May 9, 1933. R. E. RUNDELL 1,907,587

HIGH SPEED CIGARETTE MACHINE

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Fig. 1.

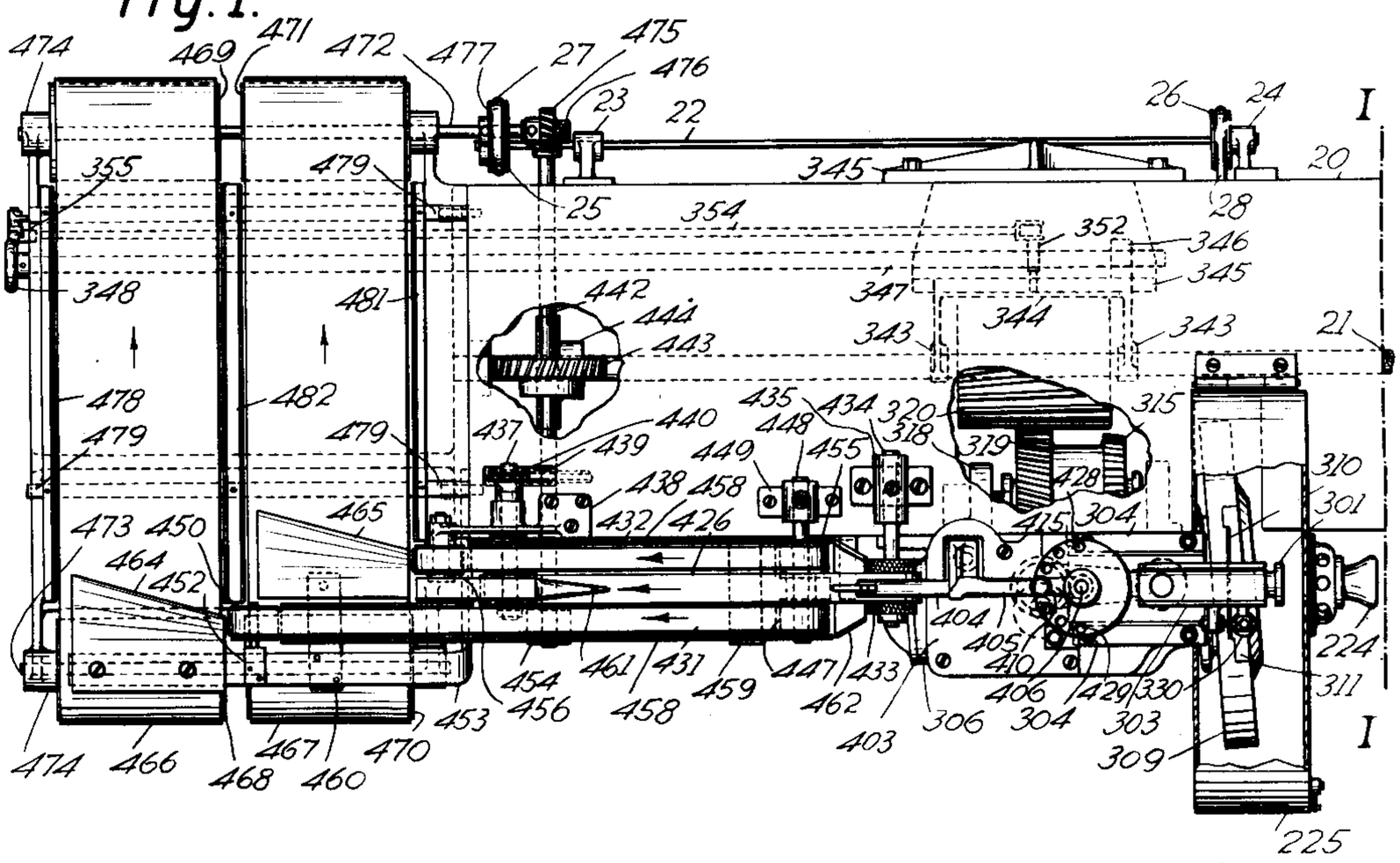
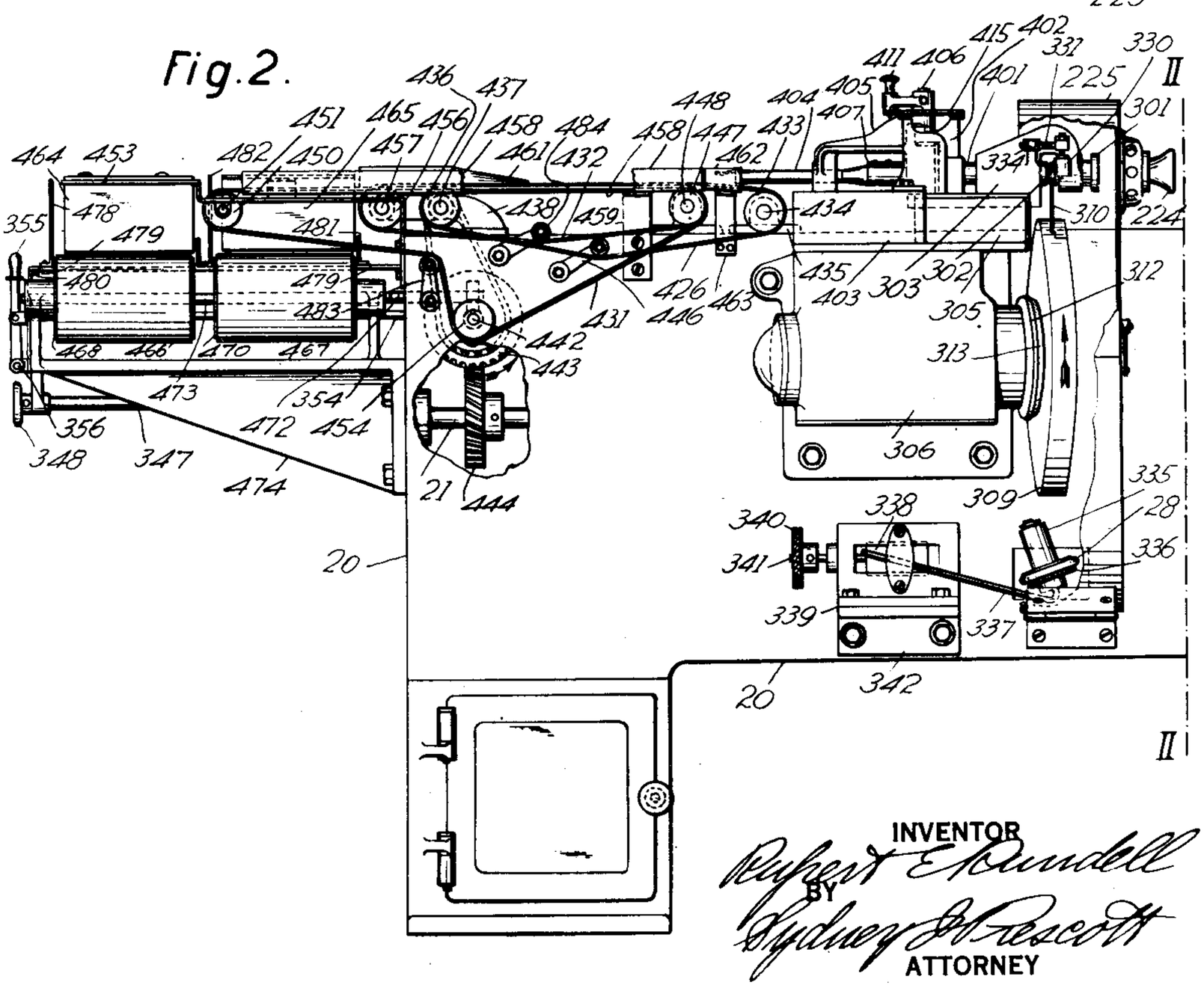


Fig. 2.



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HIGH SPEED CIGARETTE MACHINE

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Fig. 1a.

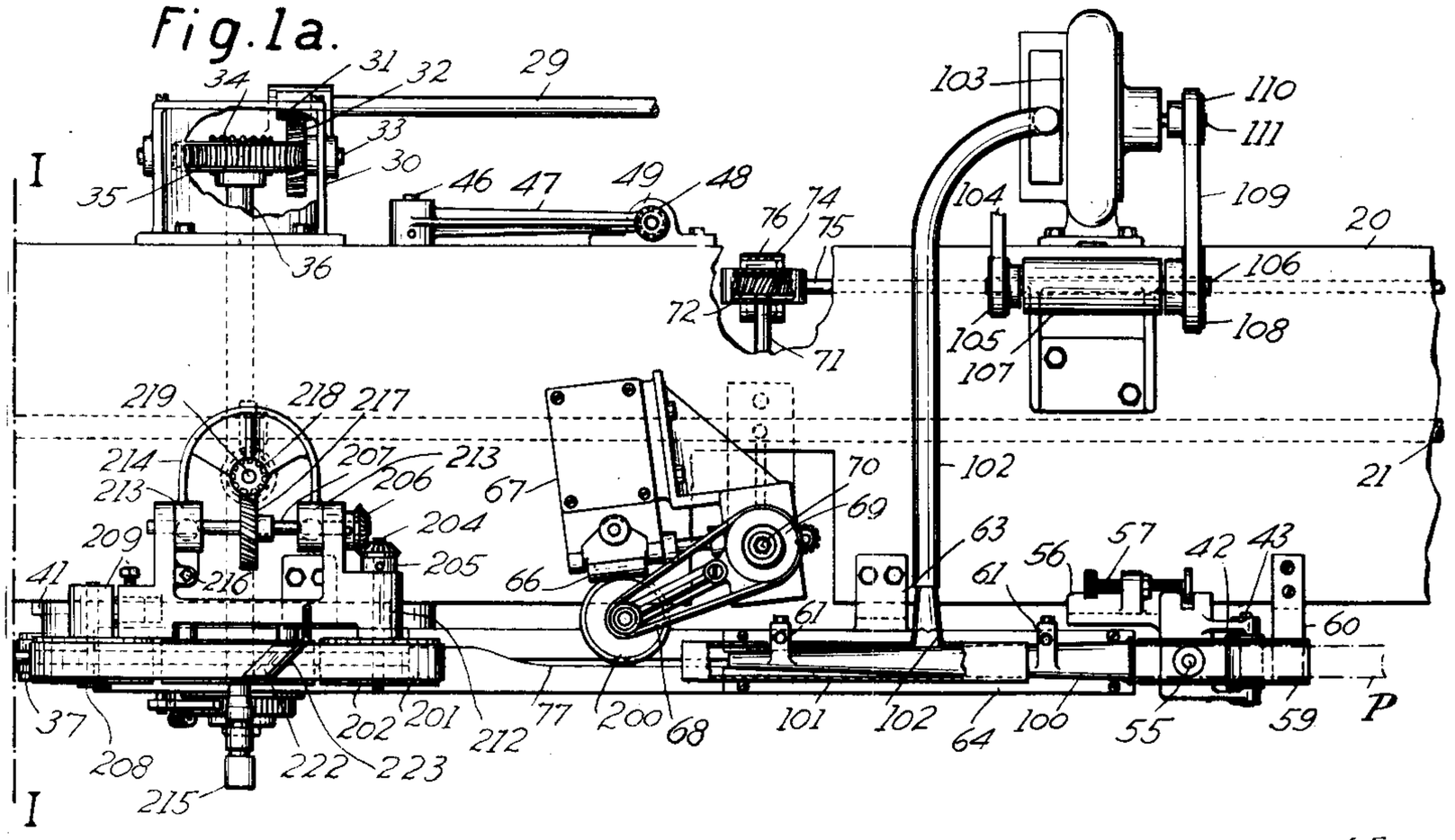

Fig. 2a.

