

Oct. 31, 1950

L. A. VON TILL ET AL

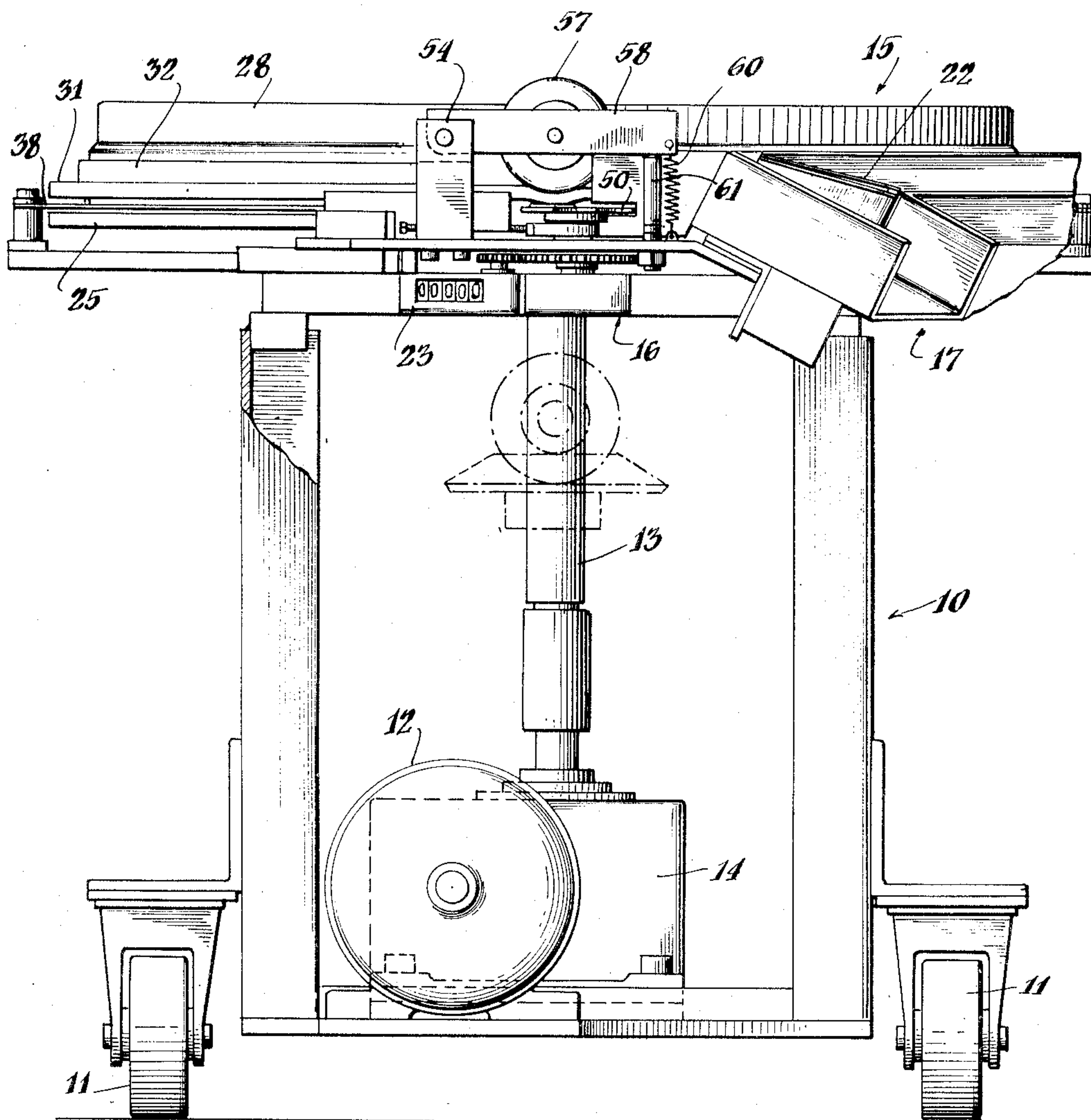
2,528,196

CAP COUNTING DEVICE FOR PACKAGING MACHINES

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6 Sheets-Sheet 1

Fig. 1.



