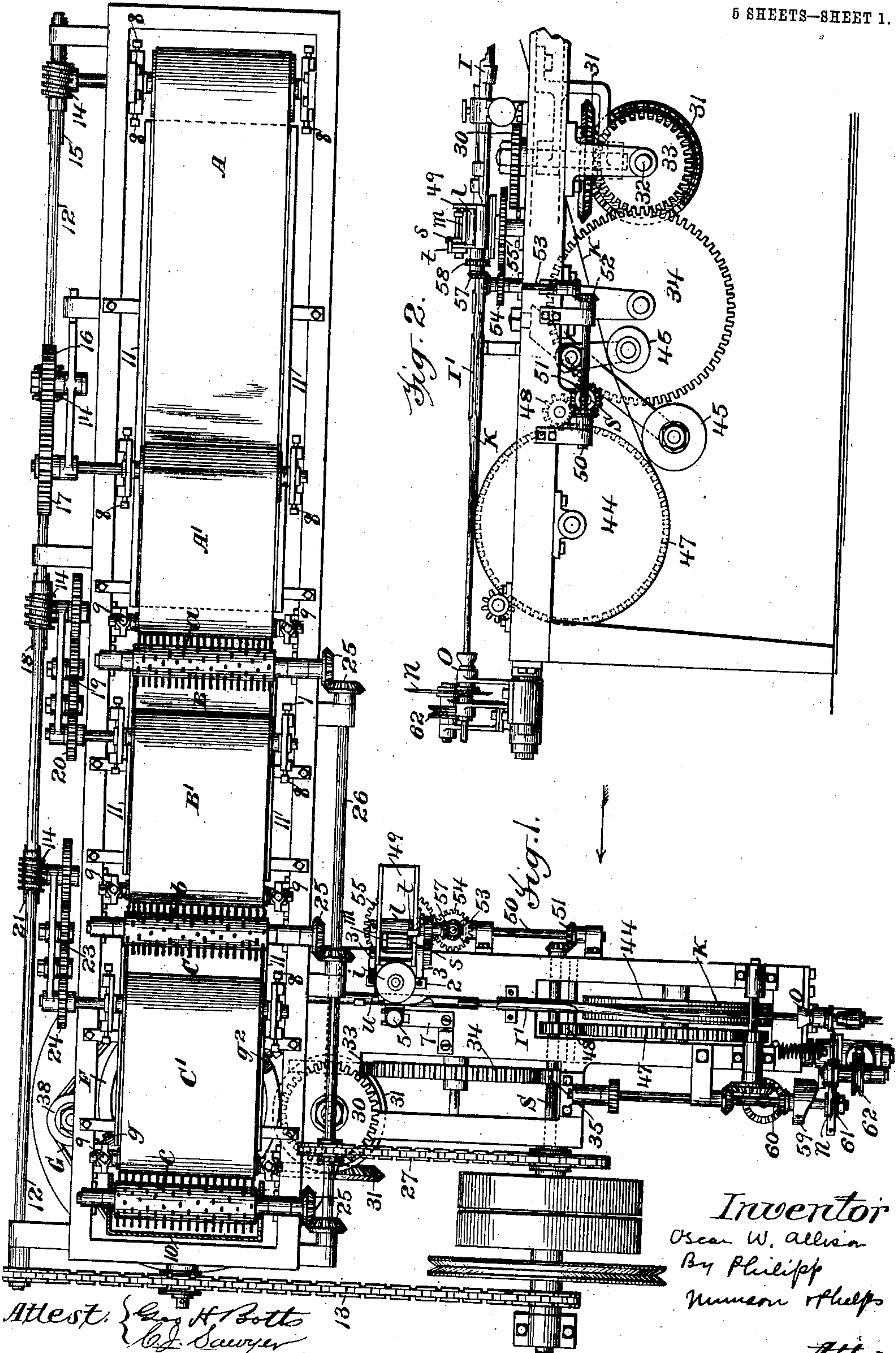


No. 829,455.

PATENTED AUG. 28, 1906.

O. W. ALLISON.
CIGARETTE MACHINE.
APPLICATION FILED MAY 1, 1896.

5 SHEETS—SHEET 1.



Attest. { *Eng H. Both*
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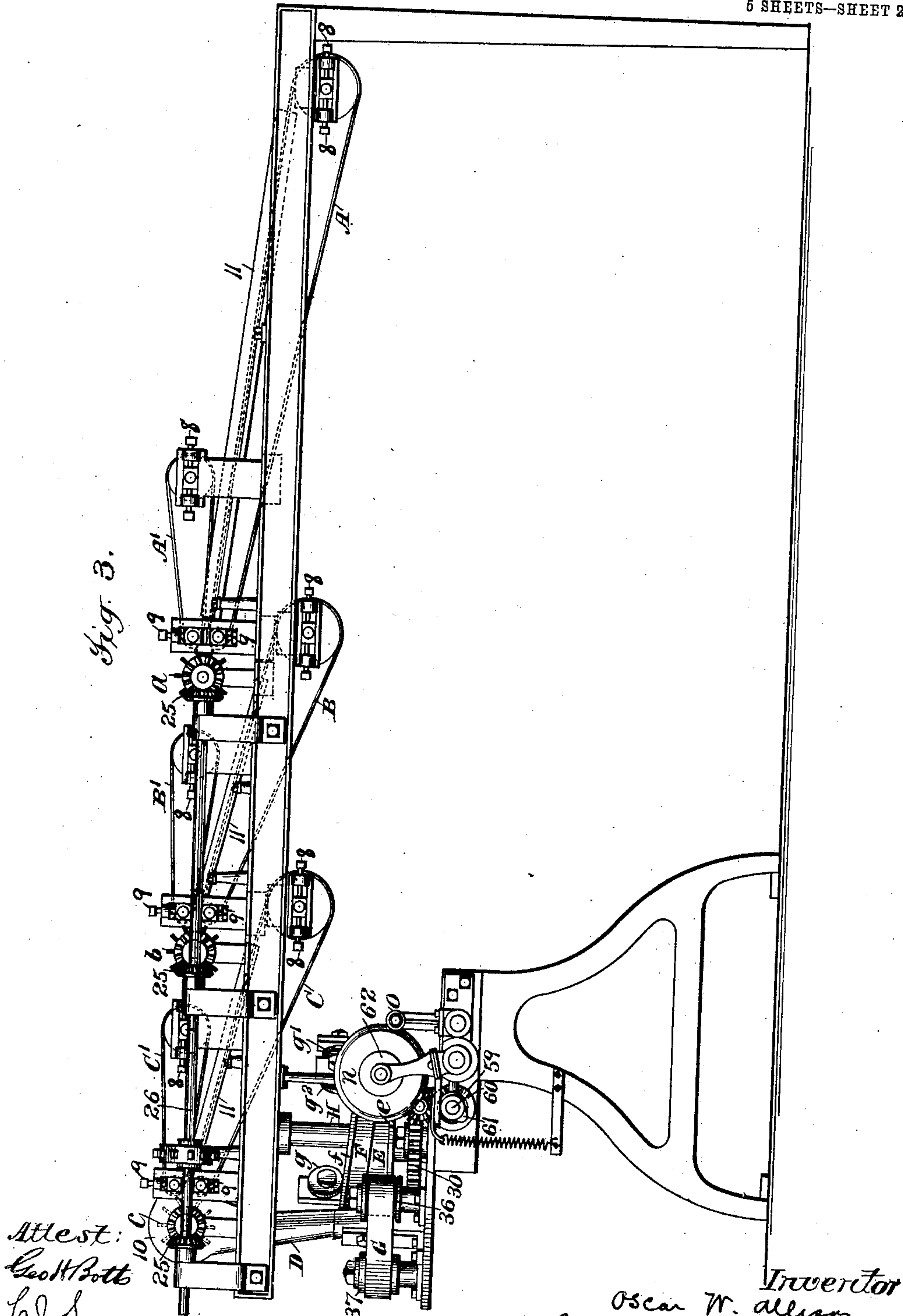
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Fig. 3.