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HIGH SPEED CIGARETTE MACHINE

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Fig. 3.

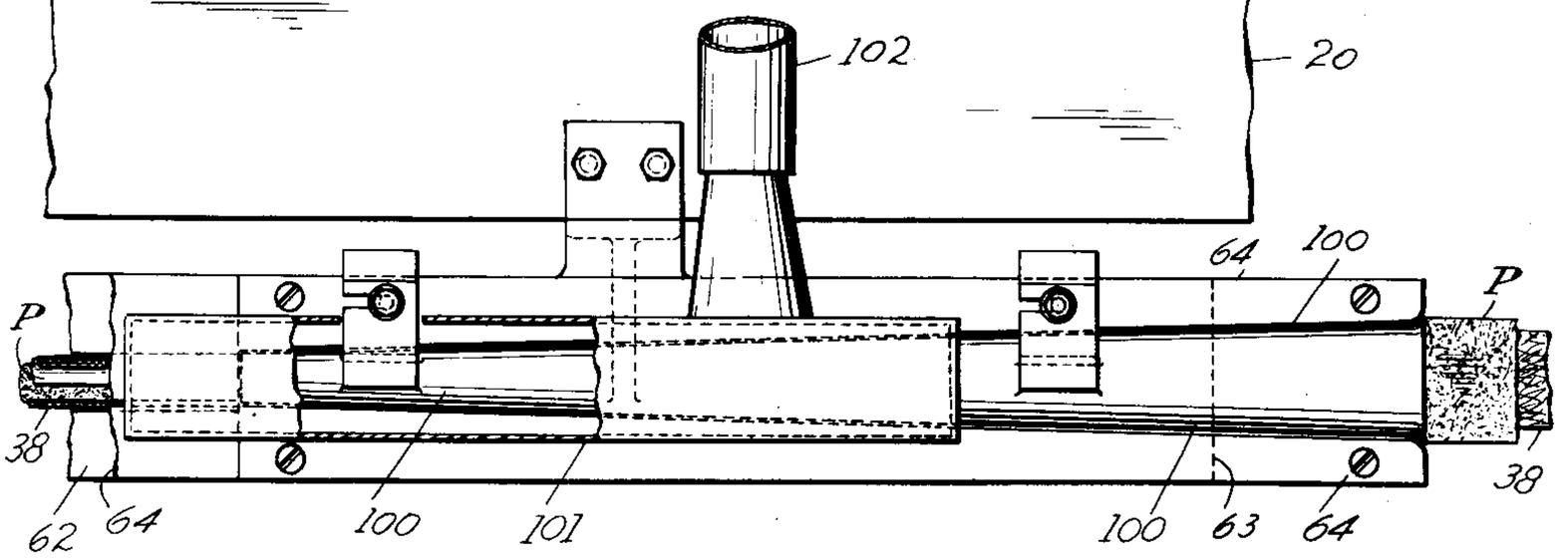


Fig. 4.

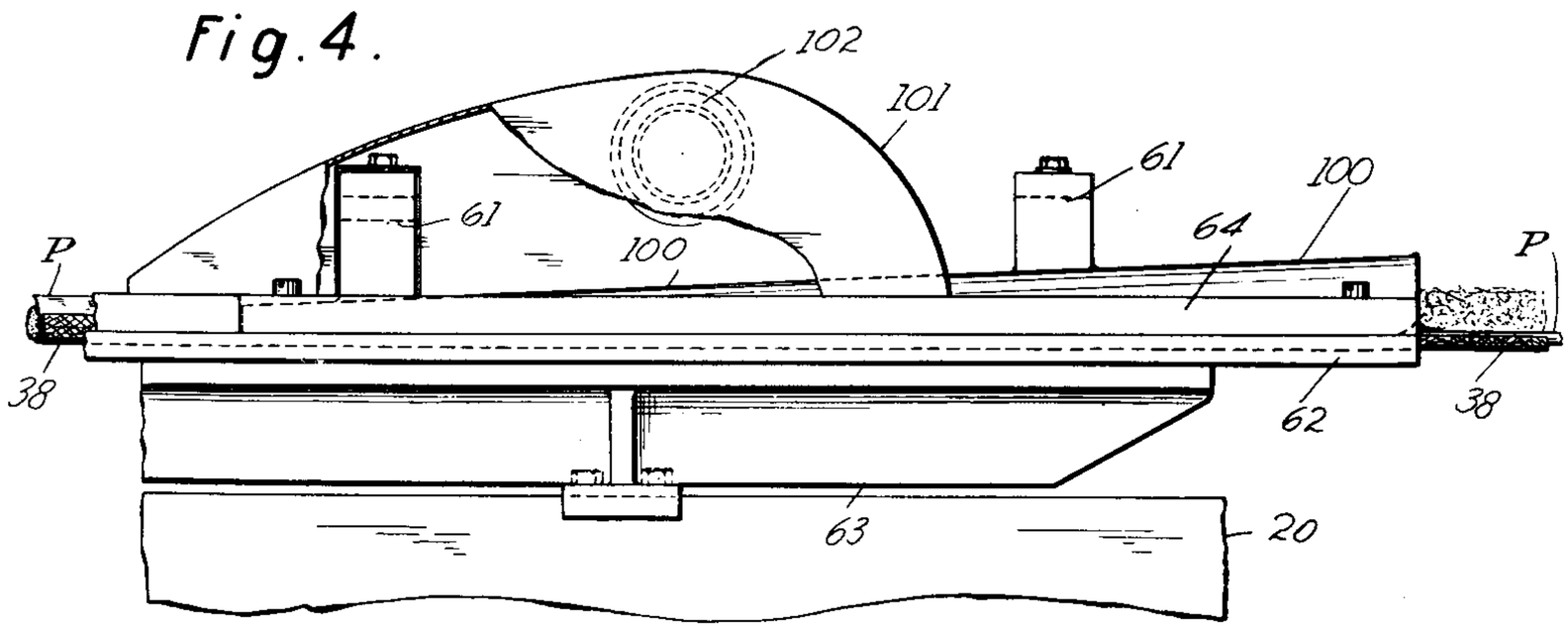
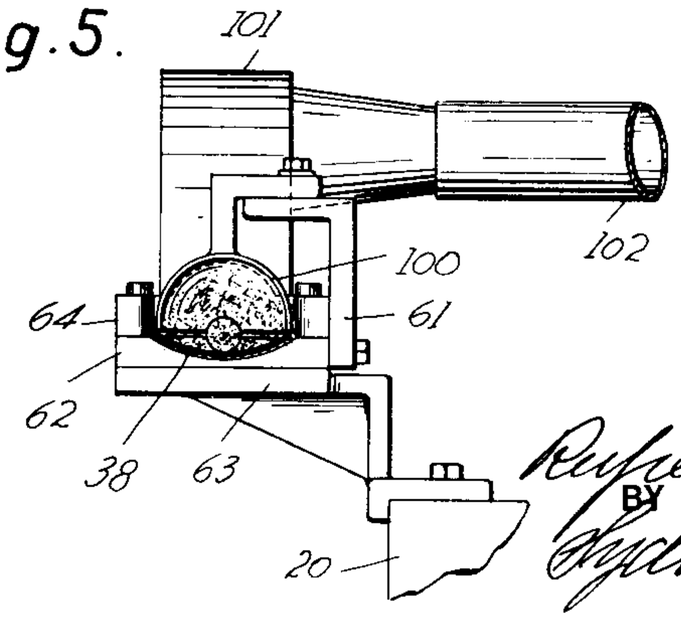


Fig. 5.



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HIGH SPEED CIGARETTE MACHINE

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Fig. 6.

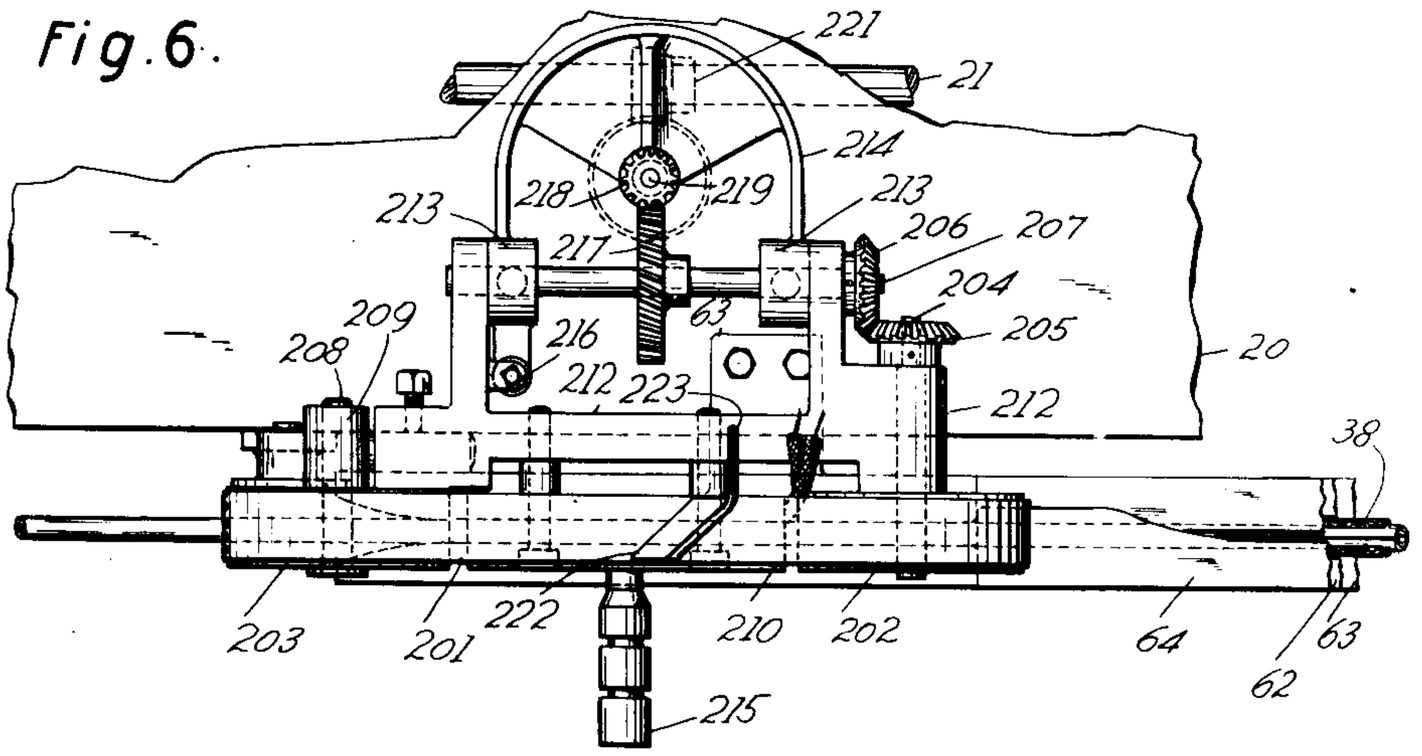

Fig. 7.