INVENTORS
Louis A. von Till
 BY *Fred Schallenkammer*

Hirell and Kane

ATTORNEYS

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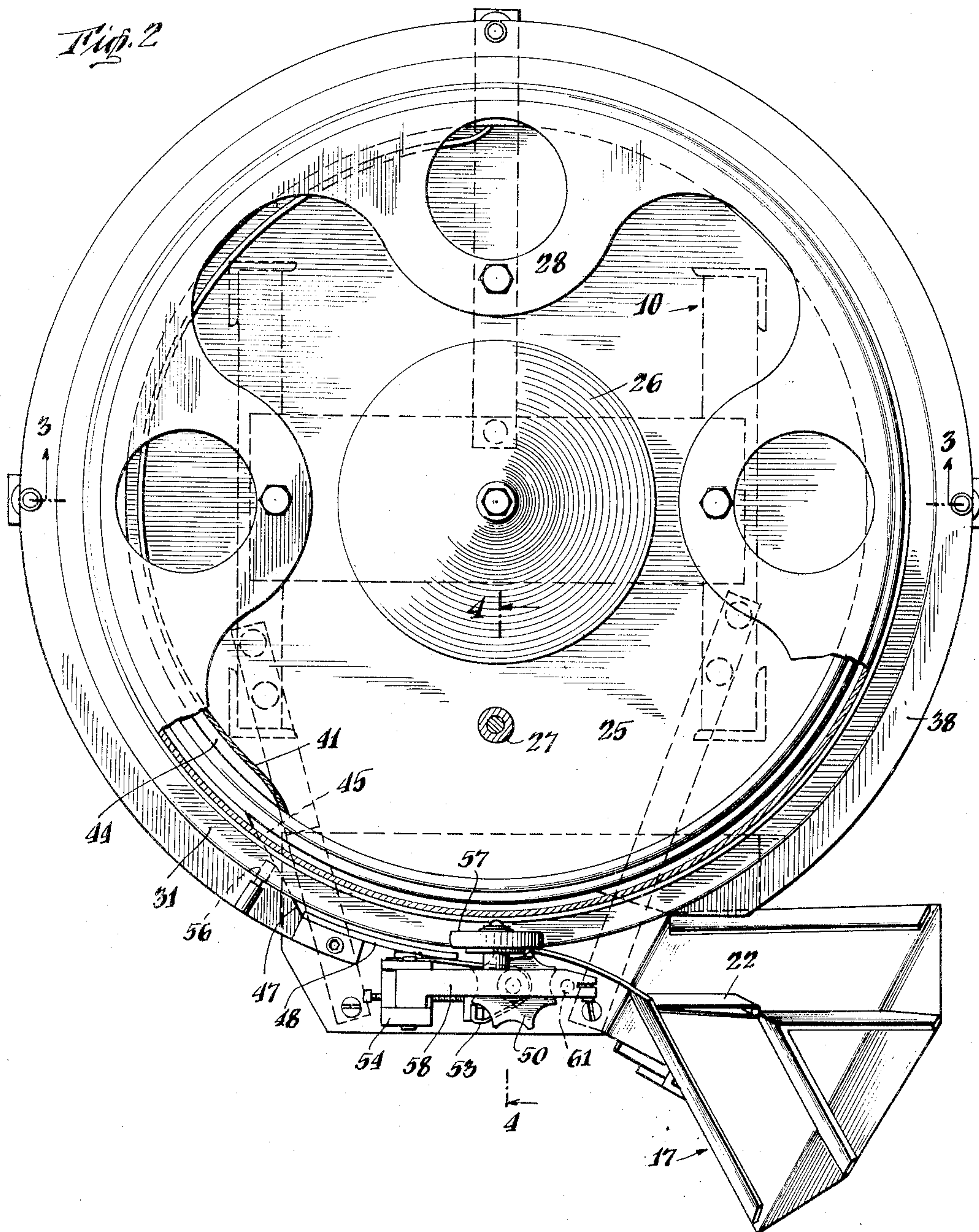
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6 Sheets-Sheet 2



