No. 817,880. PATENTED APR. 17, 1906.

R. A. SLOAN, J. E. L. BARNES & P. OGDEN.

AUTOMATICALLY REGULATED FEEDING APPARATUS FOR CIGARETTE MAKING MACHINES.

APPLICATION FILED JULY 11, 1904.

8 SHEETS—SHEET 1.

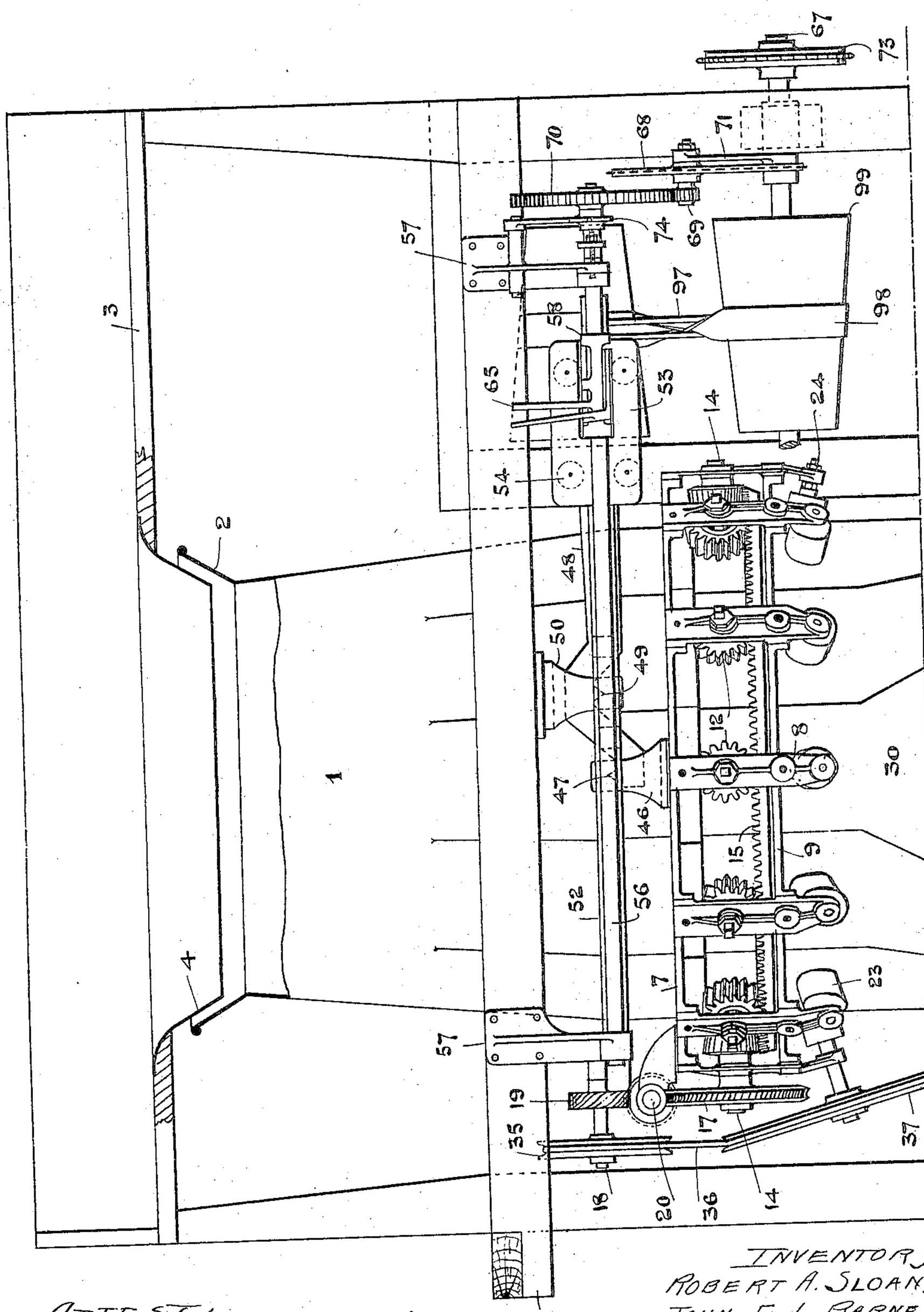

FIG. 1.

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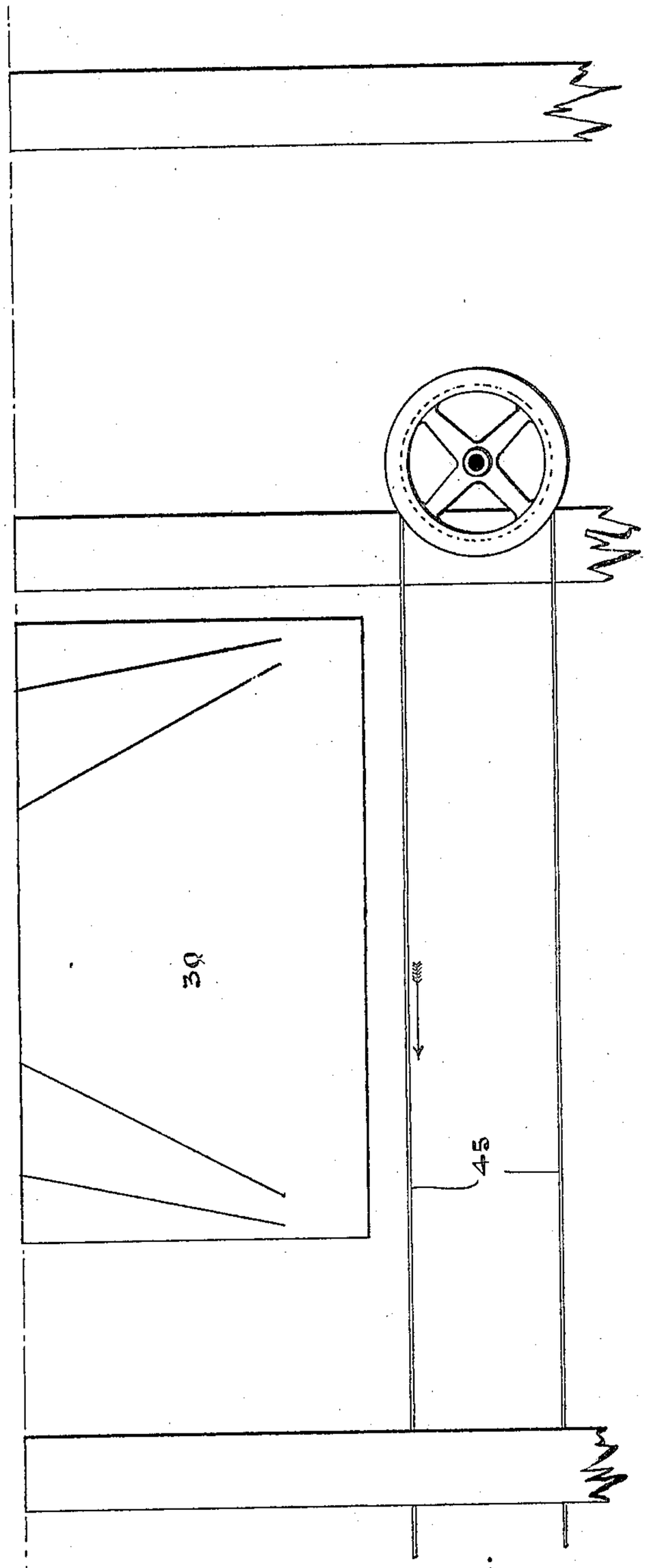
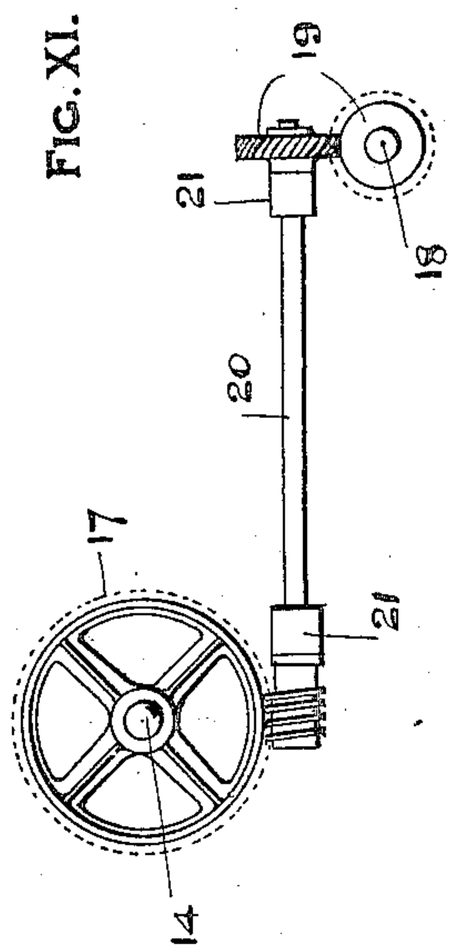


Fig. 1a.