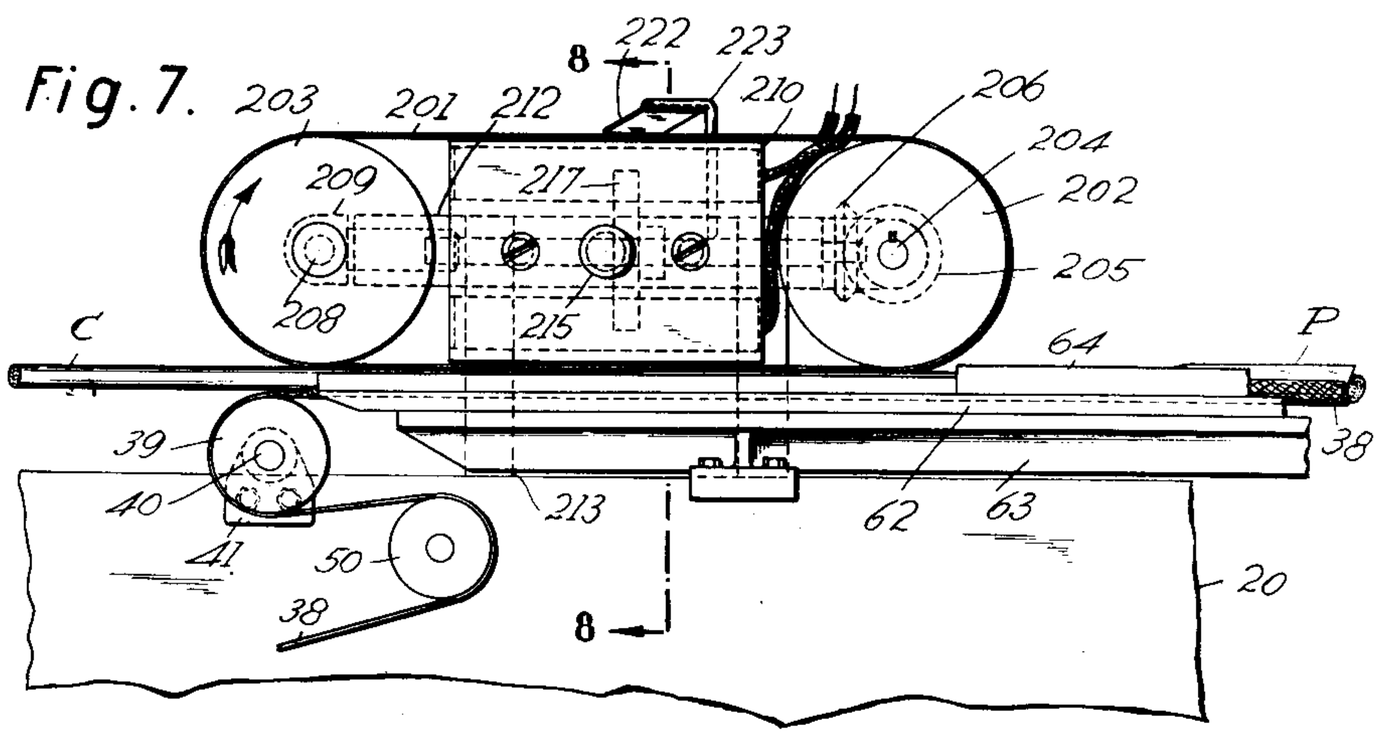

Fig. 8.

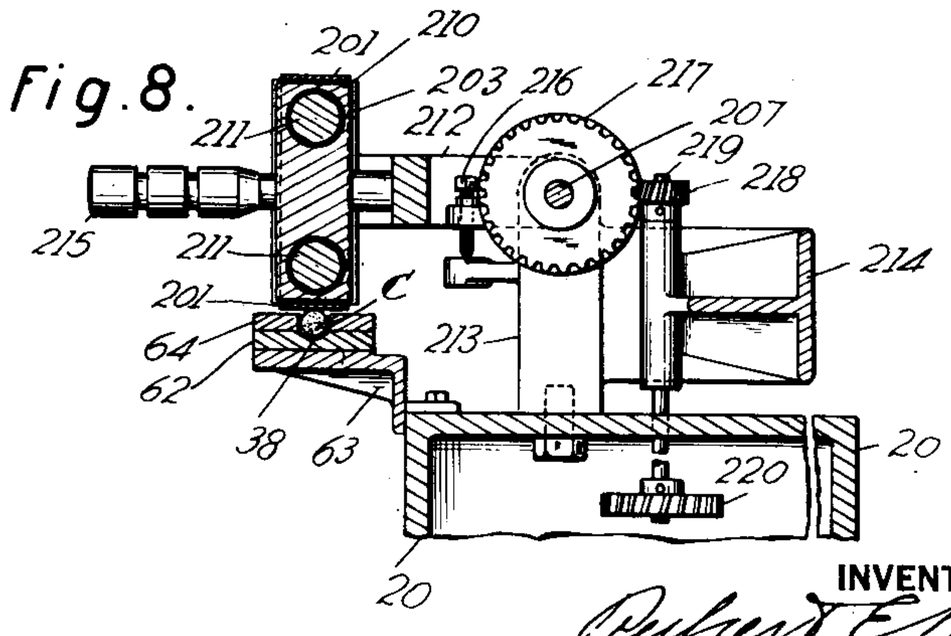

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Fig. 9.

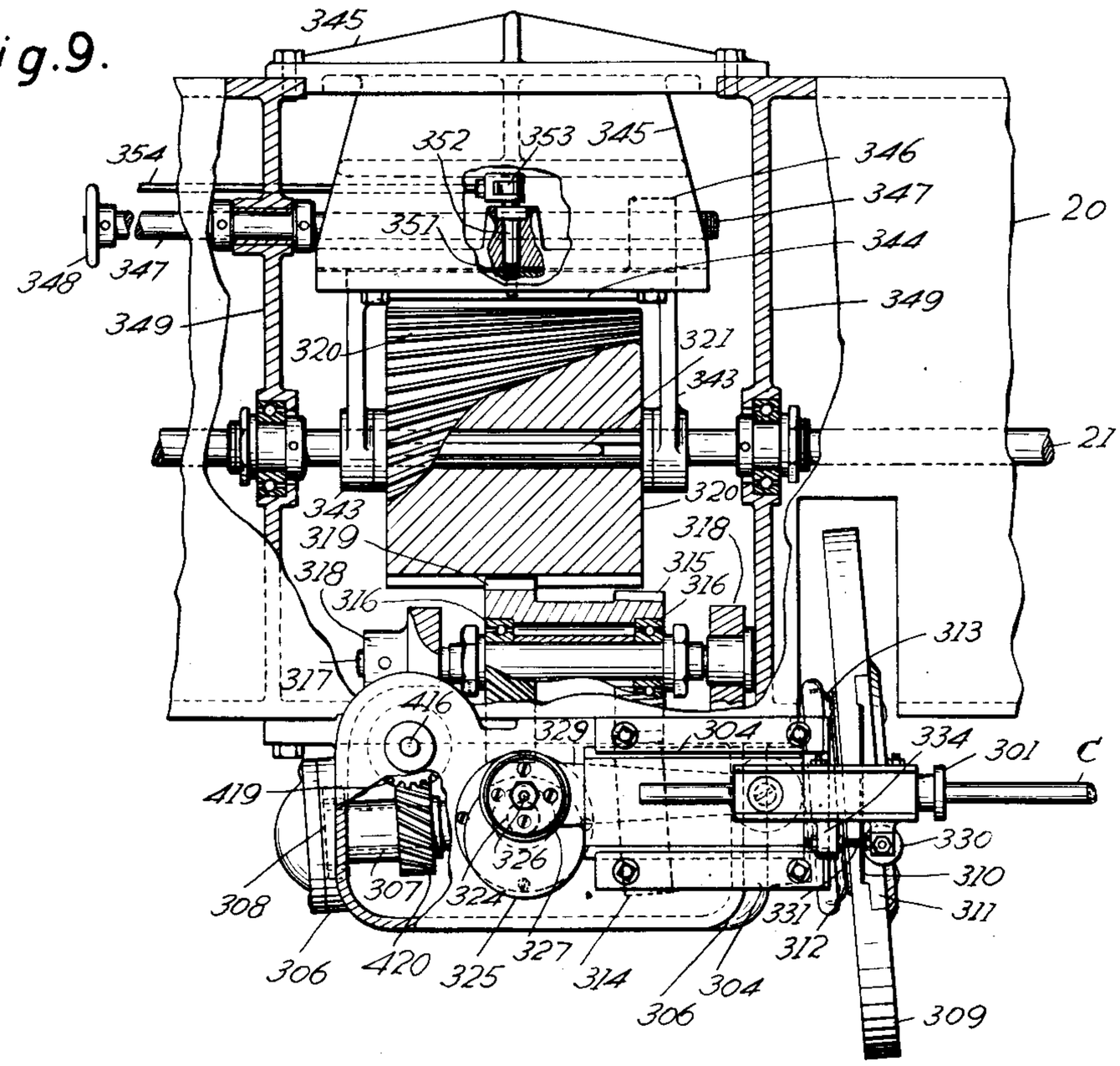

Fig. 10.

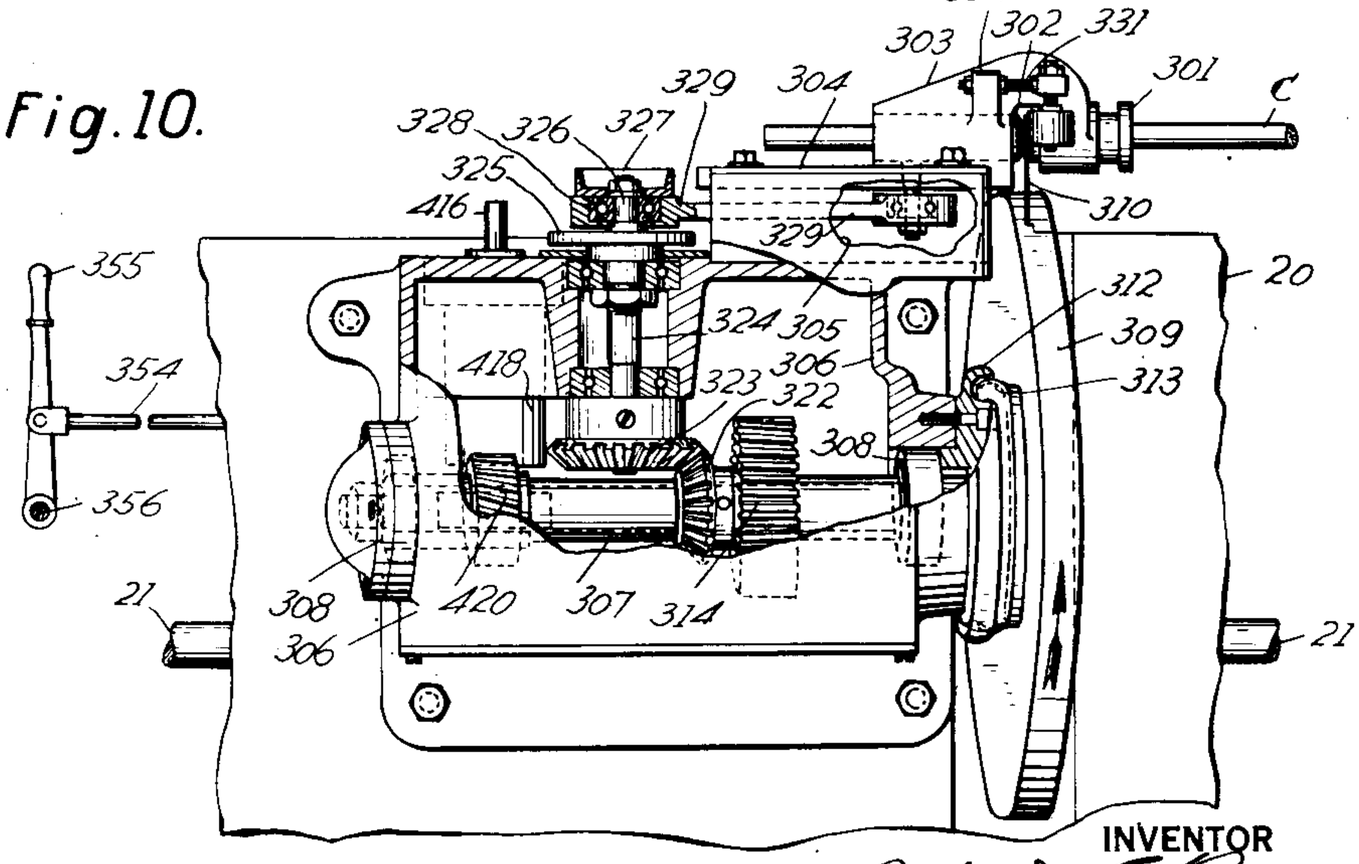

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Fig. 11.