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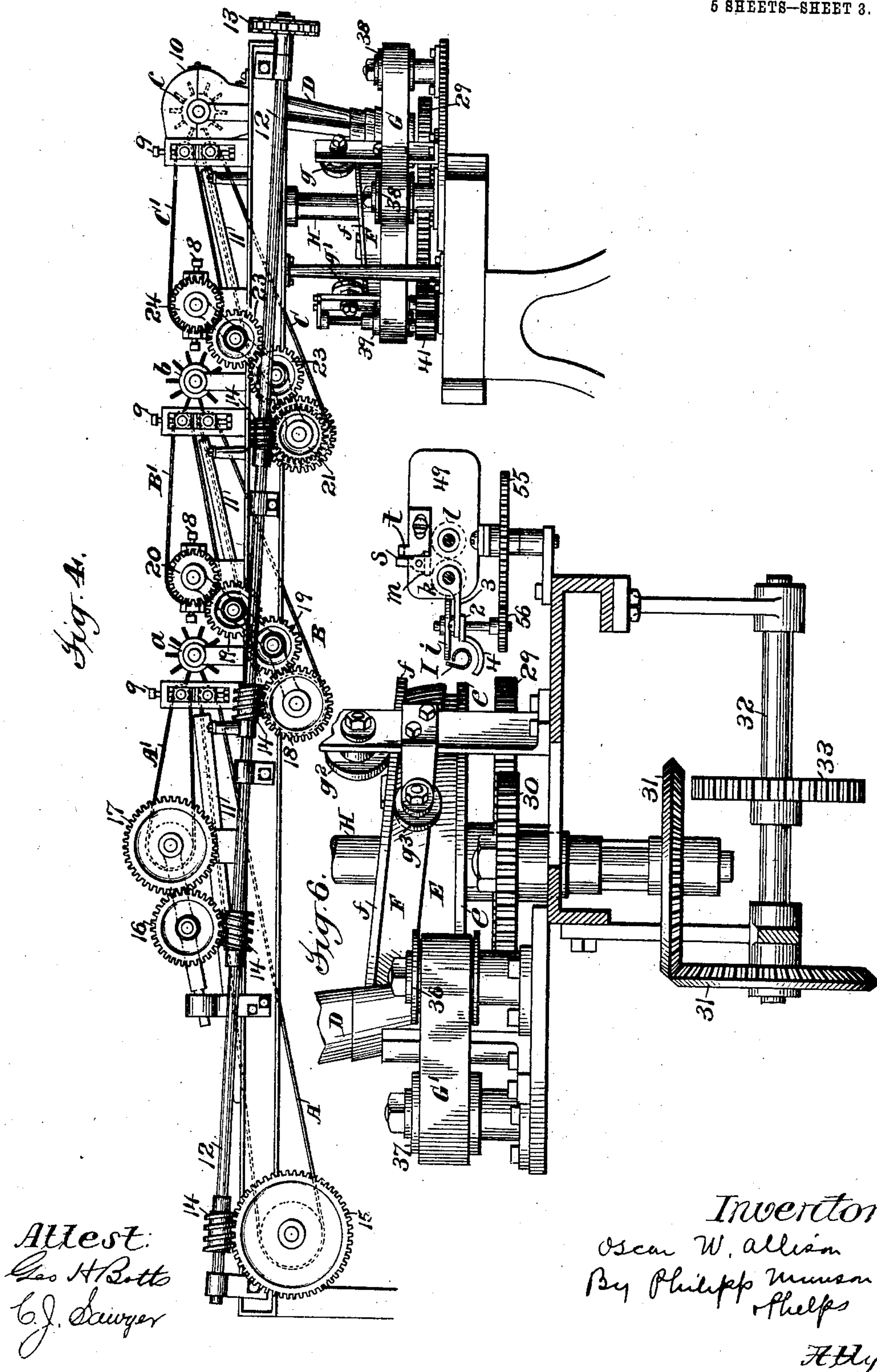
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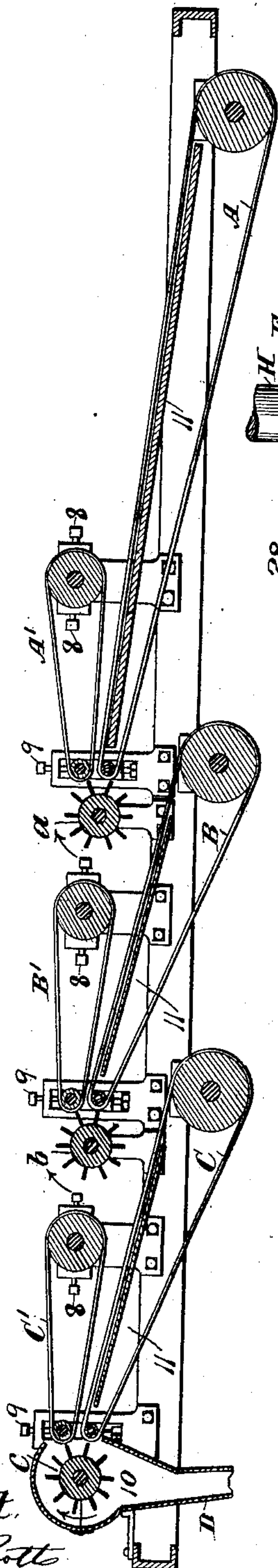
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Fig. 5.



Attest.
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Fig. 9.