Fig. XI.



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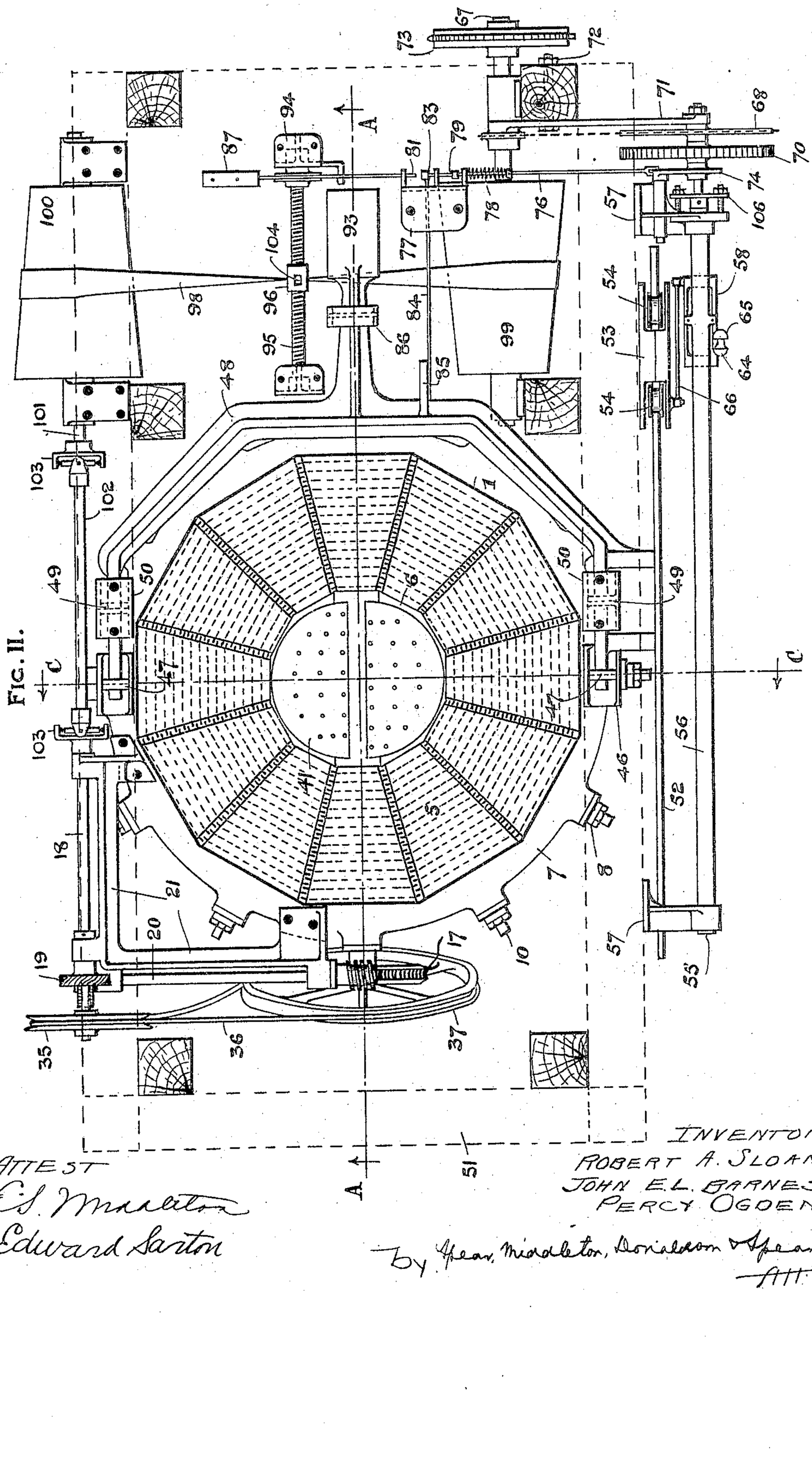

FIG. II.

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8 SHEETS—SHEET 4.

FIG. III.