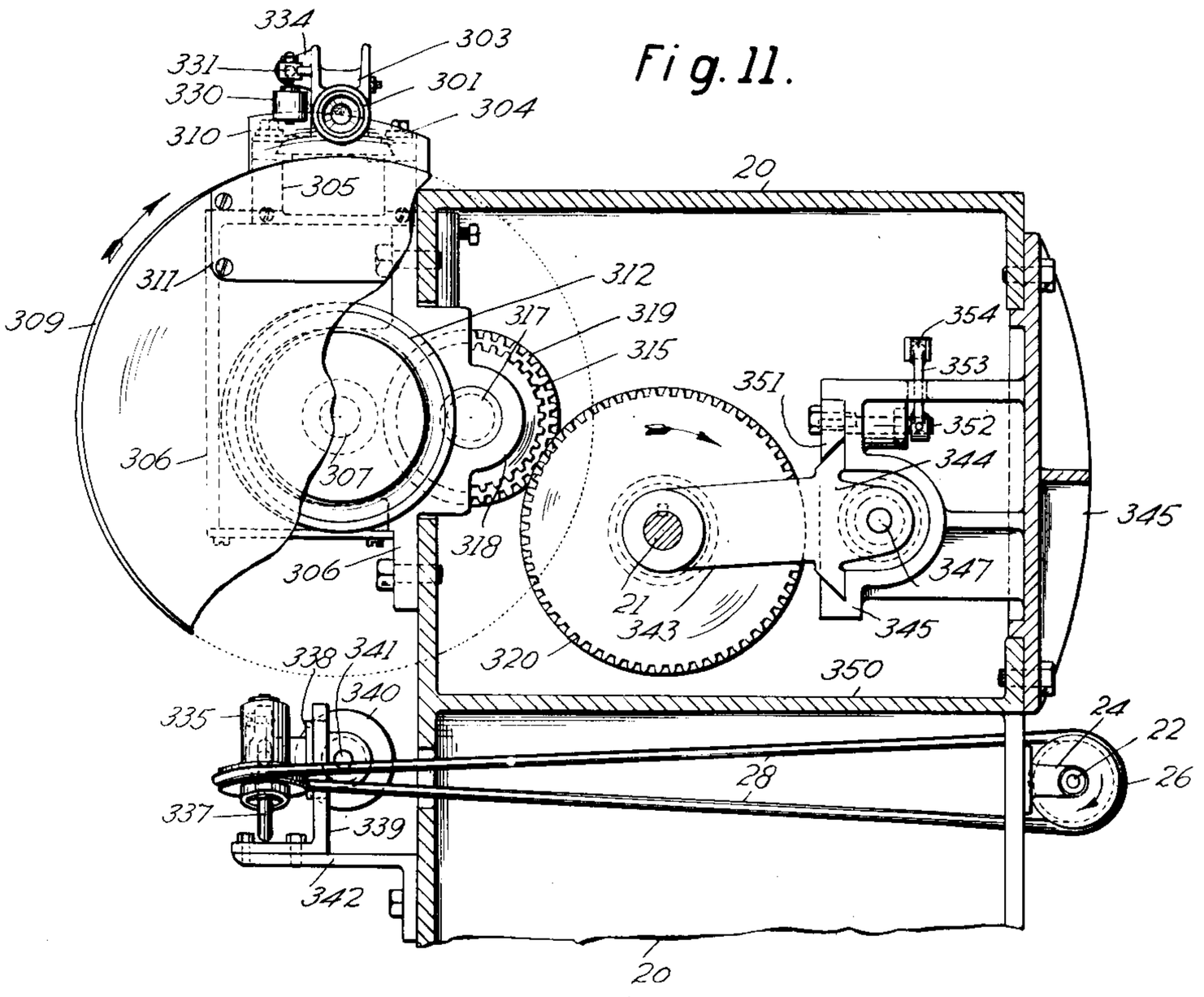


Fig. 12.

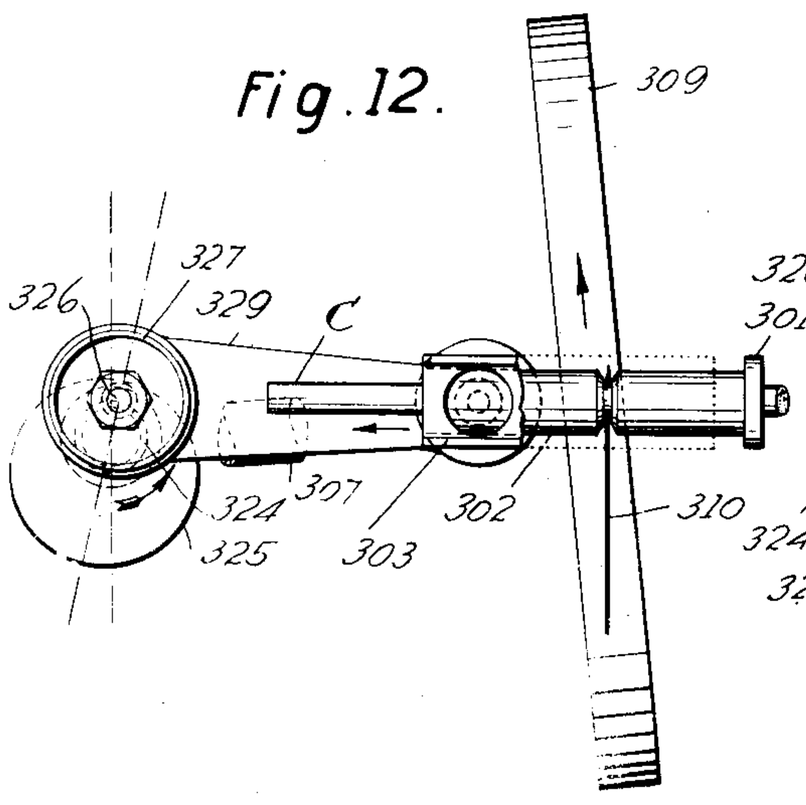
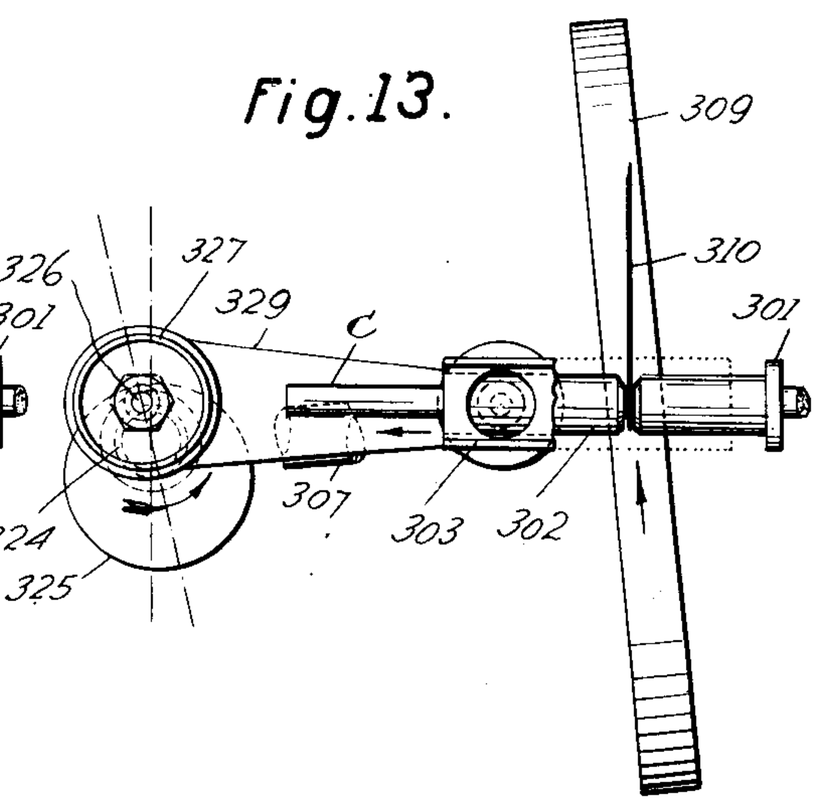


Fig. 13.



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HIGH SPEED CIGARETTE MACHINE

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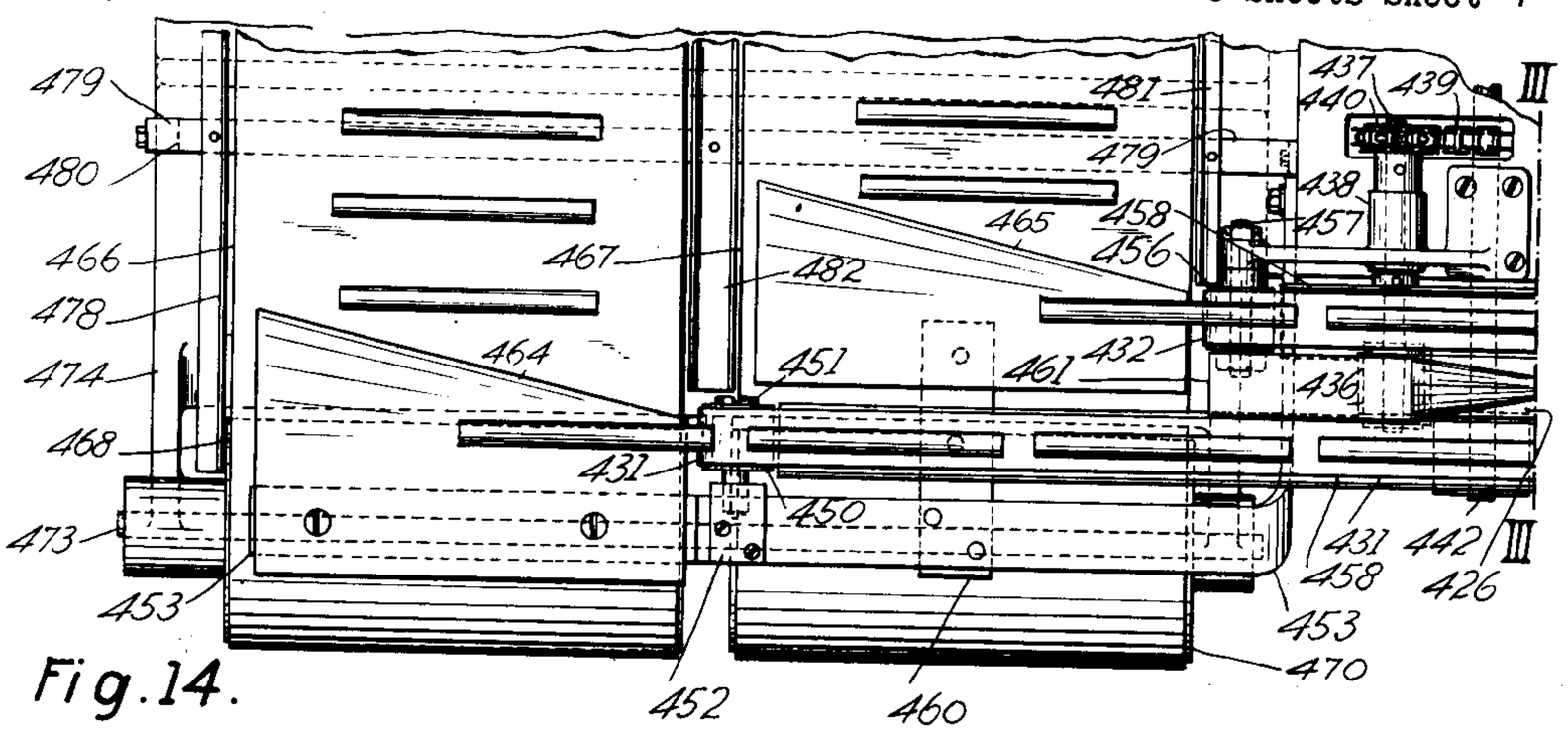

Fig. 14.