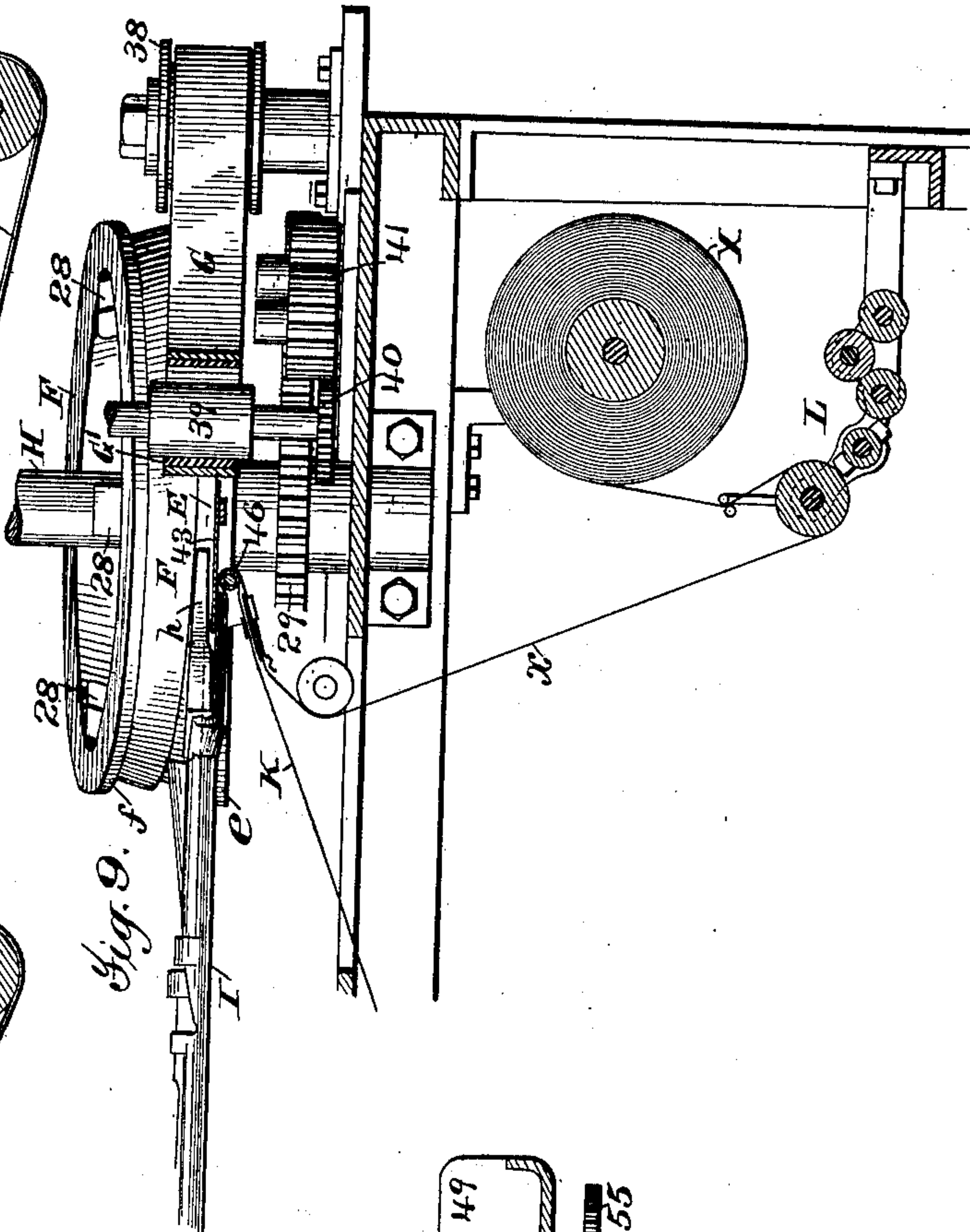
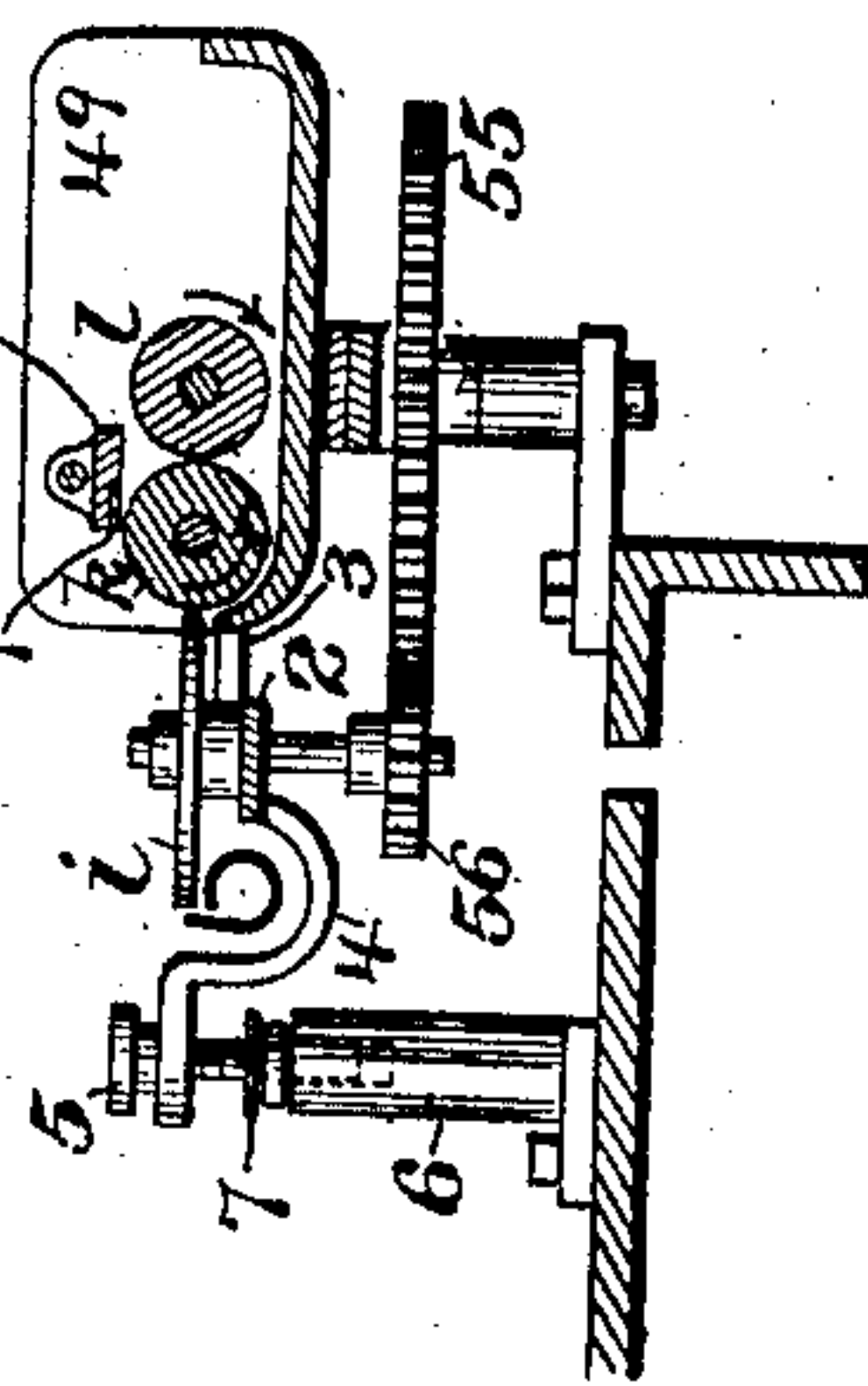


Fig. 10.