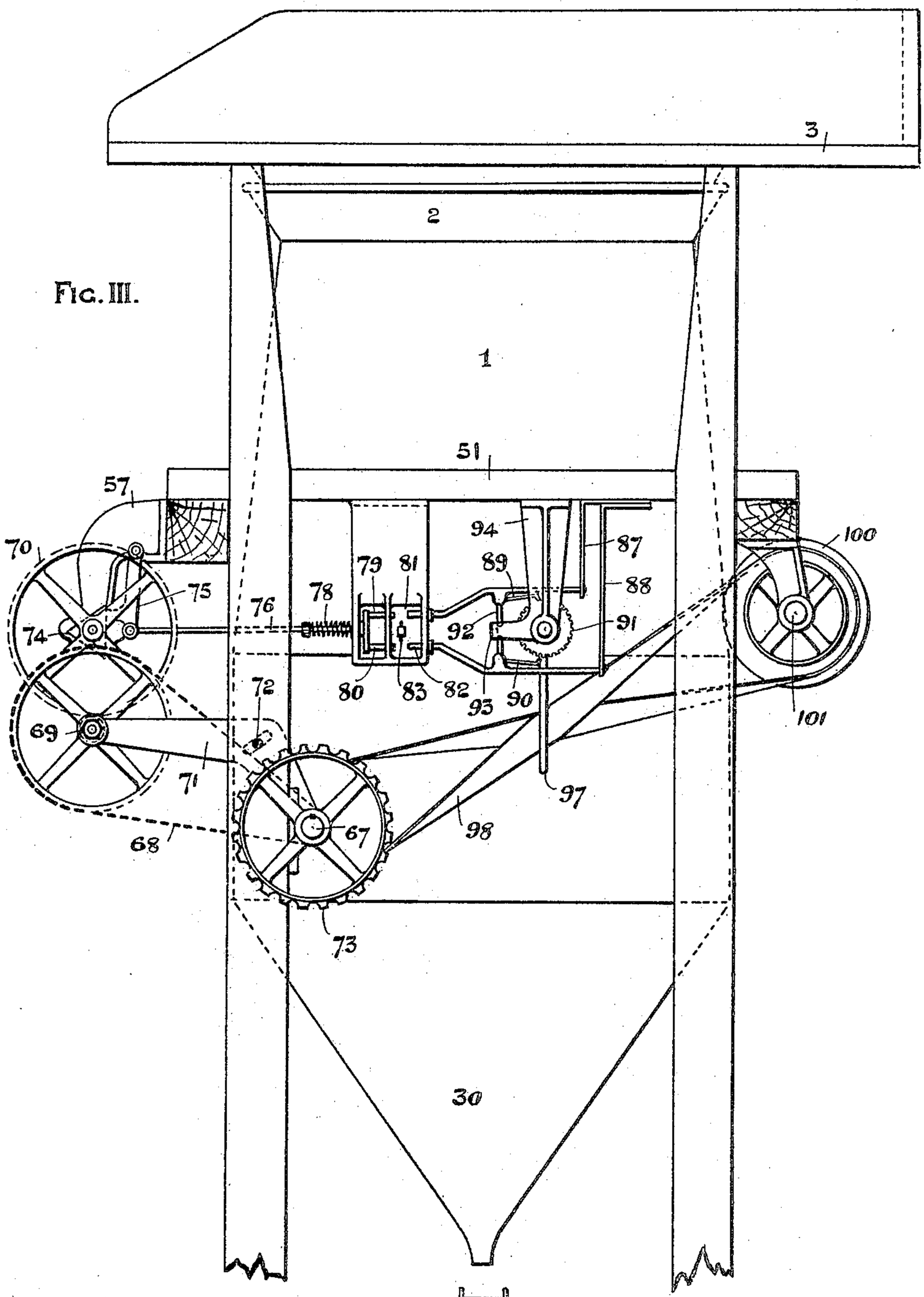

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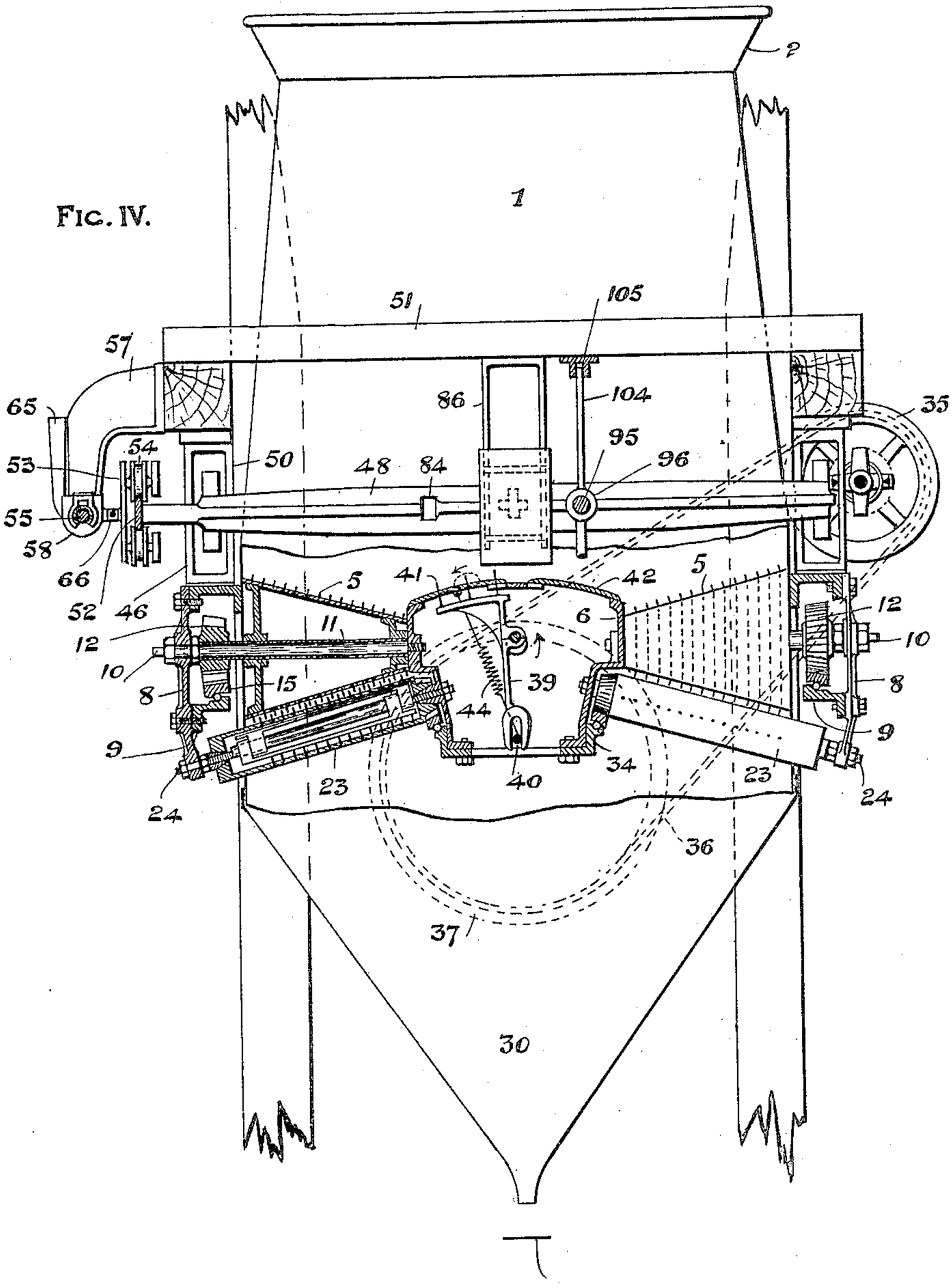
FIG. IV.



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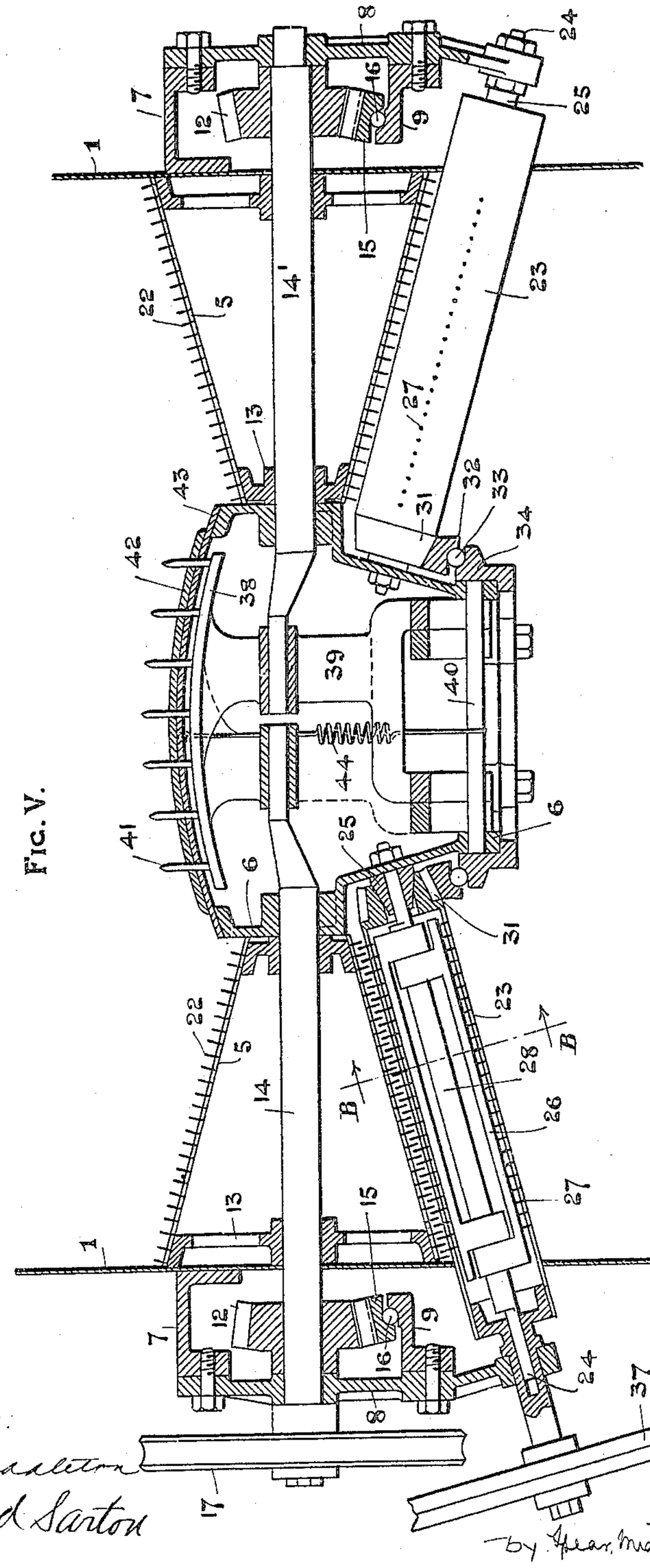
8 SHEETS—SHEET 6.

FIG. V.



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8 SHEETS—SHEET 7.

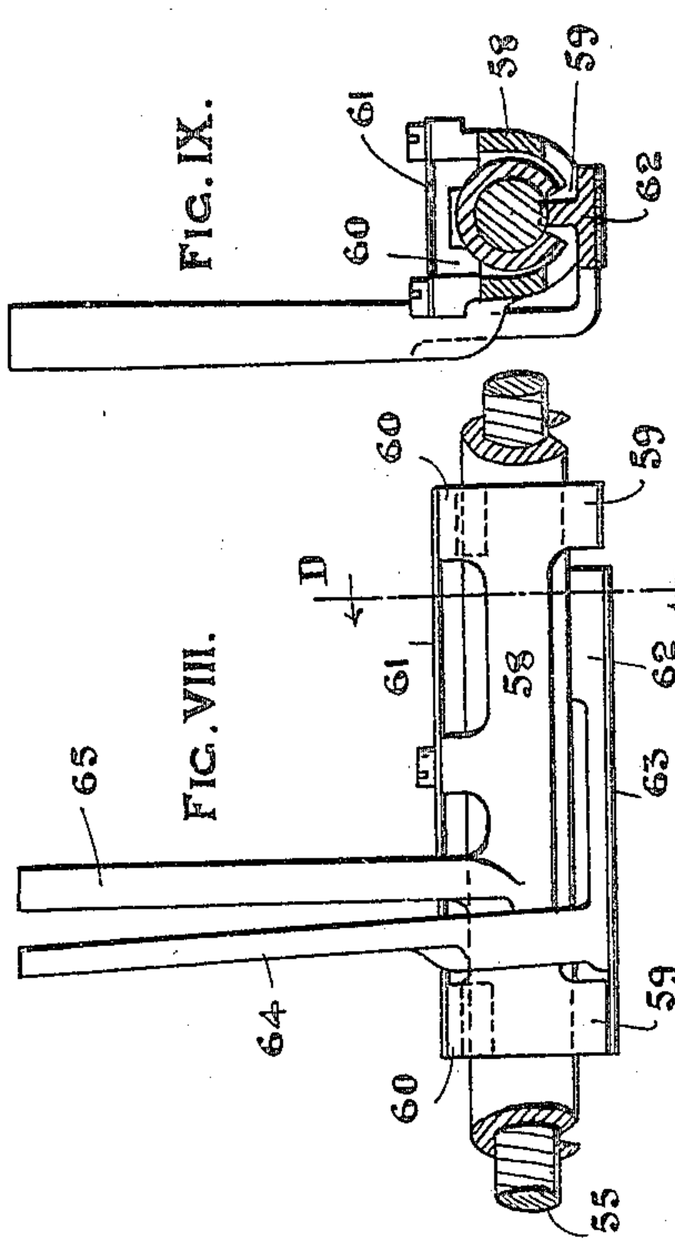

FIG. IX.

