and out of a position in which oppositely disposed portions thereof are in substantial alignment, said portions when so aligned being adapted to engage only the end faces of the end portions, respectively, of a cigarette at an area on said end face spaced from the wrapper, and means for presenting a cigarette to said devices for engagement by said device portions as stated when oppositely disposed in substantial alignment, of means for supplying treating material to at least one of said device portions at least when they are engaged with the cigarette end faces as stated so that at least one of said end faces may receive treating material from a device portion wholly internally of the wrapper.

17. A cigarette machine such as set forth in claim 16 characterized by the fact that the devices recited in said claim are mounted for continuous, non-reciprocal movement to bring their said portions into and out of said substantial alignment.

18. A cigarette machine such as set forth in claim 16 characterized by the fact that the devices recited in said claim are mounted for rotary movement to bring their said portions into and out of said substantial alignment.

19. In a cigarette machine, the combination with means for transferring a cigarette, of movable devices associated with the transferring means and adapted, for an interval during said transfer, to grip the opposite end portions of the cigarette by engagement with only the end faces of said end portions, respectively, at an area on said end faces spaced from the wrapper, said gripping devices being adapted to receive treating material for transfer to a said end face during said gripping engagement whereby at least one of said end portions may receive treating material wholly internally of the wrapper.

20. A cigarette machine such as set forth in claim 19 characterized by the fact that the devices recited in said claim are operatively connected to the transferring means recited in said claim as well as being associated therewith.

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Patent No. 2,322,747.

CERTIFICATE OF CORRECTION.

June 29, 1943.

WILLIAM SHAND.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 47, for "to" before "top" read --the--; page 5, second column, line 4, before "each" insert --on--; page 16, first column, line 37, for "by" read --be--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of November, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.