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APPLICATION FILED MAY 1, 1906.

5 SHEETS—SHEET 5.

Fig. 8.

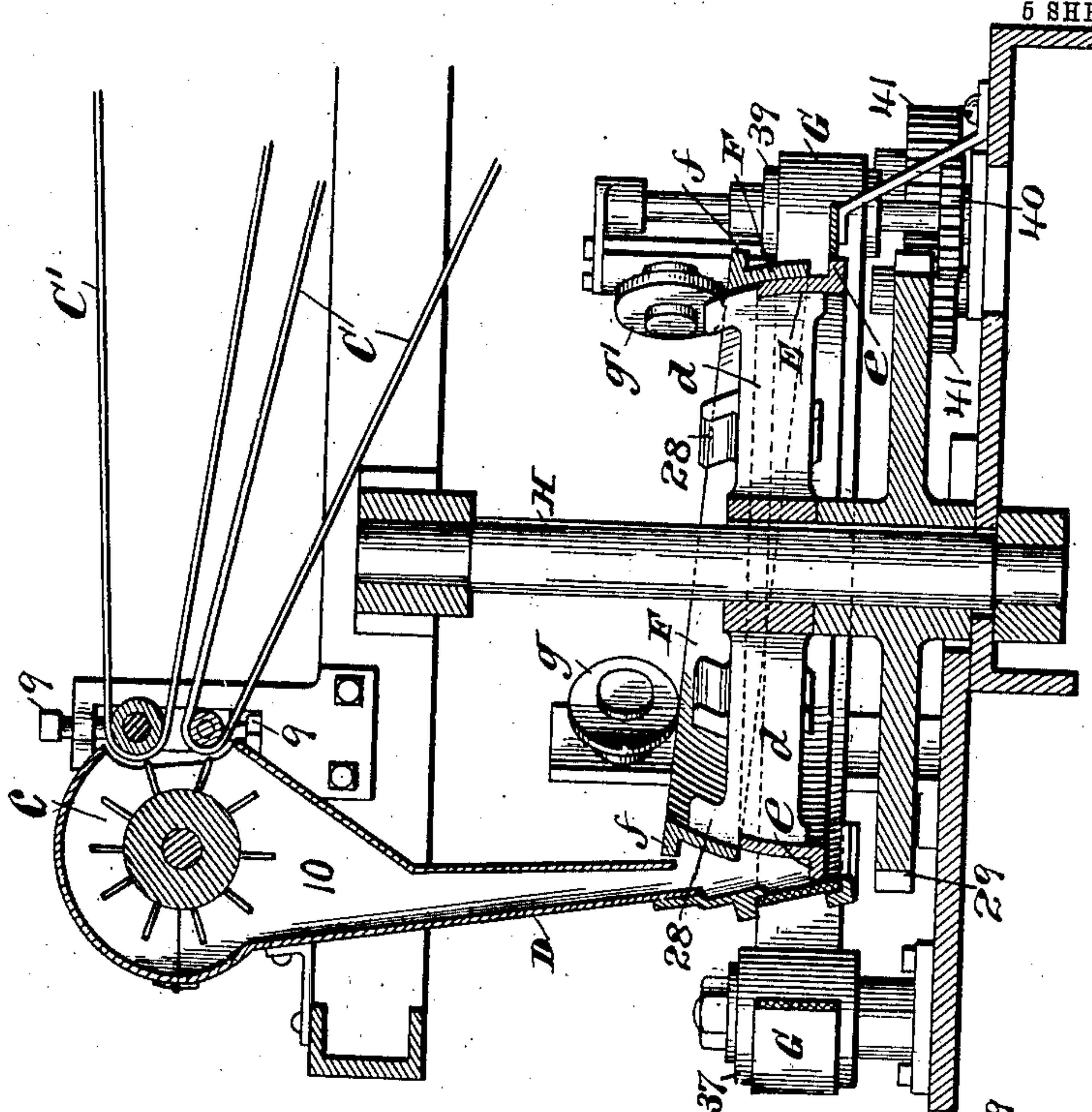
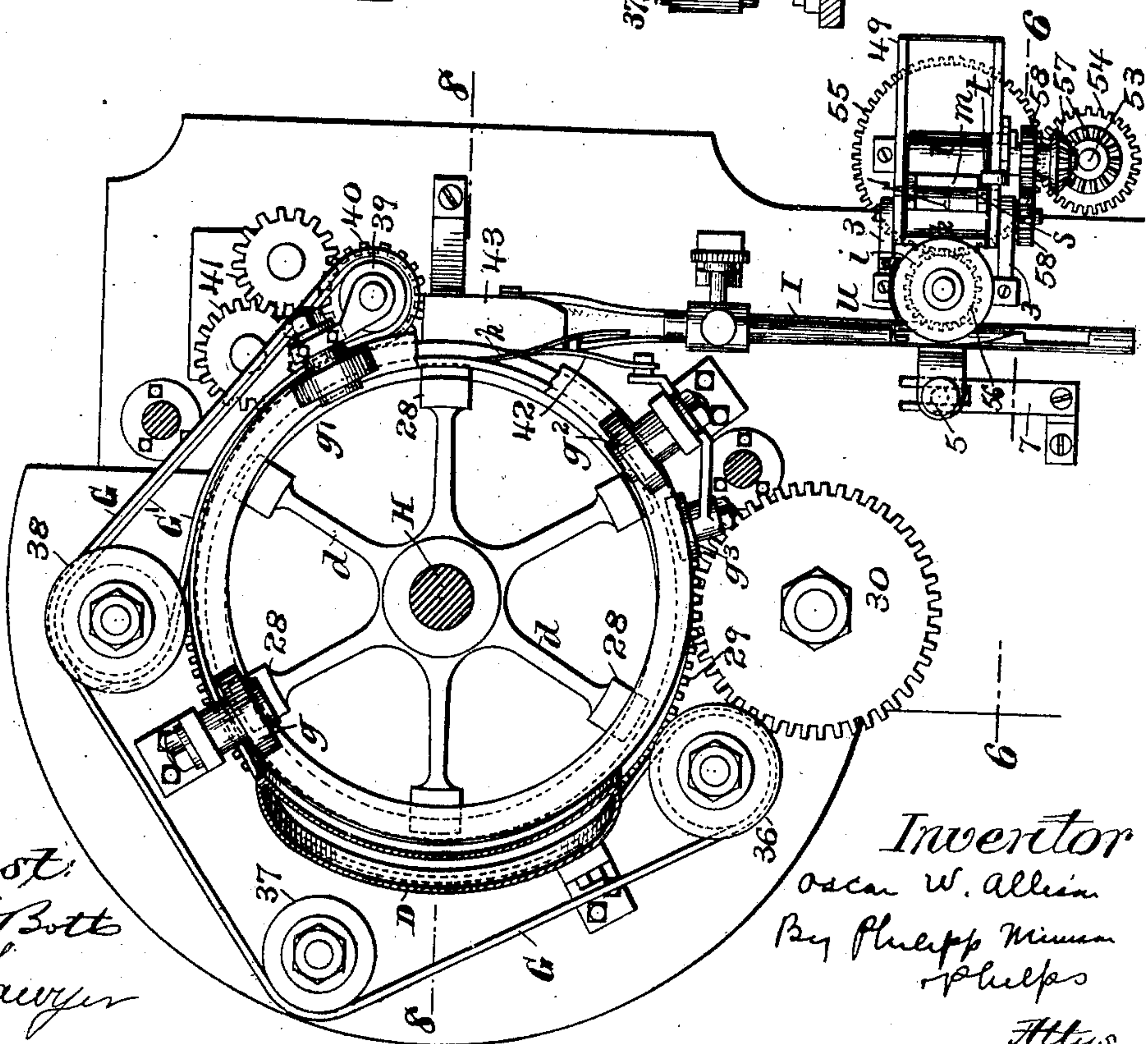