FIG. VIII.

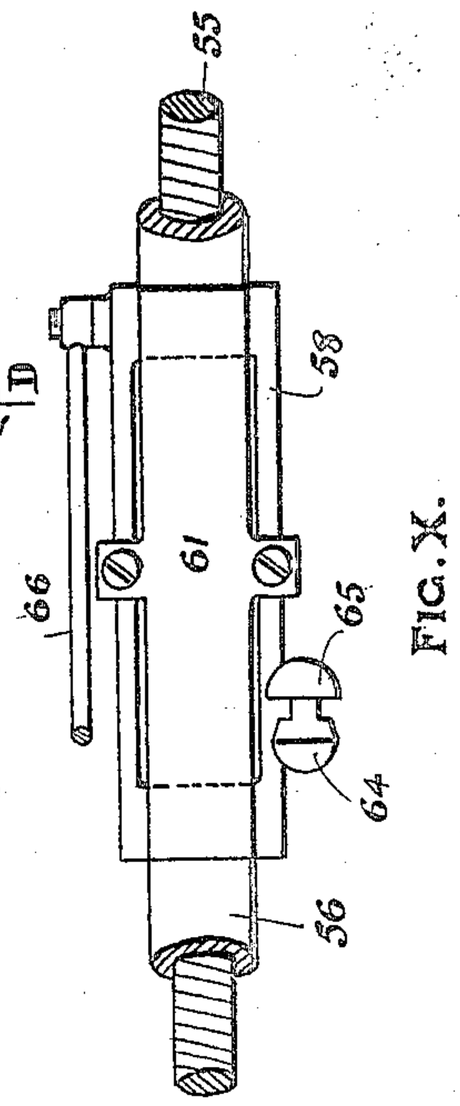

FIG. X.

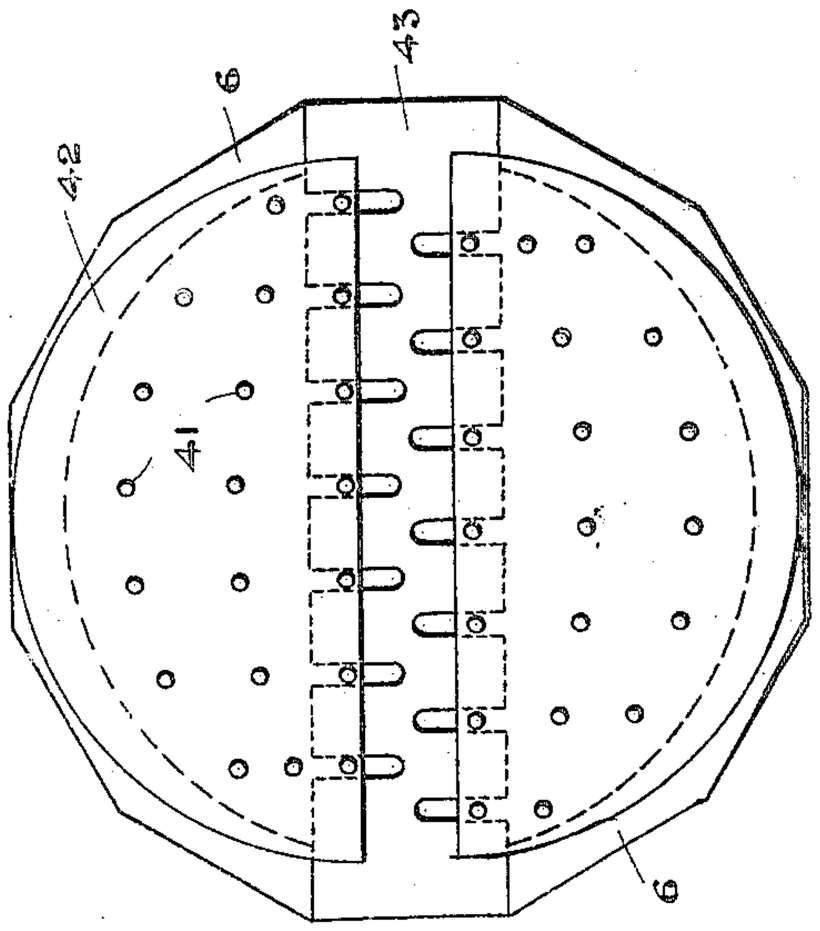

FIG. VII.

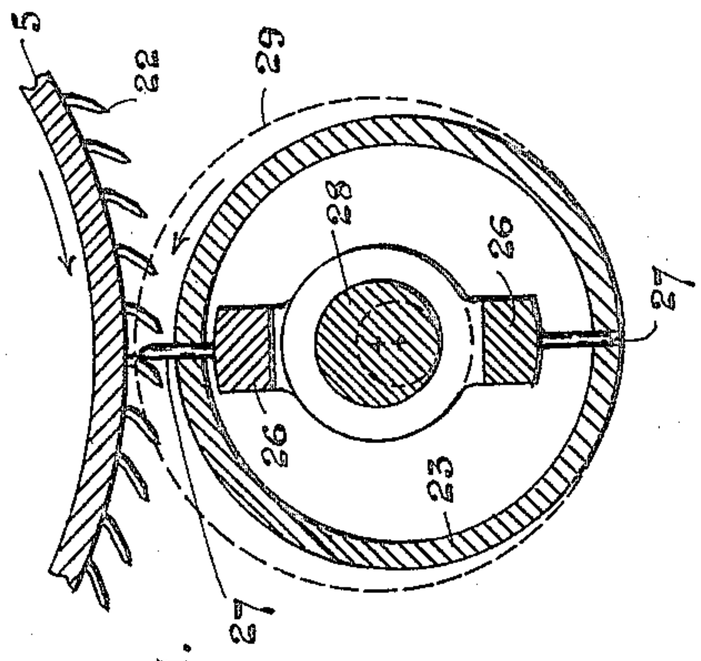

FIG. VI.

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No. 817,880. PATENTED APR. 17, 1906.

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APPLICATION FILED JULY 11, 1904.

8 SHEETS—SHEET 8.

Fig. XII.