Fig. 15.

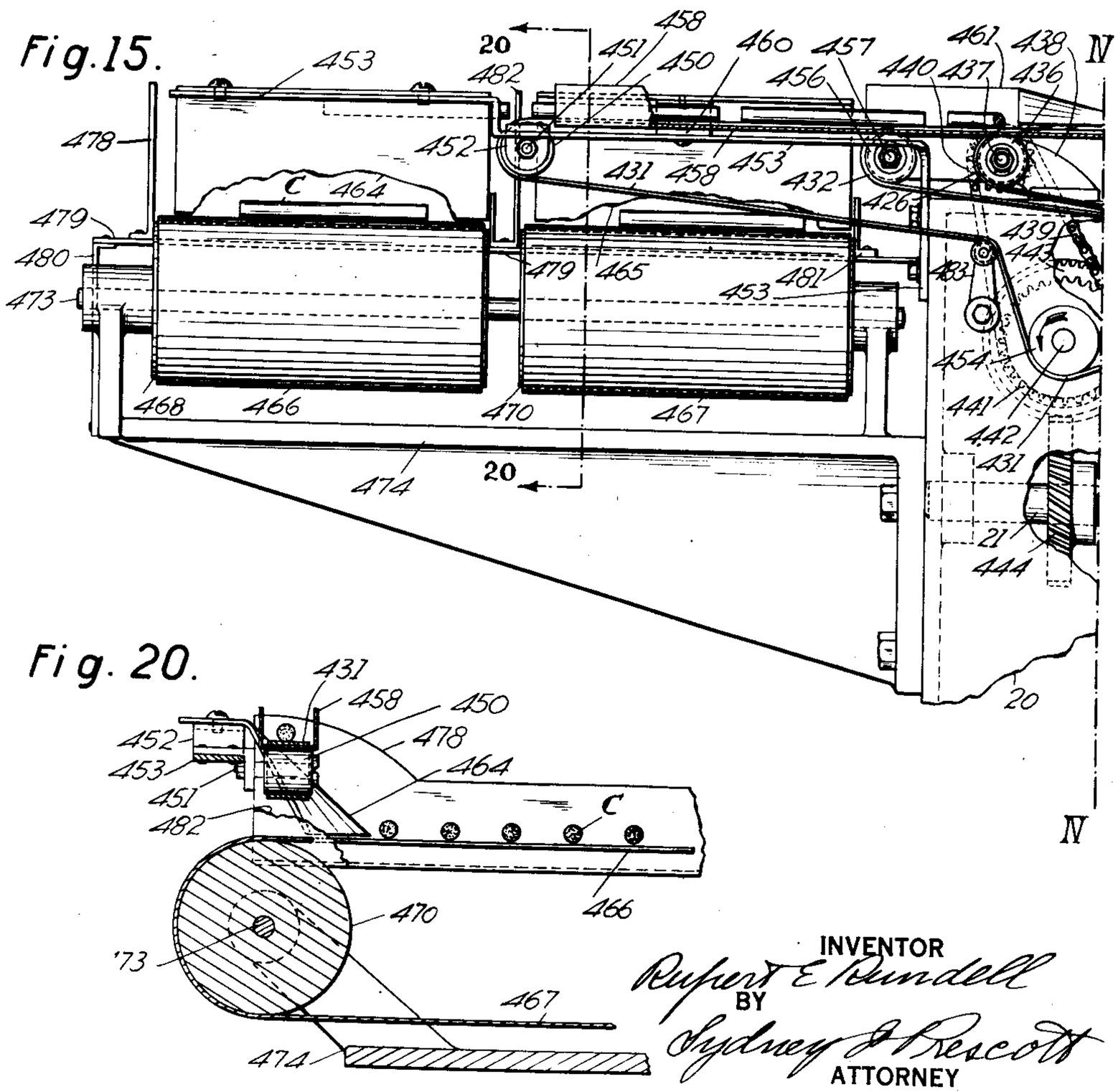

Fig. 20.

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Fig. 14a.

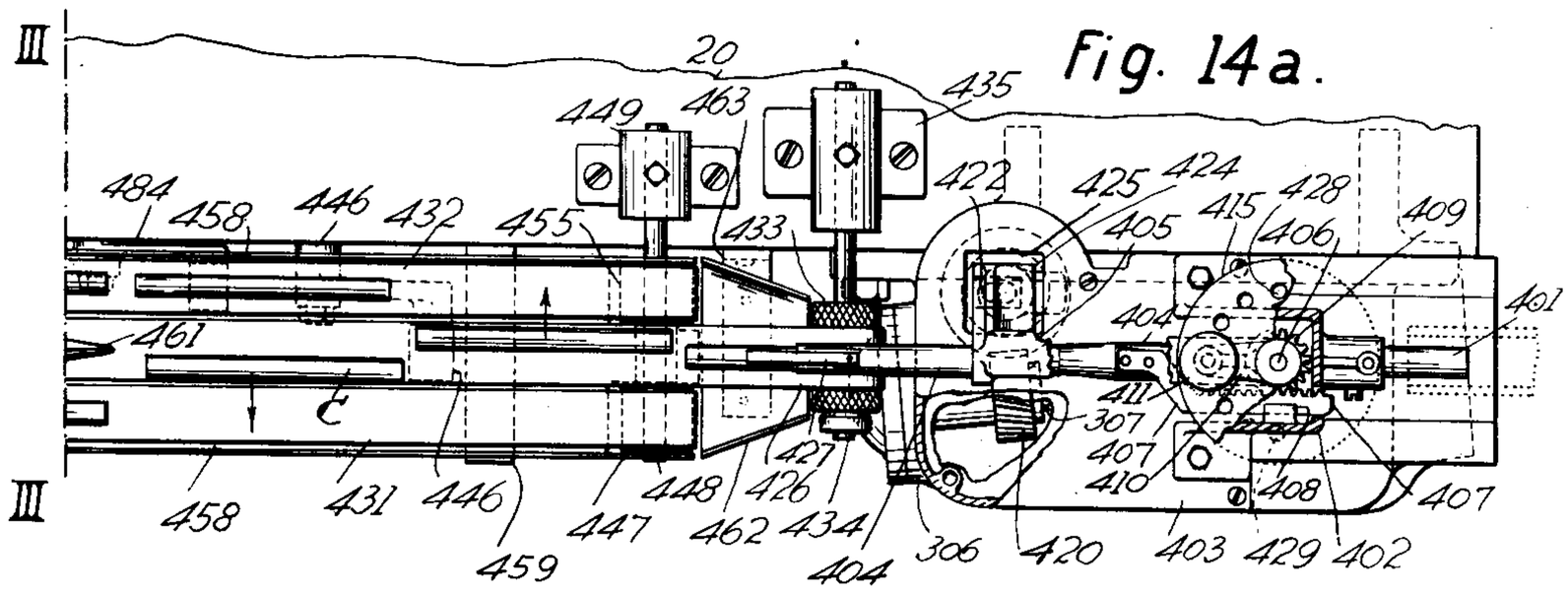


Fig. 18.

Fig. 19.

Fig. 15a.

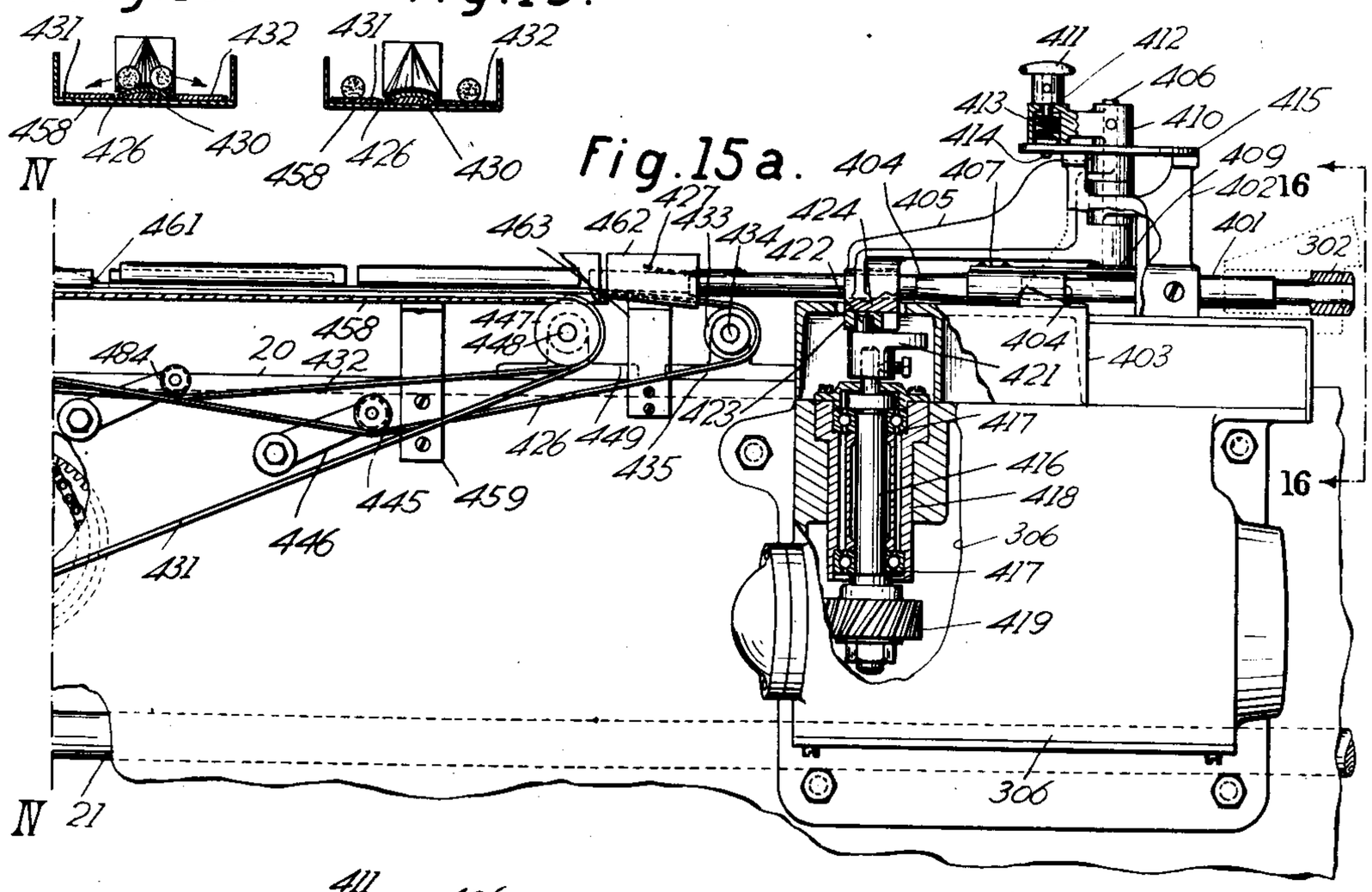
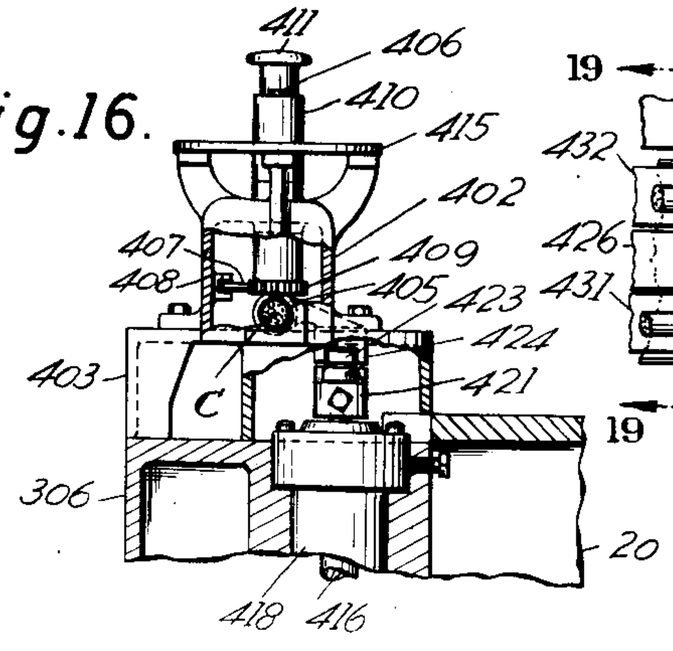


Fig. 16.