Fig. 7.



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Attys

UNITED STATES PATENT OFFICE.

OSCAR W. ALLISON, OF ROCHESTER, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AMERICAN TOBACCO COMPANY, A CORPORATION OF NEW JERSEY.

CIGARETTE-MACHINE.

No. 829,455.

Specification of Letters Patent.

Patented Aug. 28, 1906.

Application filed May 1, 1896. Serial No. 589,824.

To all whom it may concern:

Be it known that I, OSCAR W. ALLISON, a citizen of the United States, residing at Rochester, county of Monroe, and State of New York, have invented certain new and useful Improvements in Cigarette-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates generally to machines for making cigarettes, but more especially to that class of such machines in which a continuous filler of tobacco is formed and then the continuous-strip wrapper folded around the continuous filler and the edges of the wrapper united, after which the continuous cigarette-rod thus formed is cut into suitable lengths to form cigarettes.

The especial object of the present invention is to provide an efficient and high-speed machine of this class by which a longer-fibered filler may be made than by previous machines; and the invention includes various improved constructions and combinations of parts in tobacco-feeding, filler-forming, and wrapping devices and combinations thereof in cigarette-machines, all of which will be fully described hereinafter.

For a full understanding of the invention a detailed description of a complete cigarette-machine embodying all the features of the invention in their preferred form will now be given in connection with the accompanying drawings, forming a part of this specification, and the features of construction forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a plan view of the complete machine. Fig. 2 is a side view of the wrapping and delivery portion of the machine looking toward the left in Fig. 1. Fig. 3 is a side elevation of the machine looking from the delivery end. Fig. 4 is a side elevation of the tobacco-feeding and filler-forming mechanisms looking from the side opposite that shown in Fig. 3. Fig. 5 is a central longitudinal vertical section of the tobacco-feeding mechanism. Fig. 6 is a vertical section, on a larger scale than Figs. 1 to 5, taken on the line 6 of Fig. 7. Fig. 7 is a plan view of the filler-forming mechanism as shown in Fig. 6. Fig. 8 is a central vertical

section of the filler-forming mechanism on the line 8 of Fig. 7. Fig. 9 is a side view of the filler-forming mechanism looking to the left in Fig. 7 with the printing mechanism and filler-forming belts in section. Fig. 10 is a central cross-section of the pasting devices.

The various features of the machine will be described in order according to their operation in the machine.

The tobacco-feeding mechanism consists generally of three sets of bottom feeding-belts A, B, and C, corresponding shorter feeding-belts A' B' C', and corresponding picker-rolls *a b c*, the sets of feeding-belts A A' and B B' and C C' being arranged in sequence and so that the forward or delivery ends of the belts A A' deliver the tobacco above the rear end of the bottom belt B and the forward or delivery ends of the belts B B' above the rear end of the bottom belt C, the picker-rolls *a b* being mounted, respectively, opposite the forward ends of the belts A A' and B B' and above the rear ends of the belts B C, so as to deliver the tobacco from the forward ends of one set of belts to the bottom belt of the next set, while the picker-roll *c* is similarly placed relatively to the forward ends of the last set of belts C C' and delivers the tobacco from these belts through a chute D to the filler-forming mechanism.

As shown clearly in Fig. 5, the picker pins or fingers of the picker-rolls *a b c* run close to the surfaces of both the belts from which they receive the tobacco, so as to take the tobacco directly from both belts and, as shown by the arrows in this figure, rotate in the proper direction to deliver the tobacco directly downward from the belts onto the bottom belt of the next set. The belt-rolls at the delivery ends of the belts are preferably very small, as shown, as this lessens materially the space between the rolls and the ends of the picker-fingers and reduces correspondingly the amount of shorts that can be held therein. In order to reduce the size of these belt-rolls as far as possible, I drive the belts from their rear ends, so that these rolls at the delivery ends of the belts form simply supporting-rolls for the belts. The upper belt-roll at the delivery end of each set of belts is preferably made larger than the bot-

tom belt-roll, as it is found in practice that a freer movement of the tobacco is thus secured and the space between the rolls and the ends of the picker pins or fingers further lessened, and this feature is of value and may be used with larger belt-rolls.

The picker-roll *c* is shown as partly surrounded by a casing 10, having the top hinged, so that it may be removed for access to the picker-roll. The other picker-rolls *a b* are shown without casings for clearness of illustration; but it will be understood that similar casings are used to inclose these picker-rolls and the rear portions of the belts as usual in this class of mechanism. The bottom belts *A B C* preferably run through troughs 11, as shown, within which the tobacco is held to prevent its falling off the edges of the belts, and all the belts are preferably made adjustable, as by shifting one of the belt-rolls by set-screws 8, as indicated, so as to regulate the tension of the belts, and the forward ends of the belts are preferably mounted in bearings adjustable toward and from each other, as by set-screws 9, as indicated, so that the distance between the belts at their forward ends may be accurately adjusted to secure the proper action. The belts are preferably inclined upward, as shown, so that the successive sets of belts lie in substantially the same horizontal planes with the forward or delivery ends of each set of belts above the rear end of the bottom belt of the next set, as a more compact machine is thus provided and the feeding end of the machine brought at a convenient level for the operator. It will be understood, however, that this inclined arrangement of the belts is not essential, but that the successive sets of belts may be arranged on different levels, so as to bring the delivery ends of one set above the rear end of the bottom belt of the next set, although the belts run horizontally. The bottom and top belts of each set are driven at the same rate of speed; but the successive sets of belts are preferably driven at different speeds, the second set of belts *B B'* being run at a much higher speed than the first set *A A'* and preferably about twice as fast, while the third set of belts *C C'* are driven at a somewhat lower speed than the second set *B B'*, but preferably faster than the first set of belts *A A'*. The result of this arrangement is that the belts *B B'* tend to separate the tobacco received in a quite thick layer from the belts *A A'*, and this tobacco is again massed to a certain extent by the slower belts *C C'* for the formation of the filler. This result is also aided by arranging the delivery ends of the belts of the sets of belts at different distances apart, as shown in Fig. 5, the belts *A A'* and *C C'* running at about the same distance apart at their delivery ends, while the belts *B B'* are set much closer together. The distance between the belts will