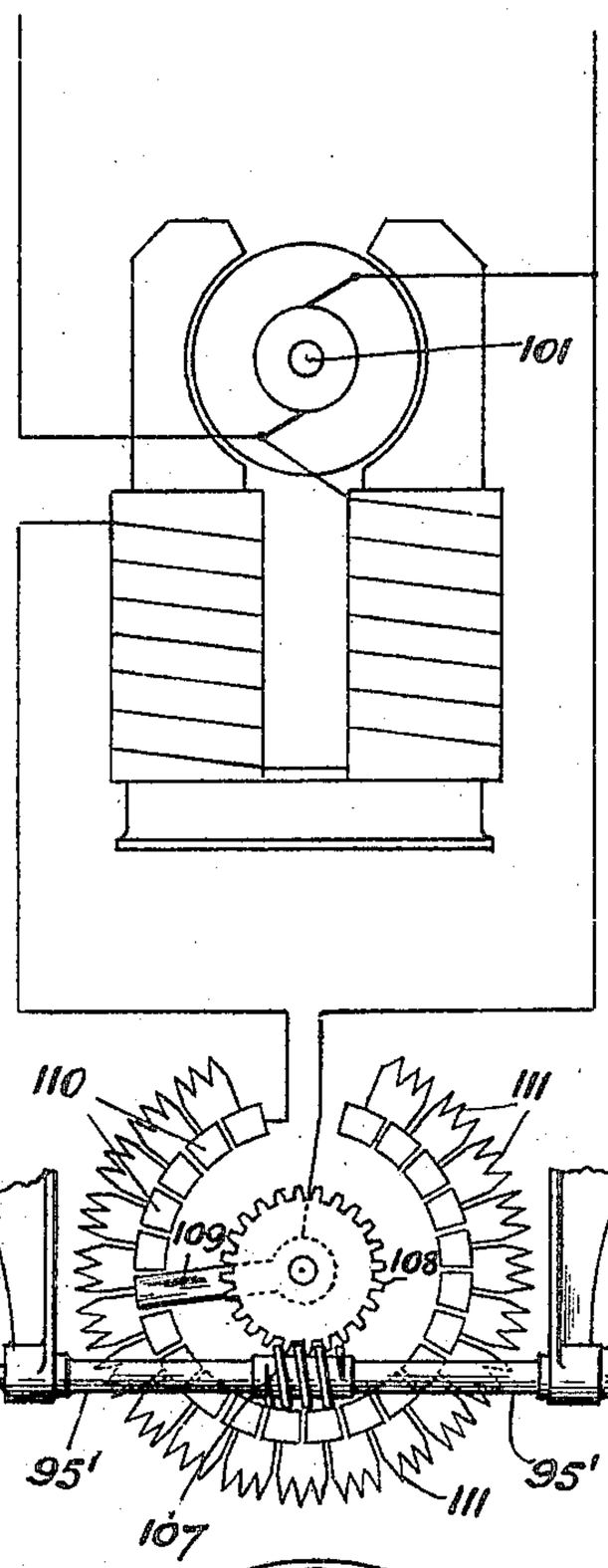
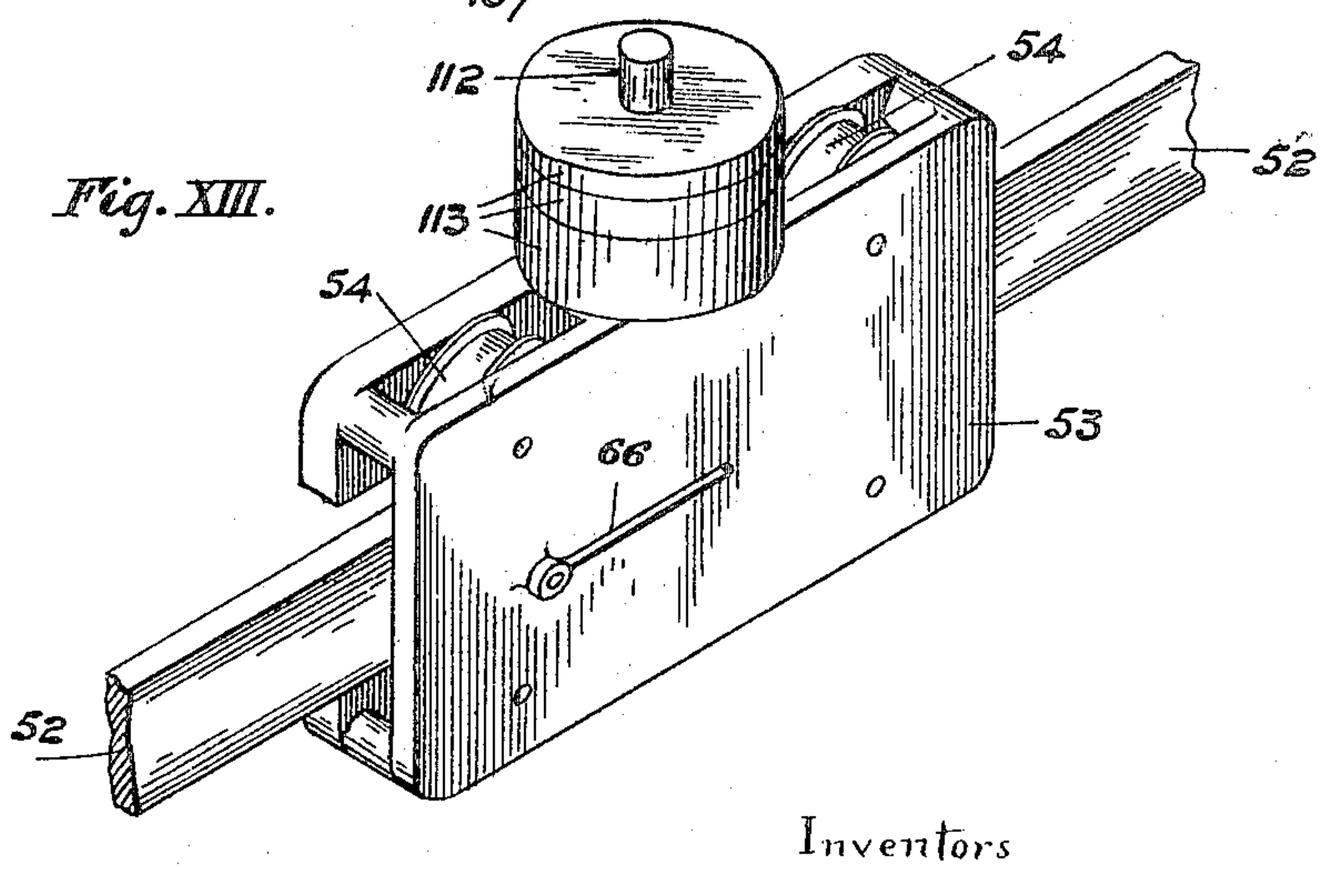


Fig. XIII.



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UNITED STATES PATENT OFFICE.

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AUTOMATICALLY-REGULATED FEEDING APPARATUS FOR CIGARETTE-MAKING MACHINES.

No. 817,880. Specification of Letters Patent. Patented April 17, 1906.

Application filed July 11, 1904. Serial No. 216,131.

To all whom it may concern:

Be it known that we, ROBERT ALEXANDER SLOAN and JOHN EDWARD LLOYD BARNES, residing in Liverpool, in the county of Lancaster, and PERCY OGDEN, residing in Bristol, England, subjects of the King of Great Britain, have invented certain new and useful Improvements in Automatically-Regulated Tobacco-Feeding Apparatus for Cigarette-Making Machines, of which the following is a specification.

Continuous cigarette-making machines are usually fed with tobacco by an attendant who spreads the prepared tobacco in a comparatively thin layer upon a traveling feed-apron. In order to determine the weight of the cigarettes—that is to say, the number to the pound—the tobacco has to be spread in small weighed quantities as uniformly as possible over measured areas of the feed-apron, and the operation has to be effected with skill and care if a good product is to be obtained and serious loss to the manufacturer from overweight avoided.

Our invention has reference to automatic apparatus intended to obviate the necessity of this skilled attendance, the manual work being reduced to setting an adjustment to the particular weight of cigarette desired and charging a hopper in bulk at comparatively long intervals, an operation calling for no particular care. The operation of the apparatus is automatically controlled continually by a weighing process in such manner that the weight of the cigarettes cannot deviate materially from that predetermined in setting the adjustment.

We have illustrated our invention in the accompanying drawings, in which Figures I and I[a] are side elevations of the upper and lower parts of the machine. Fig. II is a plan. Figs. III and IV are end elevations. Figs. V and VI are fragmentary sectional views to enlarged scales, being taken respectively on the lines A A of Fig. II and B B of Fig. V. Fig. VII is a plan of the central part of Fig. V. Figs. VIII, IX, and X show details of the slider 58; and Fig. XI is an elevation of the worm-driving gear for the collecting-drums. Fig. XII shows a method of regulating the action when an electromotor is used to drive the apparatus, and Fig. XIII shows a modification in the running-weight 53.

In Fig. I the upper part of the hopper and part of the feed-table are in section. In Fig. II the horizontal parts of the timber framing are removed for the sake of greater clearness, the outline, however, being indicated by dotted lines, and the hopper is in section on a plane just above the collecting-drums. In Fig. III, which is a view from the right of Figs. I and II, only the more proximate details are shown, this view being supplemented by Fig. IV, in which a part is a section on the line C C of Fig. II. Fig. IX is in section on the line D D of Fig. VIII.

Throughout the drawings the same parts are indicated by the same reference-figures.