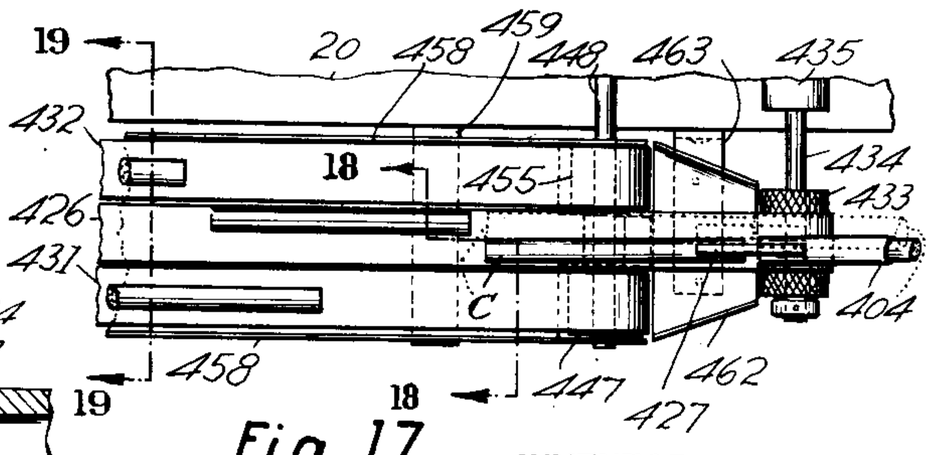


Fig. 17.

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Patented May 9, 1933

1,907,587

UNITED STATES PATENT OFFICE

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HIGH SPEED CIGARETTE MACHINE

Application filed May 1, 1929. Serial No. 359,622.

This invention relates to an improvement in high speed cigarette machines of the single continuous rod type.

Machines of the single continuous rod type have been in use for many years, and little by little through the years such machines have been improved in construction until now they operate successfully at the rate of 800 cigarettes per minute (800 CPM), in some instances. But they all fail to satisfy the need for maximum capacity and efficiency, because they all have at least six major defects; that is, at speeds above 800 CPM; (1) their vibration shakes the cigarette rod and the overlapped edges of its wrapper, and often prevents the wet paste between the overlapped edges from properly setting or drying in the extremely limited time available; (2) dust and particles of tobacco from the rod are caught between the overlapped edges of the wrapper, and often prevent effective sealing, because no means is provided for effectively keeping the wrapper edges perfectly clean, so that the paste can quickly, firmly, and uniformly adhere thereto; (3) after paste has been applied to one edge of the wrapper, and its edges have been overlapped, they often separate before the paste sets, because no means is provided for holding them relatively immovable until the sealing operation is completed; (4) the sealing device becomes fouled by paste and necessitates frequent stoppage of the machine to clear the paste away; (5) overcutting the rod, downwardly from above, often results in imperfect cuts, because the knife first engages the overlap of the wrapper which has double the resistance of the rest and is backed only by the soft tobacco rod which yields too much for perfect cutting; and (6) the abrupt stoppage of the cigarettes in the collector injures their ends.

I have discovered that these are the major causes of the difficulty heretofore encountered in attempting to operate single cigarette machines at speeds exceeding 800 CPM. Attempts have been made heretofore to overcome the difficulty, but the several causes thereof not being known, such attempts were directed to what is now known to be only one of several causes. Because they failed to discover all of the several causes, they failed to provide a remedy for all, and therefore failed to attain maximum capacity and efficiency.

The main object of the present invention is the production of a cigarette machine constructed and operating on a new principle and providing a remedy for all causes of difficulty in attaining maximum capacity and efficiency, and in which machine construction and capacity are coordinated with the rapidity of setting of the paste used. With this end in view, the natural or normal rapidity of paste setting, in the absence of interfering machine vibration and other disturbing influences is first determined, as the controlling maximum speed factor, because no machine can ever make cigarettes faster than the paste used will set. Then the machine is designed and constructed in coordination therewith. This is a radical departure from previous practice, wherein the time required for paste setting was so far away from machine speed that it was not recognized as the most important factor in cigarette machine construction and operation.

It has been found that the casein paste in common use can be made to set under moderate heat and slight pressure in about one-tenth of one second. With such paste uniformly setting at this rate, and with the several causes of high speed difficulty remedied, it has been found feasible to produce 1800 CPM, and more with faster setting paste, on a single rod machine. Other objects of the invention involve mechanical improvements in the elements of machines constructed and operated on the new principle, in order to remedy the defects which heretofore have precluded speeds above 800 CPM. With these and other objects not specifically mentioned in view, the invention consists in certain parts, constructions and combinations which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings, in which

like characters of reference indicate the same or like parts, Figs. 1 and 1*a*, when joined on the line I—I, constitute a plan view of a machine constructed in accordance with the invention; Figs. 2 and 2*a*, when joined on the line II—II, constitute a front elevation of the structure shown in Figs. 1 and 1*a*; Fig. 3 is a plan view, on an enlarged scale, of the vacuum cleaner of the pasting mechanism; Fig. 4 is a front elevation of the structure shown in Fig. 3; Fig. 5 is a side view of the structure shown in Figs. 3 and 4; Fig. 6 is a plan view, on an enlarged scale, of the rod sealing mechanism; Fig. 7 is a front elevation of the structure shown in Fig. 6; Fig. 8 is a sectional side view of the structure shown in Figs. 6 and 7; Fig. 9 is a plan view, on an enlarged scale, of the cutoff mechanism; Fig. 10 is a front elevation of the structure shown in Fig. 9; Fig. 11 is a side view of the structure shown in Figs. 9 and 10; Figs. 12 and 13 are diagrammatic plan views of the ledger tube and cutoff knife, illustrating the cutting operation; Figs. 14 and 14*a*, when joined on the line III—III, constitute a plan view, on an enlarged scale, of the cigarette collector and speed reducer; Figs. 15 and 15*a*, when joined on the line IV—IV, constitute a front elevation of the structure shown in Figs. 14 and 14*a*; Fig. 16 is a side elevation of the structure shown in Fig. 15; Fig. 17 is a plan view of the three speed reducing belts; Figs. 18 and 19 are cross sections taken on the lines 18—18 and 19—19 respectively of Fig. 17; and Fig. 20 is a cross section on the line 20—20 of Fig. 15, showing the transfer of the cigarettes from the speed reducing belts to the final collecting belts.

In carrying the invention into effect, in its preferred form, there is provided a substantially rigid or vibration resistant bed, and a series of substantially vibrationless mechanisms supported by said bed and respectively forming a continuous cigarette rod and applying a wrapper thereto and holding both until sealed, vacuum cleaning and pasting the wrapper, sealing the pasted wrapper by means of self-cleaning means, undercutting the sealed rod into individual cigarettes, and reducing the speed of the individual cigarettes, wherein the machine elements are coordinated with the rapidity of paste setting, to attain maximum capacity and efficiency.

By "substantially vibrationless mechanisms" is meant mechanisms having no moving parts of sufficient weight and effect to produce machine vibration of sufficient intensity to shake the rod and wrapper edges and interfere with rapid paste setting. By use of very light moving parts and by reason of perfect or nearly perfect balancing of the moving parts the machine operates with freedom from vibration, the effect of which would be to agitate the cigarette rod and prevent the proper setting of the paste in the extremely limited time available for sealing at the high speeds at which the machine is operated. The substantially vibrationless operation of the various mechanisms comprising this machine may be obtained by designing and constructing said mechanisms so that there will be perfect or substantially perfect balancing of moving parts, and elimination of reciprocating or oscillating elements which by their weight or effect would tend to introduce vibration effects sufficient to cause agitation of the pasted surfaces of the wrapper. The moving parts of the various mechanisms are arranged to have uniform rotary movements or uniform continuous movements along predetermined paths so as to eliminate as far as possible any tendency to introduce vibration effects.

In the best constructions contemplated, the wrapper pasting mechanism includes means for applying paste to the wrapper, and means for collecting dust and particles of tobacco from the rod and wrapper as they approach the paste applying means, in order to insure perfectly clean surfaces to which the paste will adhere quickly, firmly, and uniformly; the sealing mechanism includes a heated metallic belt engaging the wrapper, and means for continuously cleaning the belt, in order to avoid frequent machine stoppage to clear away accumulated paste; the cutting mechanism includes a very light knife, and means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod, in order to undercut the rod and thus cut last the overlapped edges of the wrapper which are solidly backed by the upper wall of the ledger tube; the collecting mechanism includes coacting devices receiving cigarettes from the cutting mechanism and reducing their speed to avoid injury to their ends when stopped by impact with an abutment at the head of the final collecting belts; and the rod forming mechanism includes a tape and coacting tube extending through the range of action of the sealing mechanism, in order to hold the rod and wrapper in proper position until the sealing operation is completed. Each of these improvements remedies one of the major causes of the difficulty heretofore encountered in attempting to operate cigarette machines at a higher speed than 800 CPM, and each contributes its proper quota of usefulness in making possible the increased machine effectiveness due to smooth high speed operation in coordination with the rapidity of paste setting.

The specific structure selected to illustrate the invention is but one of many possible concrete embodiments of the same; and

such embodiments may be widely varied in construction within the scope of the claims. The invention, therefore, is not to be restricted to the structure shown and described.

Referring to Figs. 1, 1*a*, 2 and 2*a* of the drawings: The cigarette rod is propelled in the usual manner by a tape running over pulleys supported on the bed 20 of the machine, which also supports the rod forming mechanism 100, the vacuum cleaning mechanism 101, the pasting mechanism 200, the sealing mechanism 201, the cutoff mechanism 301, and the collecting mechanism 401. The bed 20 is of deep box-like construction and therefore substantially rigid or vibration resistant. The main shaft 21 actuates the cutoff mechanism 301 and the belts of the collecting mechanism 401. A shaft 22 at the rear of the bed 20 is mounted in brackets 23 and 24, and carries pulleys 25 and 26. The former is driven by a belt 27 running over a pulley 477 on the shaft 472. The pulley 26 is connected by a belt 28 with a pulley 336 actuating the grinding wheel 335 for sharpening the knife of the cutoff mechanism.