depend somewhat on the character of the tobacco used; but good results have been obtained with belts *B B'*, separated about one-half as far as the belts *A A'* and *C C'*. Any suitable driving mechanism may be used for driving the belts; but, as shown, all the belts are driven from a worm-shaft 12, which is driven from the main driving-shaft *S* by a chain 13 and carries worm-gears 14 for driving the belts, the belt *A* being shown as driven through its rear belt-roll directly from one of the worms 14 by a gear 15 on the belt-roll. The corresponding belt *A'* is driven at the same rate of speed through another of the worms 14 by intermediates 16 and gear 17 on the rear belt-roll. The belts *B B'* are driven from one of the worms 14 at the higher rate of speed through gear 18 on the rear belt-roll of belt *B*, intermediates 19, and gear 20 on the rear belt-roll of belt *B'*. Belts *C C'* are driven at a lower rate of speed than belts *B B'* by a smaller and finer worm-gear 14 through gear 21 on the rear belt-roll *C*, a second gear on the same shaft, intermediates 23, and gear 24 on the rear belt-roll of belt *C'*.

The picker-rolls *a b c* are of a special construction, which in itself forms a part of the invention and may be used with other devices, such as rolls, for feeding the tobacco to the picker-rolls, although the belt construction shown is preferred, and the combination of the picker-rolls and pairs of belts, as shown and described, also forms a part of the invention. I use picker-rolls having the pickers arranged in rows upon the roll with the pickers in the successive rows staggered, as shown, so as to cover the surface of the belts as fully as possible and prevent strips of tobacco being carried by the belts past the pickers. The pickers are also preferably arranged in rows extending spirally about the picker-rolls. A single picker-roll for each pair of belts is used, and, as above stated, the pickers are of such length and the rolls so mounted that the pickers move close to the surfaces of both belts as they move about the belt-rolls and take the tobacco directly therefrom and deliver it directly to the bottom belt of the next set. The picker-rolls *a b c* are preferably driven at the same rate of speed and in the construction shown are all driven by beveled gears 25 from a single shaft 26, which in turn is driven from the main shaft *S* by a chain 27.

The filler-forming mechanism, to which the tobacco is delivered from the last set of belts by the picker-roll *c*, consists generally of an inner or receiving ring *E*, preferably having a spherical or convex outer surface, as shown, and an outer or compressing ring *F*, having an inner surface corresponding to the outer surface of the inner ring *E* and applied to the inner ring *E* at a slight angle to the axis of the latter, so as to form a filler-form-

ing chamber narrowing gradually from the point where the tobacco is received from the chute D to the point where the filler is discharged, and some suitable means for closing the space between the rings, so as to hold the tobacco therein as the tobacco is compressed vertically between the rim of the outer ring and a flange *e* on the inner ring to form the filler. In the specific construction shown a covering apron or belt G extends about the rings from a point at one side of the chute D to the point at which the filler is discharged, so as to form one side of the hopper to which the tobacco is delivered by chute D and to close the filler-forming chamber between the rings, and a second tightening or compressing belt G' is used outside the belt G to hold the latter up to the rings during the latter part of the operation of forming the filler. This second belt G' is important, as the belt G must run comparatively loosely on account of its running outside of the chute D through a part of its length, and some means are desirable for securing the requisite pressure of the belt during the latter part of the formation of the filler, and this result is best attained by the second belt G'. It will be understood, however, that the single belt G or other suitable means for closing the filler-forming chamber may be used.

The rings E F are arranged horizontally, the receiving-ring E being mounted on vertical shaft H by arms *d*, carried by a sleeve splined on the shaft, and the compressing-ring F being provided with an outwardly-extending flange *f*, which runs upon pulleys *g g' g''* above the flange and pulley *g'''* below the flange, these pulleys acting to hold the ring F in proper position relatively to the ring E for the formation of the filler. While the flange *e* has been shown as on the bottom of the receiving-ring E, and this is the preferred construction, as the tobacco is thus compressed downward, it will be understood that the rings may be reversed and the flange *e* be on the top of ring E and flange *f* at the bottom of ring F. The compressing-ring F is preferably driven by friction from the receiving-ring E and the belt G, as shown, and the ring E, carried by arms *d*, which are provided with upwardly-projecting bearing-surfaces 28, which aid in holding the outer ring F in proper position throughout its movement and secure the desired friction for driving the same without extending the whole ring E. The shaft H, carrying the inner ring E, is driven by a large gear 29 and from a gear 30, mounted on a short vertical shaft, which in turn is driven by beveled gears 31 from a cross-shaft 32, carrying gear 33, which is driven by a large gear 34 and small gear 35 from the main driving-shaft S. The belt G is supported and guided by belt-rolls 36 37 38 39 and the belt G' by the last two mentioned belt-rolls, and both these sets of belts are

driven from the belt-roll 39, which is driven by gear 40 on its shaft and intermediates 41 from gear 29 on shaft H, previously described. Just beyond the belts G G' and at the point where the filler-forming chamber between the rings E F commences to widen, so as to release the pressure upon the filler, the latter is directed from the filler-forming chamber between the rings by a conductor or scraper *h*, carried by a plate 42, and is thus guided over a base-plate or support 43 beneath the filler to the wrapping devices.

It will be seen that the general principle upon which this filler-forming mechanism operates is similar to that shown and described in my Patent No. 404,613, dated July 9, 1889. Therefore the operation of the present construction will be understood from the above description in connection with said patent without further detailed description. The horizontal arrangement of the ring, however, is an important improvement, an improved action being thus secured. One of the especial advantages of this horizontal arrangement is that the tobacco may be fed downward onto a large portion of the receiving-ring at the same time, while with the vertical arrangement the tobacco can be delivered to only a comparatively small part of the receiving-ring without danger of its falling off.

While the rings E F have been shown arranged with square filler-forming surfaces, so as to form a rectangular or approximately square filler, it will be understood that they may be made with their adjacent filler-forming surfaces formed in any suitable manner, so as to form a filler of cylindrical, elliptical, or any other desired shape.