1 is a hopper with an open flared top 2 for the reception of the properly prepared and conditioned tobacco. No particular care is required in charging the hopper; but as the object particularly aimed at in the operation of the apparatus is uniformity of output it is desirable that there should be no gross variations in the density of the charge, and to facilitate the charging and to prevent spilling of the tobacco we fit the feed-table 3, onto which the tobacco may be dumped and then passed into the hopper through the funnel-shaped opening 4.

5 represents a series of conical pegged drums (which we call "collecting-drums") arranged symmetrically with their axes radial, so as to floor the greater part of the horizontal section of the hopper. (See Figs. II, IV, and V.) Twelve are shown; but the number may be greater or less. As it is undesirable to carry these conical drums right to the center, they are truncated, the central area being occupied by the central frame 6. These drums are rotatably mounted and are all driven slowly in the same direction, (regarded from the outside of the hopper,) the method of carrying and driving them being as follows:

7 is a frame encircling the hopper and rigidly attached thereto. This frame is made sufficiently stiff to form a basis for all the working parts associated immediately with the hopper, the latter being made of light sheet metal, and therefore too flimsy to serve as such a basis.

8 represents a series of short vertical brackets bolted at regular intervals to the frame 7 and carrying the circular ball-race

frame 9, which also encircles the hopper and may be attached thereto.

10 (see Fig. IV) represents a series of spindles screwed at their inner ends into the center frame 6 and carried at their outer ends in holes in the brackets 8, being located by the lock-nuts shown. Their outer ends are squared for the application of a spanner. These spindles support the center frame 6, which is further steadied by the doffer-spindles, subsequently described.

11 represents tubes working freely on the spindle-stem, and to these are keyed the bevel-wheels 12 and the spiders 13, fixed within the drums 5.

The construction described applies to ten of these collecting-drums; but in the case of the remaining two—those on the center line A A of Fig. II—the construction is slightly different, for a reason which will be obvious as the description proceeds. Here there are no fixed spindles 10, the spiders being feathered to the cranked shafts 14 14′, to which the bevel-wheels 12 are also keyed. (See Fig. V.)

15 is a circular toothed ring carried on the circle of steel balls 16, running in the circular ball-race 9, so that the ring is adapted to rotate concentrically round the hopper. All the bevel-wheels 12, which are of uniform size, gear with this ring, so that motion being imparted to the shaft 14 from the worm-wheel 17, keyed thereon, the effect is to drive all the collecting-drums at the same rate and in the same direction, regarded from the outside of the hopper. The drive is transmitted to the worm-wheel 17 from the side shaft 18 through the screw-gearing 19 and worm-shaft 20. (See Figs. II and XI.) The shafts 18 and 20 are carried by the right-angled bracket 21, bolted to the frame 7.

The pegs 22 of the collecting-drums 5 are all raked sharply forward in the direction of their motion, Fig. VI, so that they are adapted to draw a layer of tobacco away from the bottom of the superincumbent mass in the hopper and carry it downward. The pegs of adjacent drums just sweep clear of each other, and as the adjacent drum-surfaces move in opposite directions the ascending side of each is adapted to remove any surplus tobacco from the descending side of the adjacent one and carry it back to the mass in the hopper, so that "snatching" or carrying away of irregular quantities is prevented. The drums being arranged circularly they form an endless series, and the action is thus uniform throughout, a very important point.

23 (see Figs. IV, V, and VI) represents a series of "doffing-cylinders," one for each of the drums 5, their function being to strip the tobacco from the lower side of the latter. These cylinders are rotatably mounted on the doffer-spindles 24, which are firmly fixed to the lower ends of the brackets 8 and to the center frame 6 by the nuts shown, the actual bearing-surfaces being formed by the tapped cones 25, screwed on the spindles.

Each doffing-cylinder is provided with a pair of doffing-combs 26, the prongs 27 of which pass through holes in the cylinder and are arranged to sweep between the pegs 22 with their points just clear of the drum-bodies 5, Fig. VI, and their motion is in the same direction as that toward which the pegs point, as the tobacco is very easily drawn away from the pegs in this direction. The combs are journaled round the eccentric portions 28 of the spindles 24, the points of the prongs following the circular locus 29 and retreating within the cylinder-body when they reach the bottom, so that the tobacco being then quite free drops into the delivery-funnel 30 below. The spindles are feathered in the frame 6 to preserve the eccentricity in the right direction. Instead of these cylinders with eccentrically-guided combs plain pegged doffing-cylinders, or stiff cylindrical brushes revolving at high speed, so as to clear themselves by centrifugal action, might be used, but the arrangement shown is preferable, as the cylinders do not require to be driven so fast as to scatter the tobacco, although their peripheral speed is necessarily higher than that of the drums and their action is more positive and gentle on the tobacco.

The doffing-cylinders are articulated together, as in the case of the collecting-drums, by the beveled wheels 31, gearing into the common toothed ring 32, carried on the circle of balls 33, running in the ball-race 34, bolted to the center frame 6.

The drive is transmitted to one of the doffing-cylinders (see Fig. V) from the side shaft 18, through the pulley 35, belt 36, and pulley 37, and this drives all the other doffing-cylinders. As the space above the center frame 6 is not within the range of the collecting-drums we provide the following means to move the tobacco laterally from this space toward the drums.

38 represents a pair of frames exactly similar, journaled on the cranked ends of the shafts 14 14′ and with depending stems 39, forked over the fixed guide-pin 40. (See Figs. IV and V.) In the latter figure the outline of the frame, which is in front of the plane of section, is indicated by dotted lines. The top of each frame is studded with stout sharpened prongs 41, projecting through holes in the semicircular covering-plates 42. These plates are adapted to slide over the top of the center frame 6 (which is of spherical form) and over the bridge-plate 43, being held down by the tension-springs 44. The arrangement causes the prongs to describe an oval path, as shown by the dotted lines in Fig. IV, the prongs projecting up into the tobacco when they are moving outwardly from the center and retreating within the thick-

ness of the covering-plates during the return movement. Each of the two sets of prongs commands about half of the central area, and their acting strokes occur simultaneously in opposite directions, so that their effect is to periodically shear the lowermost layer of the central mass of the tobacco outwardly toward the zone commanded by the collecting-drums.

The hopper is made of light sheet metal of prismoidal form near the collecting-drums, so as to conform with the bases thereof. The upper part, which is preferably detachable to facilitate access to the mechanism, is gradually worked into circular form at the mouth 2, being gradually contracted upwardly, so as to give a gradually-expanding area to facilitate the descent of the tobacco.

The delivery-funnel 30 is detachably secured surrounding the hopper below the doffers, and it tapers to the delivery-mouth below, the form of which depends upon the subsequent treatment of the tobacco in the cigarette-making machine to which it is delivered.

In the preferred form shown in the drawings the funnel-mouth is a long narrow rectangle, and it delivers the tobacco directly onto the traveling metallic tape 45 of the cigarette-making machine, being ready for immediate consolidation and inclosure in the paper wrapper.

Where it is preferred to retain the ordinary disintegrating mechanism of existing hand-fed cigarette-machines, the funnel may deliver onto the traveling feed-apron, the funnel-mouth being in that case much larger and nearly as wide as the apron.

The action of the apparatus described is gentle on the tobacco, as the process is throughout one of drawing rather than tearing or disintegrating, so that comparatively little "shorts" are produced, and the tobacco is delivered in a filamentary shower in a very equable manner, as the shower is made up of numerous independent small components.

The exact rate of delivery cannot, however, be assigned for a given speed, as it is affected by the condition and quantity of the tobacco in the hopper and probably by other unassignable influences. Hence it is not sufficient to determine the rate of feed by merely assigning a definite velocity ratio between the apparatus and the cigarette-making machine in accordance with the weight of the cigarette desired. This velocity ratio requires to be continuously and automatically controlled by the weight rate of the feed itself, so as to maintain a continuous agreement between the rate of feed and the demand of the cigarette-making machine in producing cigarettes of the assigned weight. In effecting this regulation we apply a weighing process, not to the feed delivered, but to the tobacco remaining in the hopper. It is obvious that the rate at which this latter weight diminishes is the same as that at which the feed is delivered, and it is much more convenient to deal with the former than the latter.

The apparatus already described, which it will be noted constitutes with the hopper a self-contained whole, is slung by the brackets 46 from the knife-edges 47 on the forked ends of the counterpoised weigh-beam 48, which in turn is hung by its knife-edges 49 from the brackets 50, bolted to the timber framework 51.

52 is a steelyard rigidly fixed to the weigh-beam, and it carries the running weight 53, mounted delicately on the wheels 54, so as to be traversable with minimum friction. The weights and leverages are so arranged that when the running weight is near the right-hand end of the steelyard, Fig. I, it counterpoises the apparatus with the hopper fully charged and when near the left-hand end it counterpoises the apparatus with the hopper empty.