INVENTORS
Louis A. von Till
BY *Fred Schallenhammer*

Quell and Kane

ATTORNEYS

Oct. 31, 1950

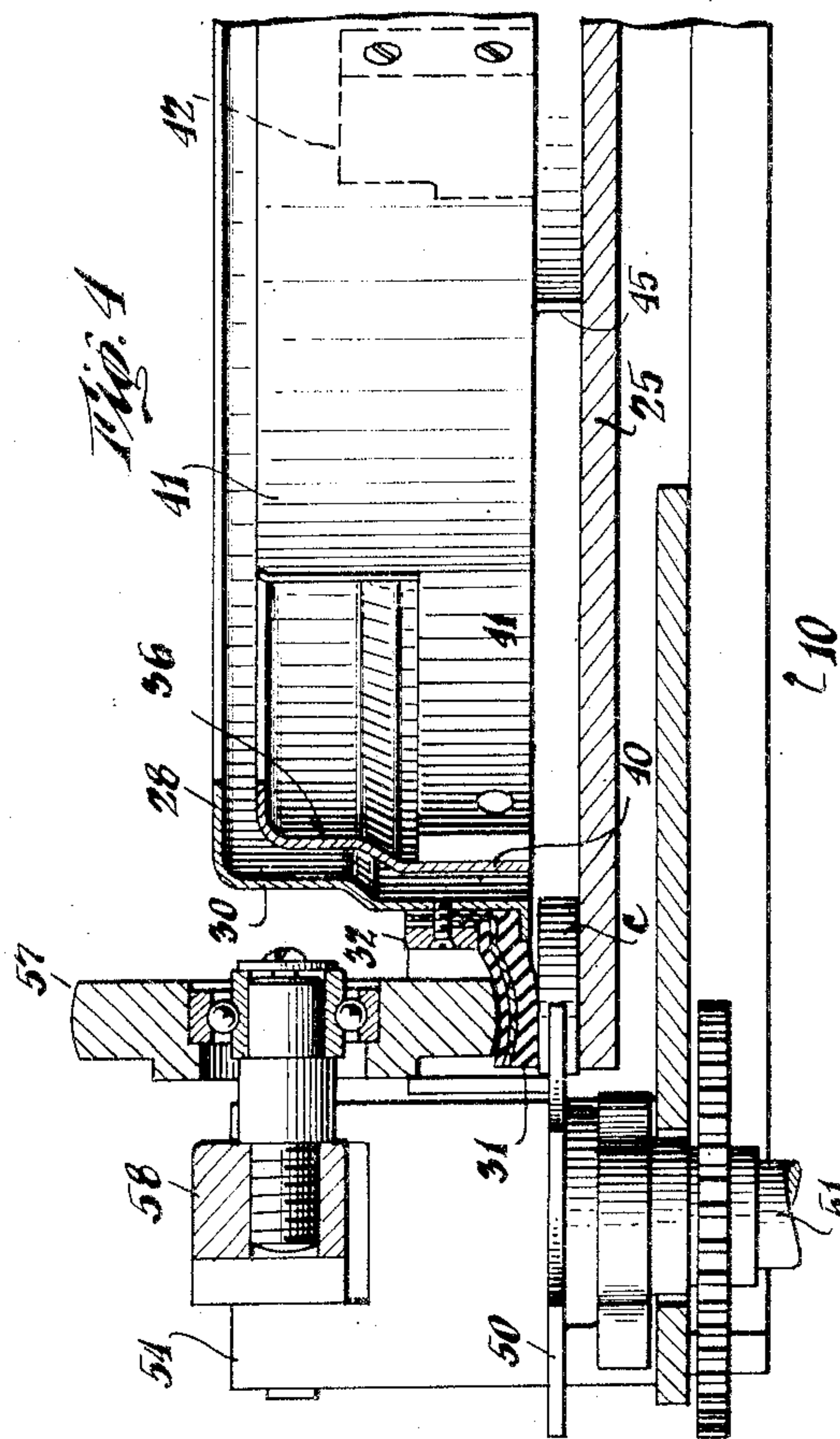