With the tobacco-feeding and filler-forming mechanisms above described a wrapping and delivery mechanism of any suitable class and construction may be used; but I preferably employ a wrapping-tube similar to that now well known in connection with cigarette-machines, through which the wrapper-strip, with the filler superposed thereon, is carried by a traveling belt or tape and the edges of the wrapper folded about the filler and one edge pasted to the other to secure the wrapper, a continuous cigarette-rod thus being delivered from the wrapping-tube, which is subsequently cut into suitable lengths to form cigarettes. In this part of the machine, I is the wrapping-tube, shown as of a common form and supported in the usual manner, through which runs the belt K with the wrapper-strip *x*, which is shown as passing from the wrapper-roll X through a printing mechanism L, which may be of any suitable form for printing any required trade-name or other device upon the wrapper and entering the rear end of the wrapping-tube upon the belt, so that the filler-rod passes onto the wrapper from the support 43, previously described, and is

guided by the conductor *h* into the rear end of the wrapping-tube with the wrapper. For the purpose of holding the edges of the pasted seam together through a sufficient run to insure the setting of the paste with the machine operating at a very high rate of speed an extension *I'* of the wrapping-tube *I* is preferably used, and to get a longer hold of this belt upon the wrapper this extension preferably being made separate from the tube, so that the latter may be removed for the purpose of cleaning, repairing, or substitution without interfering with the extension *I'*, or vice versa. The belt *K* is driven by the large belt-pulley 44 at the delivery end of the machine and runs rearward from the belt-roll 44 over tightening-pulleys 45 and about a small roll 46 at the rear end of the tube *I*, as usual in such constructions, the belt-roll 44 being driven from the main driving-shaft *S* through a gear 47 upon the shaft of the belt-roll, an intermediate 48, and a small gear on the driving-shaft.

In connection with the construction of this machine I have devised novel pasting devices which are especially adapted for use with wrapping-tubes, but which may be used also with other constructions. These improved pasting devices, as shown especially in Figs. 2, 6, 7, and 10, are as follows: A horizontally-rotating paste-wheel *i* receives paste from a circumferential line of paste at the middle of vertically-rotating feeding-rolls *k*, running within the paste-receptacle 49, the circumferential line of paste on this roll *k* being secured by a doctor *m*, which engages the top of the roll and is provided with a narrow groove 1, which allows a corresponding line of paste to be carried past the doctor by the roll. This doctor is carried by a rod pivoted in the trough and having outside the trough an arm *s*, which engages an adjustable stop *t* on the side of the trough, so that the position of the doctor *m* may be adjusted by moving the stop, the rotation of the roll *k* holding the arm *s* against the stop *t*. The paste is ground fine by the roll *k* coacting with the roll *l*, these two rolls being provided with roughened surfaces for this purpose and set at the proper distance apart to secure the desired feed of the paste between them. A doctor *u*, consisting of a thin metal plate extending about the paste-wheel *i*, secures the proper distribution of the paste on the face of the paste-wheel and prevents the paste working onto the edge of the wheel, as it tends to do.

The wheel *i* is made adjustable vertically, so as to secure its proper position relatively to the wrapper and the proper contact with the surface of roll *k*, this vertical adjustment of the paste-wheel *i* being secured by mounting it, with its driving-shaft, in a frame 2, carried by arms 3, pivoted concentrically with roll *k*, this frame 2 being held in proper position and adjustable, as desired, by an arm

through which screws a set-screw 5, which is seated in the post 6. A spring 7, bearing against a collar on the screw, presses the latter downward, and the vertical position of the paste-wheel may thus be adjusted against the tension of spring 7 by the set-screw 5. The paste-wheel *i* and rolls *k* *l* are driven from the main driving-shaft *S* through a cross-shaft 50, pairs of beveled gears 51 52, and vertical shaft 53, carrying a gear 54, which meshes with a gear 55, engaging a gear 56 on the shaft of paste-wheel *i*. The vertical shaft 53 also drives, through beveled gears 57, the two rolls *k* *l*, which are geared together by gears 58. It will be found that this pasting mechanism is very simple, efficient, and easy of adjustment, so as to secure the amount of paste desired, and that it enables cigarettes to be formed at a high rate of speed with a very small quantity of paste, while the rolls *k* *l* secure the desired fineness of the paste by grinding.

For severing the continuous cigarette-rod into cigarette lengths any suitable construction of cutting mechanism may be used; but that shown is preferably employed as forming a very efficient high-speed mechanism. In this construction the disk cutter *n* and guide *o*, through which the cigarette-rod runs, are mounted together to move in a straight line longitudinally of and with the cigarette-rod while the cutter is moving through the cigarette and the cutter *n* is oscillated transversely to the cigarette for the cutting operation. The cutter and guide are moved longitudinally by a cam 59, carried by a shaft 60, and the cutter is mounted to swing on its support transversely to the cigarette, and thus moved by a cam 61 on the same shaft, both the return movements being effected by springs and the disk cutter being driven by a belt on pulley 62, as usual in such constructions.

While I have shown and described all my improvements as combined in a single machine and as embodied in the form which I now consider the best, it will be understood that the features claimed in the different mechanisms of the machine may be used in other combinations, that many modifications may be made therein without departing from my invention, and that I am not to be limited to the exact form or arrangement of devices shown as embodying the various features of construction claimed by me.

What I claim is—

1. The combination with top and bottom tobacco-feeding belts having belt-rolls of different sizes at the delivery ends, the roll for the top belt being substantially vertically above the roll for the bottom belt, of a picker-roll placed opposite the delivery-opening between the belts and having pickers moving close to both belts, whereby the tobacco is delivered directly from the surfaces of both

belts by the picker-roll, substantially as described.

2. The combination with top and bottom tobacco-feeding belts, the belt-roll at the delivery end of the top belt being larger than that of the bottom belt and being substantially vertically above the roll of the bottom belt, of a picker-roll placed opposite the delivery-opening between the belts and having pickers moving close to both belts and from the larger toward the small belt-roll, whereby the tobacco is delivered directly from the surfaces of both belts by the picker-roll, substantially as described.

3. The combination with top and bottom tobacco-feeding belts, having small supporting belt-rolls at their delivery ends, the roll for the top belt being substantially vertically above the roll for the bottom belt, of a picker-roll placed opposite the delivery-opening between the belts and having pickers moving close to both the belts, whereby the tobacco is delivered directly from the surfaces of both belts by the picker-roll, and a tobacco-feeding belt moving at a different rate of speed from the first-mentioned tobacco-feeding belts and to which the tobacco is delivered directly by the picker-roll, substantially as described.

4. The combination with sets of bottom tobacco-feeding belts and coacting shorter top feeding-belts, the rolls for supporting the belts at their delivery ends being arranged one substantially vertically above the other, of a picker-roll arranged between the delivery ends of the first set of belts and the rear end of the second top feeding-belt, and above the second bottom feeding-belt, and arranged to deliver the tobacco from the first set of belts to the second bottom feeding-belt, substantially as described.