55 is a rotatable feed-screw carried within the tube 56, fixed parallel to the steelyard in the brackets 57.

End play of the screw is prevented by a collar on the screw abutting against the end of the tube and a thrust-plate 106, (adjusted by screws, as shown,) abutting against the collar.

The tube 56 is slit all along (see Fig. IX) and carries the slider 58, adapted to slide freely thereon without rotation. The tongues 59 on the slider engage with the slot, and the pieces 60 press elastically on the top of the tube, being riveted to the ends of the spring 61, screwed to the center of the slider.

The nut is in the form of a narrow tongue 62, passing through the slot and threaded to engage with the screw 55. It is elastically mounted on the spring 63, riveted to the slider, and has a handle 64 integral with it, so that when the latter and the slider-handle 65 are grasped together the nut is disengaged and the slider can be freely slid to any position. The slider is freely linked with the running weight 53 by the light link 66. The feed-screw is driven from the main drive-shaft 67 by positive change-gearing consisting of the chain-drive 68, spur-pinion 69, and the spur-wheel 70, feathered to the screw. The pinion 69 is carried on the swing-arm 71, centered around the shaft 67 and held by the bolt 72, so that either or both of the spur-wheels can be readily changed without interfering with the chain-drive adjustment.

The main shaft 67 is driven by positive gear through the chain-wheel 73 from any one of the spindles of the cigarette-making machine, which keeps exact time with the cigarettes produced, and it will be seen that the running weight is therefore moved along the steelyard in exact conformity with the number of cigarettes produced and the

weight assigned to them by the adjustment of the change-gearing.

If the rate of feed is in exact conformity, the weight remaining in the hopper will similarly maintain exact conformity, and if the apparatus is started in poise it will remain in poise as the operation proceeds and the weight 53 is gradually moved along toward the zero end of the steelyard.

If the rate of feed exceeds the proper amount, the weight in the hopper will decrease too rapidly to maintain the equipoise and the weigh-beam end will descend. On the other hand, if the rate of feed falls below the proper amount the weight in the hopper will not decrease rapidly enough to maintain the equipoise and the weigh-beam end will float up. This rise and fall of the weigh-beam end is used to control the speed of the hopper mechanism by means of the following relay device:

74 is a triangular cam fixed on the feed-screw 55 and adapted to periodically deflect the pivoted lever 75 through a small angle, so operating the rod 76, articulated to it at one end. The other end of this rod is guided in the bracket 77 (see Figs. II and III) and is encircled by the compression-spring 78, pressing it normally toward the feed-screw. The end of the rod is bifurcated, terminating in the upper plunger 79 and the lower plunger 80. Opposite the ends of these plungers are a second pair 81 and 82, just far enough away to render the stroke of the first pair inoperative unless the short strut 83, which we call the "interposer," is interposed. The interposer is mounted on the end of the spring-arm 84, flexible horizontally, but stiff vertically, which is fixed to the weigh-beam at 85. It plays in the space between the plungers, and it is clear that when the weigh-beam end rises it causes the plunger 81 to be operated by the cam. When it descends, it causes the plunger 82 to be operated, and when in poise neither is operated. The sling 86 limits the play of the weigh-beam.

The plungers 81 and 82 are extended to the spring-arms 87 and 88, Fig. III, which guide them and press them normally toward the interposer, and they have pivoted to them, respectively, the pawls 89 and 90, adapted, respectively, to operate the double-acting ratchet-wheel 91 in opposite directions. These pawls are urged into engagement with the wheel by small springs, (not shown,) but are held normally out of engagement when at rest by reason of the pawl-stems 92 abutting against the stop 93 on the bracket 94. This is necessary in order that each may leave the action of the other unobstructed.

The ratchet-wheel is keyed to the screw 95, carrying the nut 96, which also forms the belt-fork 97, embracing the belt 98, which conveys motion from the driving-cone 99 on the main driving-shaft 67 to the following cone 100 on a secondary shaft 101, carried from the fixed timber framework. The nut 96 is prevented from rotating by the stem 104, Fig. IV, engaging with the slot 105.

The power is conveyed to the hopper mechanism by the shaft 102, connecting the shaft 101 to the side shaft 18 through the universal couplings 103. If these latter be accurately made and perfectly balanced, the shaft 102 can only convey to the hopper a pure torque and half its weight. The former cannot affect the weighing, and the latter is included in the counterpoise. The action of this part of the apparatus will now be clear.

The change-gear 69 and 70 having been set in accordance with the cigarette weight intended and the hopper charged, the slider 58 is moved along until the weigh-beam is in poise. If the tobacco is being delivered too fast—say to bear the proper ratio to the number of cigarettes produced—the equipoise cannot be maintained, the interposer will descend, the lower pawl will become operative, and the belt 98 will be gradually moved so as to drive from a smaller onto a larger diameter, so reducing the speed of the hopper mechanism, and consequently the rate of feed, until the equipoise is reëstablished. When this occurs, the speed-regulating mechanism ceases to act and only again comes into action in either direction, as may be required, when the equipoise is again disturbed. The speed-regulating device is made prompt, but sufficiently gradual, to prevent "hunting," and it will be seen that the arrangement, while purely automatic, is adapted to produce from a given weight of tobacco the exact number of cigarettes intended subject to very small limits of error and with practicably imperceptible variations in the weights of the individual cigarettes.

The speed-cones and crossed-belt arrangement shown are only to be taken by way of example of a well-known speed-varying mechanism, as any other of the well-known devices of this class might be substituted for it.

Where it is preferred to drive the apparatus directly by an electromotor, the speed is controlled by switching resistance into or out of the motor-circuit. This may conveniently be done by using the ratchet-wheel 91 to operate a rotary rheostat in the motor-circuit. This arrangement is illustrated diagrammatically in Fig. XII. The spindle 95′ of the ratchet-wheel 91 carries the worm-screw 107, which drives the worm-wheel 108, which in turn rotates the conducting-arm 109 (from which it is insulated) of the rheostat. The latter is of usual construction—that is to say, it comprises the series of contact-pieces 110, over which the arm 109 slides with electric contact and which are connected to the resistance-coils 111. The diagram shows the regulation as applied to

the field-circuit of a shunt-wound motor. The field-wire enters the rheostat by the arm 109 and leaves by one of the end contact-pieces 110. It will be seen that as the arm 109 rotates contra-clockwise the effect is to weaken the field, and so accelerate the motor, and vice versa.

The motor may be attached to the hopper; but as it is desirable to keep down the weight on the knife-edges we prefer to attach the motor to the fixed framework and convey the power, as in the drawings, through universal couplings. The motor-spindle may take the place of the shaft 101, the speed-cones being of course dispensed with.

Instead of making the adjustment for the cigarette weight by varying the change-gear 69 70, as described, it will be seen that the same result may be obtained by keeping the gear ratio fixed and varying the weight of the running weight 53 proportionally to the cigarette weight desired. In this case the running weight is made suitable for the lightest cigarette weight intended, and provision is made on it for the ready attachment of supplemental weights as required. This is shown in Fig. XIII. 112 is a stem fixed to the weight 53, and 113 represents perforated supplemental weights which can be readily slipped over the stem as may be required.

It is clear from the description that the device for delivering the tobacco may be varied without departing from the regulating means and that any suitable well-known device for distributing or disintegrating tobacco for cigarette-making machines might be substituted, the essential conditions being that it should be slung from the weigh-beam knife-edges and energized in such manner as not to affect the weighing.

Having now fully described our invention, we declare that what we claim, and desire to secure by Letters Patent, is—

1. In tobacco-feeding apparatus for cigarette-machines, in combination; a movable hopper adapted to contain a supply of tobacco the weight of which tobacco tends to move the hopper in the one direction; a counterbalance tending to move the hopper in the opposite direction with a counterbalancing effect which diminishes in accordance with the rate at which it is desired the tobacco should be fed from the hopper to the machine; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine; and a variable-speed feed-mechanism driving device, controlled by the movement of the hopper; substantially as described.

2. In tobacco-feeding apparatus for cigarette-machines, in combination; a hopper adapted to contain a supply of tobacco and connected to one end of a weigh-beam; a counterbalance connected to the other end of the weigh-beam the counterbalancing effect of which diminishes in accordance with the rate at which it is desired the tobacco should be fed from the hopper to the machine; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine; and a variable-speed feed-mechanism driving device, controlled by the movement of the weigh-beam; substantially as described.