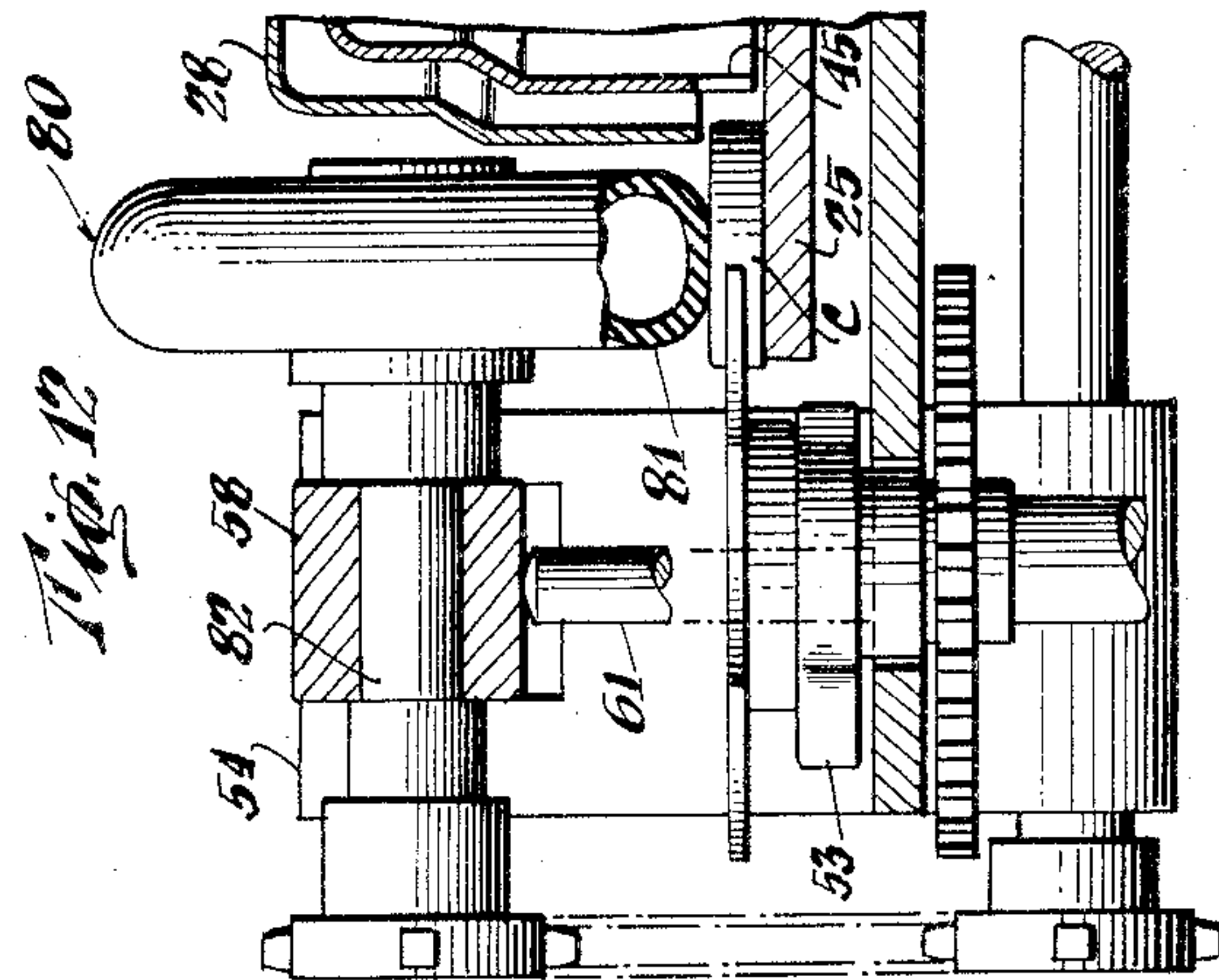
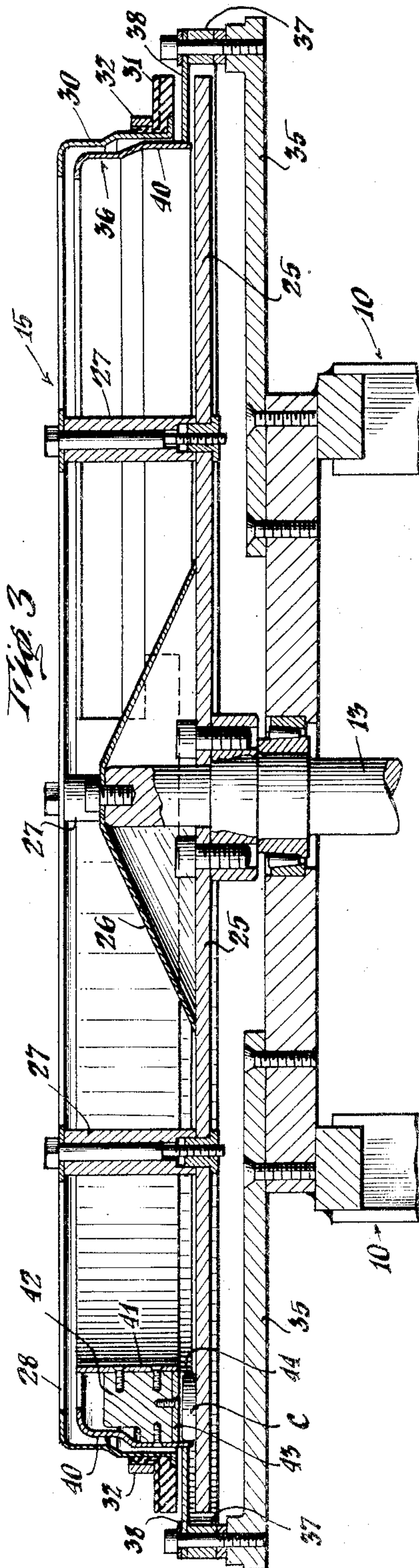
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6 Sheets-Sheet 3