A shaft 29 (Fig. 1*a*) also at the rear of the bed 20, is supported by a gear housing 30, and is connected to the machine drive. A spur gear 31 on the shaft 29 is in mesh with a gear 32 on a shaft 33, the worm 34 of which drives a worm gear 35 on a shaft 36. The outer end of the shaft 36 carries a drive wheel 37 of the rod propelling tape 38 which runs over a roller 39 held by a stud 40 of a bracket 41, and over a roller 42 on a stud 43. A roller 44, which presses the tape 38 against the wheel 37, is carried by an arm 45 fast on a shaft 46. This shaft projects rearwardly through the bed 20 and has on its rear end an arm 47 against which bears a spring 48 carried by a housing 49, thereby maintaining contact between the roller 44 and the wheel 37. An idle roller 50 is placed near the roller 44 to make the contact arc of the tape 38 on the periphery of the wheel 37 as large as possible, to prevent tape slippage. A tape tensioning device 51, between the roller 44 and idle roller 52 on a bracket 53, serves to adjust the tautness of the tape 38. The stud 43 is held by an arm 54 adjustably mounted on a stud 55 located in a bracket 56. An adjusting screw 57 limits the movement of the arm 54, while a U-shaped guide 58 centers the tape upon reaching the roller 42. Above the roller 42 is a channel 59, attached to the bed 20 by an angle 60. Through this channel, the cigarette paper or wrapper P with its tobacco charge supplied from the tobacco feed 65, is guided by the tape 38.

The rod forming mechanism and vacuum cleaner, Figs. 1*a*, 2*a*, 3, 4 and 5: The conical former 100 around which the wrapper P is carried by the tape 38, is held by means of bars 61 attached to a tape support bar 62 supported by an angle 63, the tape being guided by the guide bars 64, the bars 62 and 64 constituting the forming tube with which the tape 38 and former 100 cooperate to fold the wrapper about the tobacco to form the cigarette rod. On the top of the former 100 is placed a suction head 101 (Figs. 3 to 5) which has an outlet connected by a pipe 102 with a suction pump 103 attached to the rear side of the bed 20. This pump is driven by a separate motor, the belt 104 of which runs over a pulley 105 on a shaft 106 held by a bracket 107, a pulley 108 on the shaft 106 being connected by a belt 109 with a pulley 110 on a shaft 111 of the pump 103. The discharge outlet of the suction pump is connected by a pipe 112 with a dust collector 113. The vacuum cleaner above described serves to collect dust and particles of tobacco from the rod and wrapper as they approach the pasting mechanism, thereby insuring perfectly clean surfaces of the wrapper to which the paste can quickly, firmly, and uniformly adhere.

The pasting mechanism, Figs. 1*a* and 2*a*: After the cigarette rod leaves the rod forming mechanism, the upstanding edge of the wrapper engages the paste wheel 200 which is in contact with a paste drum mounted in a paste pot 67. The paste wheel 200 is driven by a belt 68 from the pulley 69 on the shaft 70 geared to the shaft 71 having a spiral gear 72 in mesh, through an intermediate gear 73, with the spiral gear 74 on the shaft 75. A housing 76 supports the shafts 71 and 75, the latter being connected with the main drive. Upon paste being applied to the overlap of the wrapper, the latter is forced to close upon the cigarette rod by the curved bar 77 carried by the tape support bar 62. As shown in Figs. 7 and 8 the forming tube 62, 64 is extended beyond the part 77 and cooperates with the moving tape 38 throughout the entire range of action of the sealing mechanism now to be described in order to hold the overlapping edges of the wrapper relatively immovable until the completion of the sealing operation.

The sealing mechanism, Figs. 6 to 8: The endless metallic belt 201 of the sealing mechanism is supported by two pulleys 202 and 203, the former mounted on a shaft 204 having a bevel gear 205 in mesh with a bevel gear 206 on a drive shaft 207, and the latter is supported by a stud 208 carried by a block 209. Between the horizontal runs of the belt 201 is located a heated block 210 containing heating units 211, the block 210 being attached to a frame 212 which also supports the shaft 204. The shaft 207 is supported by the posts 213 of a frame 214, and carries the frame 212. A handle 215 is attached to the block 210 for lifting the

sealer off the cigarette rod, the limit of its downward movement being adjusted by a set screw 216 which bears against a stop on a post 213. The shaft 207 has a spiral gear 217 in mesh with a spiral gear 218 on the shaft 219 which is supported by the frame 214. On the lower end of the shaft 219 is a spiral gear 220 which is in mesh with a spiral gear 221 on the shaft 21.

A scraper 222, attached to a post 223, prevents accumulation of paste on the belt 201. The mechanism above described provides for continuously cleaning the sealing belt, thereby avoiding frequent machine stoppage to clear away accumulated paste.

The cutoff mechanism, Figs. 9 to 13: The sealed rod, on leaving the sealing mechanism, enters the stationary mouthpiece 224 (Figs. 1 and 2) leading to the ledger tube 301—302 of the cutoff mechanism. The mouthpiece 224 is secured to a guard cover 225 whose upper part is hinged to the top of the bed 20, and whose lower part is hinged to the side thereof. After passing through the mouthpiece 224, the cigarette rod C enters the tubes 301 and 302 which form the ledger tube for the cutoff knife. The tubes 301 and 302 are held by a block 303 which slides between plates 304 attached to the upper part 305 of a housing 306 secured to the side of the bed 20. This housing supports a shaft 307 turning in ball bearings 308 and carrying a disc 309 to which a wafer knife 310 is clamped by a plate 311. The shaft 307 is set at a slight angle to the cigarette rod, so that the rotating knife, which is set at right angles to the rod, will follow the movement of the reciprocating ledger tube. A recessed cover 312 holds the forward ball bearing 308 in place, while the inwardly turned rim of a plate 313 attached to the disc 309 projects into the groove of the cover 312, thereby preventing oil of the housing 306 from reaching the knife and cigarette rod. Any oil reaching the plate 313 will, by the centrifugal force of the revolving disc, be thrown into the groove of the cover 312, which is provided with a suitable outlet for drainage.

The shaft 307 has a bevel gear 314 driven by a bevel gear 315 on ball bearings 316 of a shaft 317 which is mounted between the arms 318 of the housing 306. The bevel gear 315 is integral with a spiral gear 319 which is driven by a spiral gear 320 slidably mounted, by means of a spline 321, on the main shaft 21. A fixedly mounted bevel gear 322 on the shaft 307 is in mesh with a bevel gear 323 on a shaft 324 which, at its upper end, carries a disc 325 having an eccentric stud 326. On this stud is clamped, by a flanged member 327, shaped to serve as an oil reservoir for the ball bearing 328, a lever 329 the other end of which is connected with the slide block 303.

As the knife 310 of the rotating disc 309 approaches the ledger tube 301—302, it engages the grinding wheel 330 which is loosely mounted on a stud 331 held by a lug 334 projecting from the block 303. On the opposite side of the disc 309 is a grinder 335 (Figs. 2 and 11) attached to a pulley 336 and carried by an adjustable rod 337 held by a block 338 slidably mounted on an angle 339 and actuated by a knob 340 on a shaft 341. The angle 339 is carried by an angle 342 attached to the bed 20.

The spiral gear 320 is axially movable by the arms 343 which are connected together so as to form a frame 344 slidable on the shaft 21 and guided in a bracket 345. One of the arms 343 terminates in a lug 346 which engages the threaded end of a rod 347 having at its outer end a hand wheel 348. By turning this hand wheel, the spiral gear 320 is moved axially, thereby changing its operating position with relation to the bevel gear 314, thus retarding or advancing the cutting point or time of cutting when necessary to accurately register the cut when cork-tipped or printed cigarettes are being made.

The driving and adjusting means of the cutting mechanism are enclosed by cross webs 349, the bottom web 350, the top of the bed 20, and the cover of the bracket 345, so that a complete housing is formed for the gears 315, 319 and 320, permitting them to run in oil. To prevent the frame 344 from moving accidentally, the gib 351 (Figs. 9 and 11) is clamped against the inclined sliding surface of the frame 344 by a tie shaft 352 inserted in the bracket 345, the threaded end of the shaft 352 engaging the gib. The outer end of the shaft 352 carries a lever 353 which is connected by a rod 354 with a shift lever 355 located on the stud 356 of the bracket 474. Shifting of the lever 355, when making an adjustment of the cutoff setting acts upon the threaded end of the shaft 352 like a screw which either tightens the gib 351 against the sliding surface of the frame 344, or loosens the same.

In Figs. 12 and 13, the movement of the knife 310 between the ledger tubes 301 and 302 is illustrated. In Fig. 12, the knife is entering the cutting space. The knife is perpendicular to the cigarette rod and, since the disc 309 is set at the proper angle, it moves in parallelism along with the ledger tubes, leaving the same, still perpendicular to the cigarette rod, as shown in Fig. 13.

The cutting mechanism above described produces undercuts of the cigarette rod, which has the advantage hereinbefore pointed out.

The collecting mechanism, Figs. 14 to 20: The individual cigarettes cut from the rod

by the cutting mechanism and passing through the ledger tubes 301—302 enter the stationary tube 401 which projects telescopically into the ledger tube 302. The tube 401 is held in a bracket 402 attached to the housing 403 affixed to the housing 306 of the shaft 307. Into the tube 401 also projects telescopically the oscillatory cigarette guide 404. This guide is loosely held by an arm 405 which is hinged on a shaft 406 supported by the bracket 402. On the top of the guide 404 is fastened a rack 407 sliding in a guide 408 and in mesh with a pinion 409 on the vertical shaft 406. The upper end of this shaft carries a fixed lever 410 which has a knob 411 on a stud 412 held under tension by a spring 413. A downward extension 414 of the stud 412 projects into a hole in a disc 415 carried by the bracket 402. A shaft 416, supported by ball bearings 417 in a sleeve 418 held by the housing 306, is driven by means of a spiral gear 419 in mesh with a spiral gear 420 on the shaft 307. The top of the shaft 416 carries an eccentric 421 the stud 422 of which projects into a slidably mounted block 423 on a lug 424 of the arm 405 projecting through an opening 425 of the housing 403.

The guide 404, oscillating by the means described, discharges the individual cigarettes C upon a fast running belt 426. The delivery end of the guide 404 is provided with a spring 427 which bears upon the issuing cigarettes and presses them down upon the belt 426, the latter thereby actually pulling them out of the guide, because it has a slightly greater speed than the cigarette rod, for the purpose of slightly separating the issuing cigarettes. The position of the guide 404 with respect to the stationary tube 401 determines the discharge speed of the cigarettes from the guide 404 which must be synchronized with the oscillating speed thereof, which is at all times equal to the cutting speed of the machine. The guide 404 is adjustable by means of the lever 410 which can be set in various positions by the indexing holes 428, 429, in the disc 415. For retarded discharge at a given production speed of the machine, the lever 410 is set with the stud 414 in the extreme right hand hole 428, thereby moving the guide 404 outward over the tube 401, making the tube projection as long as possible. For accelerated discharge, the lever 410 is set in the extreme left hand hole 429, thereby pushing the tube 402 inward over the tube 401 and making its projection as short as possible, thus causing the cigarettes to discharge quickly.

As the cigarettes issue from the guide 404, they are, on account of the oscillating motion of the latter, alternately deposited upon the right and left sides of the fast running belt 426 which is supported by a rounded bar 430 (Figs. 18 and 19), so as to be transversely arched, which causes the cigarettes to alternately roll upon the slow running belts 431 and 432 which flank the fast running belt 426. The belts 431 and 432 run at half the speed of the belt 426.