3. In tobacco-feeding apparatus for cigarette-machines, in combination; a hopper adapted to contain a supply of tobacco, attached to one end of a weigh-beam; a counterbalancing-weight moved along the weigh-beam by gearing connected to the driving-shaft of the cigarette-machine; the cigarette-machine driving-shaft; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine; and a variable-speed feed-mechanism driving device, controlled by the movement of the weigh-beam; substantially as described.

4. In tobacco-feeding apparatus for cigarette-machines, in combination; a hopper adapted to contain a supply of tobacco and carried from one end of a weigh-beam; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine, carried by the said hopper; a counterbalancing-weight moved along the weigh-beam by gearing connected to the driving-shaft of the cigarette-machine; the cigarette-machine driving-shaft; and a variable-speed feed-mechanism driving device, controlled by the movement of the weigh-beam; substantially as described.

5. In tobacco-feeding apparatus for cigarette-machines, in combination; a hopper adapted to contain a supply of tobacco and carried from one end of a weigh-beam; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine, carried by the said hopper; a counterbalancing-weight moved along the weigh-beam by gearing connected to the driving-shaft of the cigarette-machine; the cigarette-machine driving-shaft; and a variable-speed feed-mechanism driving device controlled by the movement of the weigh-beam and provided with flexible means adapted to convey power to the feeding mechanism but incapable of transmitting any turning moment to the weigh-beam; substantially as described.

6. In tobacco-feeding apparatus for cigarette-machines, in combination; a hopper adapted to contain a supply of tobacco and carried from one end of a weigh-beam; a feeding mechanism for transferring the tobacco from the hopper to the cigarette-machine, carried by the said hopper; a counterbalancing-weight moved along the weigh-beam by gearing connected to the driving-shaft of the cigarette-machine; the cigarette-machine driving-shaft; and a variable-speed feed-mechanism driving device comprising a

ratchet-wheel the angular position of which determines the speed; a pair of pawls, a reciprocating piece, an interposer connected to the weigh-beam and flexible means adapted to convey the power to the feeding mechanism but incapable of transmitting any turning moment to the weigh-beam; substantially as described.

7. In tobacco-feeding apparatus for cigarette-machines, in combination: a hopper; a series of rotating conical pegged drums radially arranged at the bottom of the hopper, a series of rotating doffers, and means for driving the drums and doffers; substantially as described.

8. In tobacco-feeding apparatus for cigarette-machines, in combination: a hopper, a series of rotating conical pegged drums radially arranged in an annulus at the bottom of the hopper, a series of rotating doffers, the reciprocating prongs and sliding plates at the center of the hopper, and means for driving the drums, doffers and prongs; substantially as described.

9. In tobacco-feeding apparatus for cigarette-machines, in combination: the hopper, the conical pegged drums and the rotating doffers comprising a rotating cylinder provided with combs protruding through holes in the cylinder and journaled eccentrically relatively to the cylinder-journals, and means for driving the drums and doffers; substantially as described.

10. In tobacco-feeding apparatus for cigarette-machines, in combination: the hopper, the conical pegged drums, the rotating doffers and the means for moving the tobacco laterally from the central space within the pegged conical drums comprising two crank-driven frames each carrying a series of prongs which describe an elliptical path, two sliding plates provided with holes to take the said prongs through which holes the prongs protrude on the outstroke and in which they are housed on the return stroke, and means for driving the drums, doffers and prongs; substantially as described.

11. In tobacco-feeding apparatus for cigarette-machines, in combination; the hopper, the pegged conical drums arranged radially, a series of gear-wheels, one on each drum, one of which is driven, and a common gear-wheel meshing with each of the said drum gear-wheels; substantially as described.

12. In tobacco-feeding apparatus for cigarette-machines, in combination; the hopper, the pegged conical drums, the means for driving the drums, the rotating doffers arranged radially, a gear-wheel on each doffer, one of which is driven, and a common gear-wheel meshing with each of said doffer gear-wheels; substantially as described.

13. In tobacco-feeding apparatus for cigarette-machines, in combination; the weigh-beam, the hopper and the feeding mechanism, attached to one end of the weigh-beam, a counterbalancing-weight moved along the weigh-beam by gearing connected to the cigarette-machine driving-shaft, the cigarette-machine driving-shaft, and the means for driving and controlling the speed of the feeding mechanism comprising a shaft driven at a constant speed, a shaft connected to the feeding mechanism by a universal coupling adapted to transmit the torque to the feeding mechanism but incapable of transmittting any turning moment to the weigh-beam, a speed-varying gear interposed between the said shafts and means for operating the said gear controlled by the movement of the weigh-beam; substantially as described.

14. In tobacco-feeding apparatus for cigarette-machines, in combination; the weigh-beam, the hopper and the feeding mechanism, attached to one end of the weigh-beam, a counterbalancing-weight moved along the weigh-beam by gearing connected to the cigarette-machine driving-shaft, the cigarette-machine driving-shaft, and the means for driving and controlling the speed of the feeding mechanism comprising a shaft driven at a constant speed, a shaft connected to the feeding mechanism by a universal coupling adapted to transmit the torque to the feeding mechanism but incapable of transmitting any turning moment to the weigh-beam; a cone-pulley on each of the said shafts, a movable driving connection between the said pulleys, a guide adapted to move said driving connection, and means controlled by the weigh-beam for operating the said guide; substantially as described.

15. In tobacco-feeding apparatus for cigarette-machines, in combination; the weigh-beam, the hopper and feeding mechanism attached to one end of the weigh-beam, the counterbalance moved along the weigh-beam by gearing from the cigarette-machine shaft, the cigarette-machine shaft, the means for driving and varying the speed of the feeding mechanism comprising the cone-pulleys, the belt, the belt-guide, the ratchet, the two pawls, the reciprocating piece, and the interposer connected to the weigh-beam; substantially as described.

16. In tobacco-feeding apparatus for cigarette-machines, in combination; the weigh-beam, the hopper and the feeding mechanism connected to one end of the weigh-beam, the variable-speed feeding-mechanism driving device, the driving-shaft of the cigarette-machine, a counterbalance moving along the weigh-beam and means for moving it comprising a screw driven from the driving-shaft of the cigarette-machine, and a nut adapted to engage the said screw and connected to the counterbalance; substantially as described.

17. In tobacco-feeding apparatus for cigarette-making machines; means for continu-

ously and automatically controlling the cigarette weight by regulating the speed and therefore the rate of delivery by the rate at which the weight in the distributing-hopper diminishes in relation to the rate at which the cigarettes are produced; substantially as described.

18. In tobacco-feeding apparatus for cigarette-making machines, means for controlling the cigarette weight, in which the tobacco-distributing device as a whole is slung on a counterpoised weigh-beam with a running weight traversed proportionately to the number of cigarettes produced; the distributing device being energized in such manner as not to affect the weighing; and the rise and fall of the weigh-beam end being used to control the speed and therefore the rate of delivery; substantially as described.

19. In tobacco-feeding apparatus for cigarette-making machines; in combination; a tobacco-distributing device slung as a whole from a counterpoised weigh-beam; means for energizing it without affecting the weighing; a steelyard attached to the weigh-beam; a running weight on the steelyard; means for traversing the weight along the steelyard proportionately to the number of cigarettes produced; a relay controlled by the rise and fall of the weigh-beam end; and a speed-varying mechanism operated by the said relay and controlling the rate of delivery; substantially as described.

20. In tobacco-feeding apparatus for cigarette-making machines; in combination; a tobacco-distributing device slung as a whole from a counterpoised weigh-beam; means for energizing it without affecting the weighing; a steelyard attached to the weigh-beam; a running weight on the steelyard; a feed-screw for traversing the weight along the steelyard; change-gear connecting the said screw to the cigarette-making machine; a relay controlled by the rise and fall of the weigh-beam end; and a speed-varying mechanism operated by the said relay and controlling the rate of delivery; substantially as described.

21. In tobacco-feeding apparatus for cigarette-making machines; a tobacco-distributing device consisting of a hopper and a series of conical pegged collecting-drums therein arranged in a circle so that each is adapted to clear surplus tobacco from one adjacent to it, and means for stripping the tobacco from the collecting-drums; substantially as described.

In witness whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ROBT. A. SLOAN.
J. E. LLOYD BARNES.
PERCY OGDEN.

Witnesses to the signatures of Robert Alexander Sloan and John Edward Lloyd Barnes:

JOSEPH E. HIRSH,
HENRY WILLIAMS.

Witnesses to the signature of Percy Ogden:

GERARD MOSELY,
PERCY HENRY MILLARD.