5. The combination with two sets of tobacco-feeding belts, the second set of feeding-belts running at a higher speed than the first set and having their ends closer together than the first set, of a picker-roll at the delivery end of the first set of belts arranged to deliver the tobacco from said belts to the second set of belts, substantially as described.

6. The combination with two sets of tobacco-feeding belts, the second set of feeding-belts running at a higher speed than the first set, of a third set of belts running at a lower speed than the second set and having their delivery ends separated farther than those of the second set, a picker-roll at the end of the first and second set of belts arranged to deliver the tobacco from one set of belts to the next, and a picker-roll receiving the tobacco from the third set of belts, substantially as described.

7. The combination with a plurality of sets of bottom tobacco-feeding belts and co-

acting shorter top feeding-belts, said belts being inclined so as to feed the tobacco upward and having their delivery ends in substantially the same horizontal plane, of picker-rolls at the delivery ends of the belts arranged to receive the tobacco from one set of belts and deliver it to the bottom belt of the next set of belts, substantially as described.

8. The combination with a horizontally-revolving receiving-ring provided with a flange, of tobacco-feeding devices whereby the tobacco is fed downward substantially vertically to the receiving-ring, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, substantially as described.

9. The combination with a horizontally-revolving receiving-ring provided with a flange, of tobacco-feeding devices whereby the tobacco is fed downward substantially vertically to the receiving-ring, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, means for covering the space between the rings, and a conductor for guiding the filler from the space between the rings, substantially as described.

10. The combination with a horizontally-revolving receiving-ring provided with a bottom flange, of tobacco-feeding devices whereby the tobacco is fed downward substantially vertically to the receiving-ring, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, and means for covering the space between the rings, substantially as described.

11. The combination with a horizontally-revolving receiving-ring provided with a flange, of tobacco-feeding devices whereby the tobacco is fed downward substantially vertically to the receiving-ring, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, and a covering-belt extending about the rings from the point where the tobacco is received to the point where the filler is delivered from the rings, substantially as described.

12. The combination with a horizontally-revolving receiving-ring provided with a flange, of a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, a covering-belt extending about the rings from the point where the to-

tobacco is received to the point where the filler is delivered from the rings, and a compressing-belt for pressing the covering-belt against the rings, substantially as described.

5 13. The combination with a horizontally-revolving receiving-ring provided with a flange, of a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, wheels as *g*, *g'*, &c., for holding the compressing-ring in position, and arms *d* carrying the receiving-ring and having portions 28 extending above the receiving-ring and forming bearing-surfaces for the compressing-ring, substantially as described.

10 14. The combination with a horizontally-revolving receiving-ring having a flange, of tobacco-feeding devices whereby the tobacco is fed downward substantially vertically to the receiving-ring, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, means for covering the space between the rings, a wrapping-tube and conveying-belt for applying a wrapper to the filler, and a conductor for guiding the filler from the filler-forming rings to the wrapping-tube, substantially as described.

15 15. The combination with two or more sets of tobacco-feeding belts, a single picker-roll at the delivery end of each set of belts arranged to receive the tobacco directly from the belts and deliver it directly to the next set of belts, and a chute to which the last picker-roll delivers the tobacco, of a horizontally-revolving receiving-ring to which the tobacco is delivered substantially vertically by the chute, a revolving compressing-ring mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco on the receiving-ring, and means for covering the space between the rings, substantially as described.

20 16. The combination with tobacco-feeding mechanism and vertically-arranged chute D, of horizontally-revolving receiving-ring E provided with a flange, revolving compressing-ring F mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the flange on the receiving-ring, and belt G covering the space between the rings and forming one side of the receiving-chamber to which the tobacco is delivered by the chute D, substantially as described.

25 17. The combination with tobacco-feeding mechanism, and vertically-arranged chute D, of horizontally-revolving receiving-ring E provided with a flange, revolving compressing-ring F mounted obliquely upon the face of the receiving-ring and arranged to gradually compress the tobacco against the

flange on the receiving-ring, belt G covering the space between the rings and forming one side of the receiving-chamber to which the tobacco is delivered by the chute D, and compressing-belt G' for pressing the belt G against the rings, substantially as described.

70 18. The combination with a paste-receptacle, as 49, and paste-feeding roll *k*, of doctor *m* having a groove 1 for securing a circumferential line of paste on roll *k*, and paste-wheel *i* rotating in a plane transverse to the plane of rotation of roll *k*, substantially as described.

75 19. The combination with a paste-receptacle, as 49, and the paste-feeding roll *k*, of doctor *m* having groove 1 for securing a circumferential line of paste on roll *k*, and paste-wheel *i* rotating in a plane transverse to the plane of rotation of roll *k* and having doctor *u* for distributing the paste on the face of the wheel, substantially as described.

80 20. The combination with a paste-receptacle, as 49, and the paste-feeding roll *k* of doctor *m* having a groove 1 for securing a circumferential line of paste on roll *k*, paste-wheel *i*, and grinding-roll *l* coacting with roll *k*, substantially as described.

85 21. The combination with a paste-receptacle, as 49, and paste-feeding roll *k* and paste-wheel *i* rotating in a plane transverse to the plane of rotation of the roll *k*, of paste-grinding roll *l* coacting with roll *k*, substantially as described.

90 22. The combination with a paste-receptacle, as 49, and paste-feeding roll *k*, a doctor on said roll, and paste-wheel *i* rotating in a plane transverse to the plane of rotation of the roll *k*, of paste-grinding roll *l* coacting with said roll *k*, substantially as described.

95 23. The combination with a paste-receptacle, as 49, and the paste-feeding roll *k*, of doctor *m* having a groove 1 for securing a circumferential line of paste on roll *k*, paste-wheel *i* rotating in a plane transverse to the plane of rotation of roll *k*, and means for adjusting the position of the doctor *m*, substantially as described.

100 24. The combination with the paste-feeding roll *k*, of paste-wheel *i* fed by roll *k* and adjustable concentrically with said roll, substantially as described.

105 25. The combination with the paste-feeding roll *k*, of paste-wheel *i* fed by roll *k*, frame 2 carrying said wheel and mounted to swing concentrically with said roll *k*, and a spring for holding said frame under yielding pressure, substantially as described.

110 26. The combination with paste-feeding roll *k*, of paste-wheel *i* fed by roll *k*, moving frame 2 carrying said wheel, a spring for holding said frame under yielding pressure, and means for adjusting the position of the wheel against the tension of the spring, substantially as described.

27. The combination with a paste-recep-
tacle, as 49, and paste-feeding roll *k*, of
grinding-roll *l* coacting therewith, doctor *m*
engaging roll *k* and having groove 1, paste-
5 wheel *i* fed by roll *k* and adjustable concen-
trically therewith, and doctor *u* on the paste-
wheel, substantially as described.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing
witnesses.

OSCAR W. ALLISON.

Witnesses:

J. J. KENNEDY,

C. J. SAWYER.