The belt 426 runs over a pulley 433 on a stud 434 held by a bearing 435 attached to the bed 20, and over a pulley 436 on a stud 437 held by a bracket 438 attached to the bed 20. The pulley 436 is driven by a chain 439 running over a sprocket 440 on the shaft 437. The chain 439 is driven by a sprocket 441 on a shaft 442 which is supported by bearings in the bed 20, and which has a spiral gear 443 in mesh with a spiral gear 444 on the main shaft 21. An idler 445 on a lever 446 serves as a tightener for the belt 426. The belt 431 runs over a pulley 447 on a shaft 448, held by bearings 449 attached to the bed 20 (Figs. 18 and 21), over a pulley 450 on a stud 451 held by an angle 452 attached to a bar 453 held by the bed 20, and over a pulley 454 on the shaft 442 by which the belt 431 is driven. The belt 432 is driven by a pulley 455 integral with the pulley 447 on the shaft 448, and runs over a pulley 456 on a stud 457 held by the bracket 438. The belts 431 and 432 are supported by a channel 458 which in turn is carried by an angle 459 attached to the bed 20, and by a bar 460 attached to the bar 453. On top of the belt 426, above the pulley 436, is suspended, by the channel 458, a wedge shaped block 461 which guides to their respective belts 431 and 432 all cigarettes which have not rolled off the belt 426 previous to their engagement therewith. A channel 462 attached, between the pulleys 433 and 447, to an angle 463 fastened to the bed 20, serves as side guards for the cigarettes discharged by the guide 404.

The cigarettes having rolled from the fast running belt to the slower running belts, they are thereby carried to the curved plates 464 and 465, the former held by the bar 453, and the latter by the bar 460. From these plates, they roll upon the final collector belts 466 and 467 which run over pulleys 468, 469 and 470, 471 respectively. The shafts 472 and 473 of these pulleys are supported by a bracket 474. The shaft 472 is driven by means of a spiral gear 475 in mesh with spiral gear 476 on the shaft 442. A pulley 477 on the shaft 472 drives, by means of a belt 27, the shaft 22. An angle 478 on bars 479, held by the bed 20 and by angles 480 attached to the bracket 474, prevents the cigarettes from falling off the belt 466. An angle 481, also carried by the bars 479, similarly prevents the cigarettes on the belt 467 from falling off, while a U-shaped rail 482 mounted on the bars 479 between the final collector belts separates the cigarettes on the two belts and prevents them from sliding from one belt to the other. The belt

431 is kept in proper tension by a tightener 483, while the belt 432 is kept taut by a tightener 484.

In the machine above described, all of the defects which heretofore have been the major causes of the difficulty encountered in attempting to operate cigarette machines at speeds exceeding 800 CPM, have been remedied. The present machine requires only the same operating crew as any one of the earlier machines, and since its capacity is more than double that of any prior single rod machine, its maintenance and operation cost is correspondingly less than that of the former multiple machine equipment necessary to produce an equal number of cigarettes in the same time.

In view of the foregoing, and of the well known operation of machines of the same type, a detailed description of the operation of the machine is deemed unnecessary and is therefore omitted in the interest of brevity.

What is claimed is:

1. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a substantially rigid bed, of a series of substantially vibrationless mechanisms supported thereby for respectively forming the rod and applying a wrapper thereto, pasting the applied wrapper, sealing the pasted wrapper, cutting the sealed rod into individual cigarettes, and collecting the individual cigarettes, said pasting mechanism including vacuum cleaning means for collecting dust and particles of tobacco from the rod and wrapper to insure clean surfaces for pasting.

2. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a substantially rigid bed, of a series of substantially vibrationless mechanisms supported thereby for respectively forming the rod and applying a wrapper thereto, pasting the applied wrapper, sealing the pasted wrapper, cutting the sealed rod into individual cigarettes, and collecting the individual cigarettes, said sealing mechanism including self-cleaning means to prevent machine stoppage for cleaning purposes.

3. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper including paste applying means and means for collecting dust and particles of tobacco from the rod and wrapper as they approach said applying means.

4. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper including paste applying means, and means including a suction head adjacent said applying means for collecting dust and particles of tobacco from the rod and wrapper as they approach said applying means.

5. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, and mechanism for sealing the pasted wrapper including a heated metallic belt engaging the pasted wrapper, and means for continuously cleaning said belt.

6. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, and mechanism for sealing the pasted wrapper including a heated metallic belt engaging the wrapper, and an angularly disposed scraper engaging and continuously cleaning the idle run of said belt.

7. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, and mechanism for sealing the pasted wrapper including means for holding the overlapped edges of the wrapper in relatively immovable position until the sealing operation is completed and moving means for sealing the pasted wrapper.

8. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, and mechanism for sealing the pasted wrapper including an extension of the forming tape and tube of the rod forming mechanism through the entire range of action of the sealing mechanism to hold the overlapped edges of the wrapper in relatively immovable position until the sealing operation is completed, said sealing mechanism engaging the overlapped edges of the wrapper along the entire length of the rod being sealed.

9. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light knife, a rotating shaft obliquely disposed with respect to the cigarette rod and connected to said knife, and means for rotating said shaft to move said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, and means for adjusting the path crossing time of said knife, said knife being arranged in a plane perpendicular to the cigarette rod.

10. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light

knife, a disc carrying said knife and rotating on an axis located below the level of the rod and slightly oblique thereto in order to produce undercuts of the rod, and means for adjusting the cutting time of said knife.

11. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light knife and a shaft obliquely disposed with respect to the cigarette rod and connected to said knife, means for rotating said shaft to move said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, rotating means alongside the path of the knife for slightly grinding it after each cut, and means for adjusting the path crossing time of said knife.

12. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light knife, means for rotating said knife across the path of the rod and in a closed orbit located mainly below the level of the rod in order to produce undercuts of the rod, and means for adjusting the path crossing time of the knife.

13. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light knife, spiral gearing for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, and screw-actuated means for adjusting said spiral bearing to vary the path crossing time of said knife.

14. The combination with mechanism for making a continuous cigarette rod, of mechanism for cutting the rod into individual cigarettes including a very light knife, means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, a very light reciprocating ledger tube coacting with said knife at the path of the rod, and means for adjusting the path crossing time of the knife and the reciprocating time of the ledger tube.

15. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including an oscillating device and associated mechanism receiving cigarettes from the cutting mechanism at rod speed and reducing their speed to avoid injury to their ends.

16. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including an oscillating device and associated mechanism receiving cigarettes from the cutting mechanism at rod speed in close end-to-end formation and reforming them into close end-to-end formation in two columns to reduce their speed and avoid injury to their ends.

17. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including a fast running belt, slower running belts flanking said fast running belt, and means for causing cigarettes received by said fast running belt from the cutting mechanism at rod speed to be alternately delivered to said slower running belts.

18. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including a transversely arched belt, flat belts flanking said arched belt, and a very light oscillating guide receiving cigarettes from the cutting mechanism and delivering them alternately to opposite sides of said arched belt from which they roll to said flat belts.

19. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including a very light oscillating guide receiving cigarettes from the cutting mechanism, and means for adjusting said guide longitudinally to control the issuance of cigarettes therefrom at the ends of its oscillations.

20. The combination with mechanism for cutting a continuous cigarette rod into individual cigarettes, of mechanism for collecting the individual cigarettes including a very light oscillating guide receiving cigarettes from the cutting mechanism, and a rack and pinion for adjusting said guide longitudinally to control issuance of cigarettes therefrom at the ends of its oscillations.

21. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper including paste applying means and means for collecting dust and particles of tobacco from the rod and wrapper as they approach said applying means, a heated metallic sealing belt engaging the pasted wrapper, and means for continuously cleaning said belt.

22. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper including paste applying means and means for collecting dust and particles of tobacco from the rod and wrapper as they approach said applying means, a heated metallic sealing belt engaging the pasted wrapper, means for continuously

cleaning said belt, a very light knife, and means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod.

23. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper including paste applying means and means for collecting dust and particles of tobacco from the rod and wrapper as they approach said applying means, a heated metallic sealing belt engaging the pasted wrapper, means for continuously cleaning said belt, a very light knife, means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, and coacting devices receiving cigarettes from the cutting mechanism at rod speed and reducing their speed to avoid injury to their ends.

24. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, a heated metallic sealing belt engaging the pasted wrapper, means for continuously cleaning said belt, a very light knife, and means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod.

25. The combination with mechanism for forming a continuous cigarette rod and applying a wrapper thereto, of mechanism for pasting the wrapper, a heated metallic sealing belt engaging the pasted wrapper, means for continuously cleaning said belt, a very light knife, means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, and coacting devices receiving cigarettes from the cutting mechanism at rod speed and reducing their speed to avoid injury to their ends.

26. The combination with mechanism for making a continuous cigarette rod, of a very light knife, means for moving said knife across the path of the rod and in an orbit located mainly below the level of the rod in order to produce undercuts of the rod, means for adjusting the path crossing time of said knife, and coacting devices receiving cigarettes from the cutting mechanism at rod speed and reducing their speed to avoid injury to their ends.

27. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a rigid vibration resistant bed, of a series of substantially vibrationless mechanisms supported by said bed for respectively forming the rod and applying a wrapper thereto, cleaning and pasting the wrapper, sealing the pasted wrapper by engaging the overlapped wrapper edges along the entire length of the rod being sealed to hold them relatively immovable until the sealing operation is completed, undercutting the sealed rod into individual cigarettes to insure perfect cigarettes, and collecting the cigarettes and reducing their speed to avoid injury to their ends.

28. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a rigid vibration resistant bed, of a series of substantially vibrationless mechanisms supported by said bed for respectively forming the rod and applying a wrapper thereto, cleaning and pasting the wrapper, sealing the pasted wrapper by engaging the overlapped wrapper edges along the entire length of the rod being sealed to hold them relatively immovable until the sealing operation is completed, undercutting the sealed rod into individual cigarettes to insure perfect cigarettes, and collecting the cigarettes and reducing their speed to avoid injury to their ends, said rod forming mechanism including a forming tube and tape extending through the range of action of said sealing mechanism to prevent displacement of the wrapper.

29. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a rigid vibration resistant bed, of a series of substantially vibrationless mechanisms supported by said bed for respectively forming the rod and applying a wrapper thereto, cleaning and pasting the wrapper, sealing the pasted wrapper by engaging the overlapped wrapper edges along the entire length of the rod being sealed to hold them relatively immovable until the sealing operation is completed, undercutting the sealed rod into individual cigarettes to insure perfect cigarettes, and collecting the cigarettes and reducing their speed to avoid injury to their ends, said cleaning and pasting mechanism including vacuum cleaning means for collecting dust and particles of tobacco from the rod and wrapper to insure clean surfaces for pasting.

30. In a continuous rod cigarette machine wherein the machine elements are coordinated with the rapidity of paste setting to attain maximum capacity and efficiency, the combination with a rigid vibration resistant bed, of a series of substantially vibrationless mechanisms supported by said bed for respectively forming the rod and applying a wrapper thereto, cleaning and pasting the wrapper, sealing the pasted wrapper by engaging the overlapped wrapper edges along

the entire length of the rod being sealed to hold them relatively immovable until the sealing operation is completed, undercutting the sealed rod into individual cigarettes to insure perfect cigarettes, and collecting the cigarettes and reducing their speed to avoid injury to their ends, said sealing mechanism including self-cleaning means to avoid machine stoppage for cleaning purposes.

In testimony whereof, I have signed my name to this specification.

RUPERT E. RUNDELL.