INVENTORS
Louis A. von Till
Fred Schallenkammer
BY

Snell and Kane

ATTORNEYS

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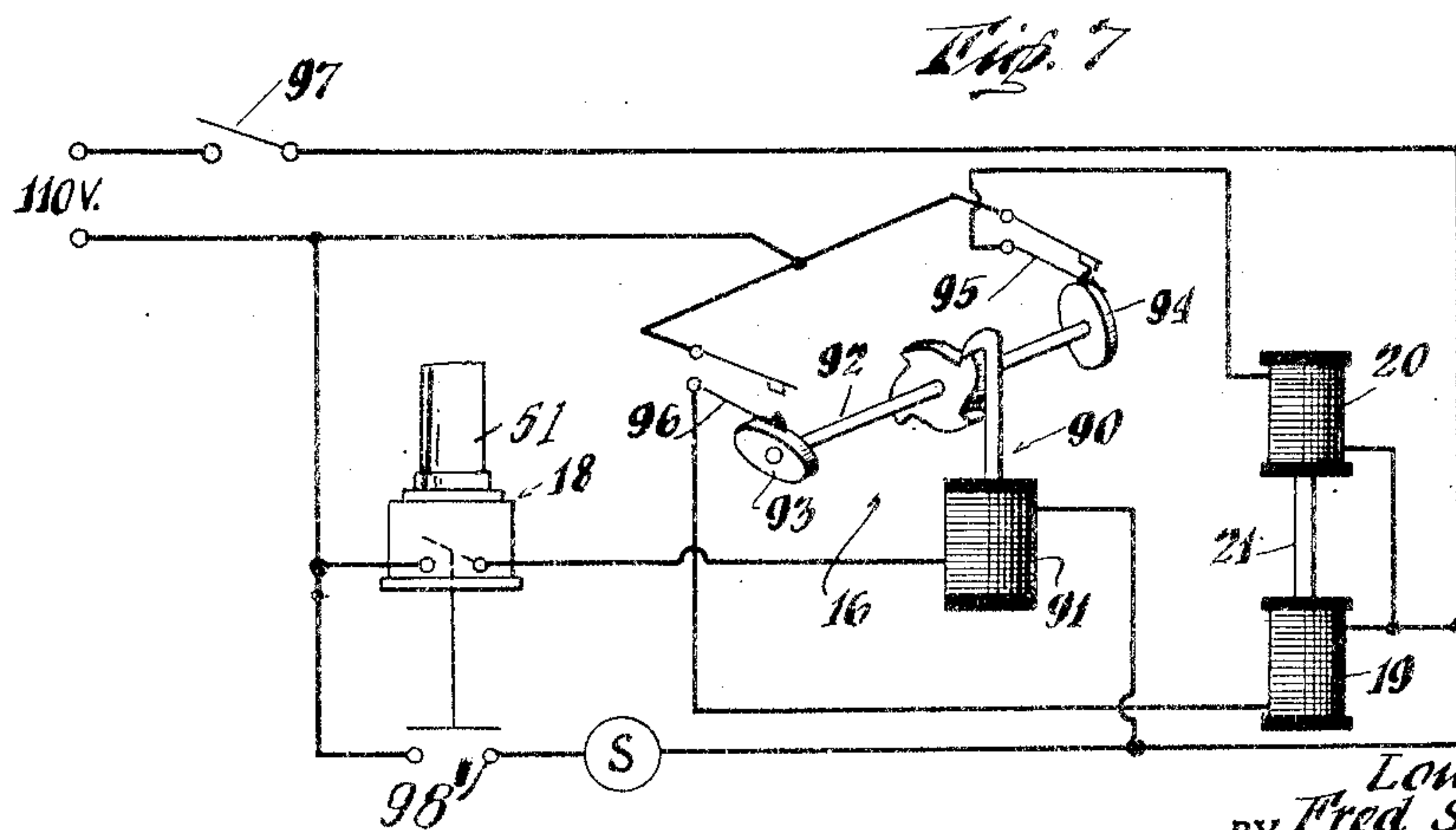
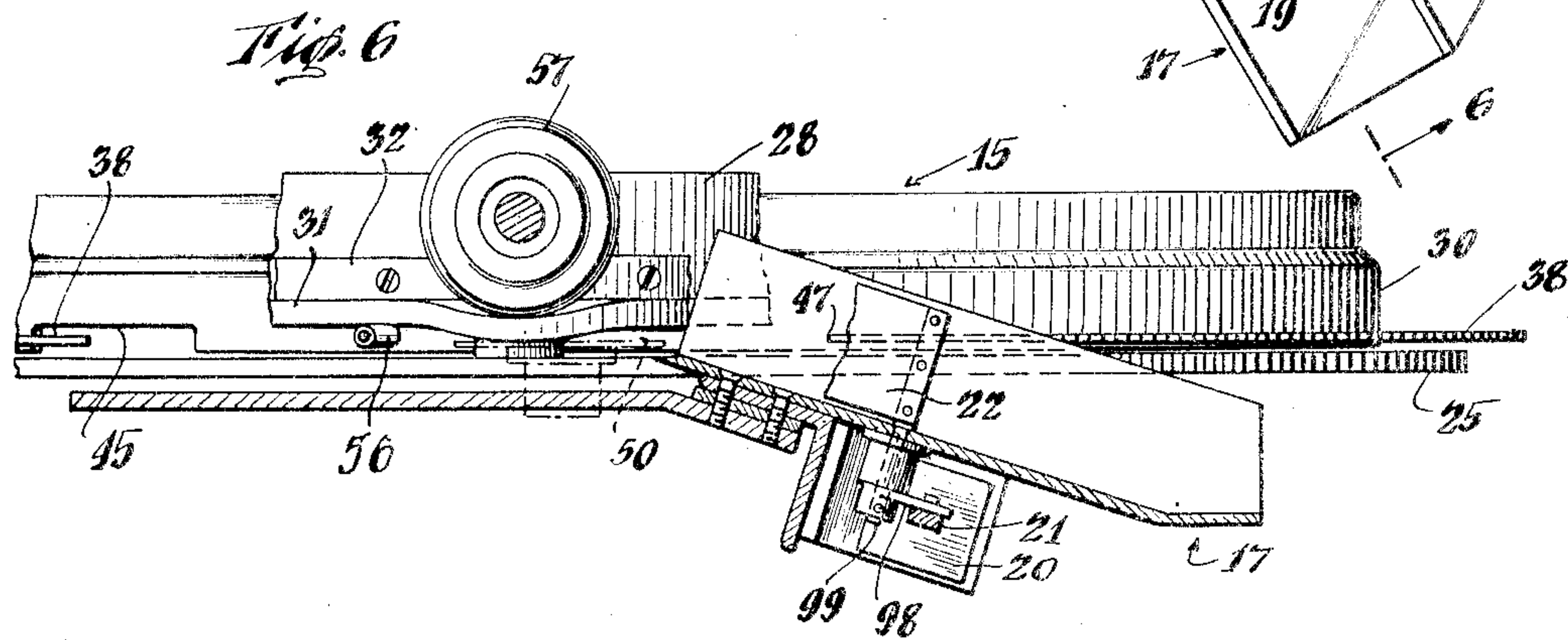
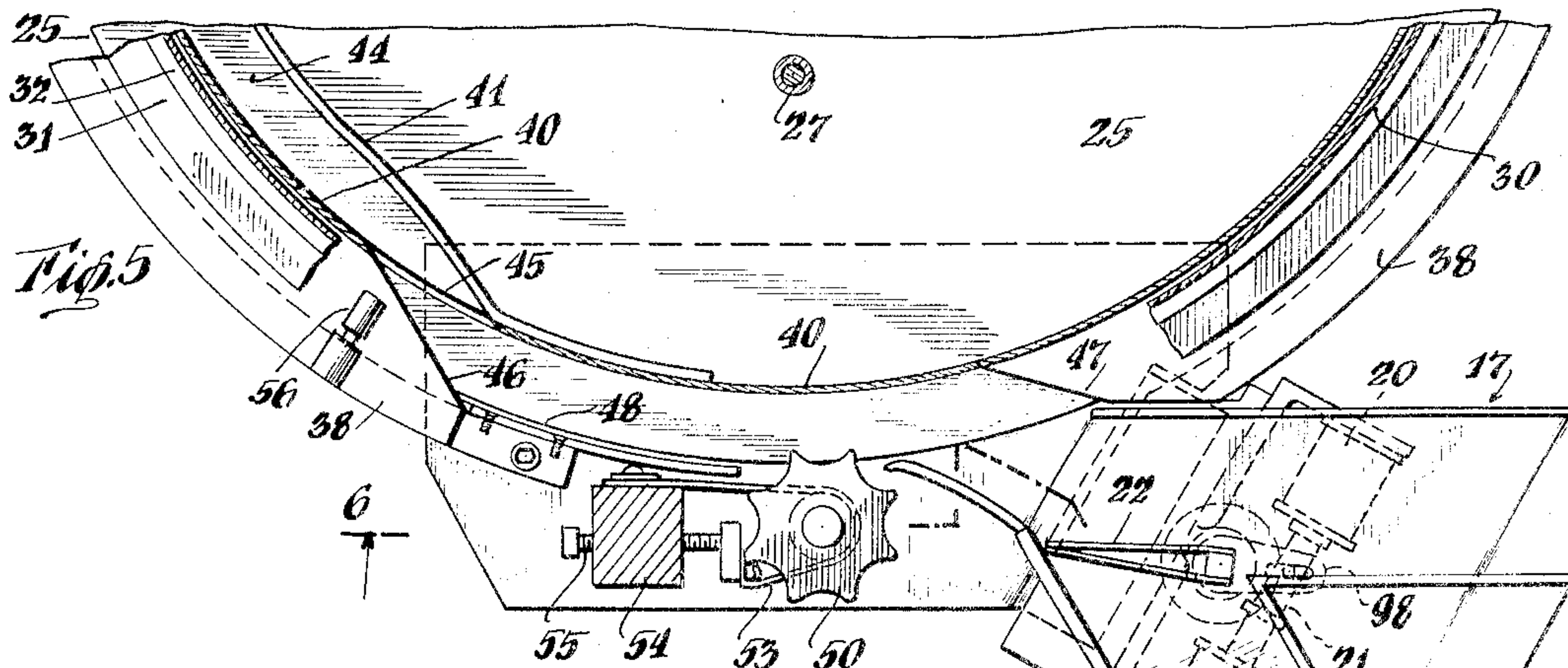
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6 Sheets-Sheet 4



INVENTORS
Louis A. von Till
 BY *Fred Schallenkammer*

Snell and Kane

ATTORNEYS

Oct. 31, 1950

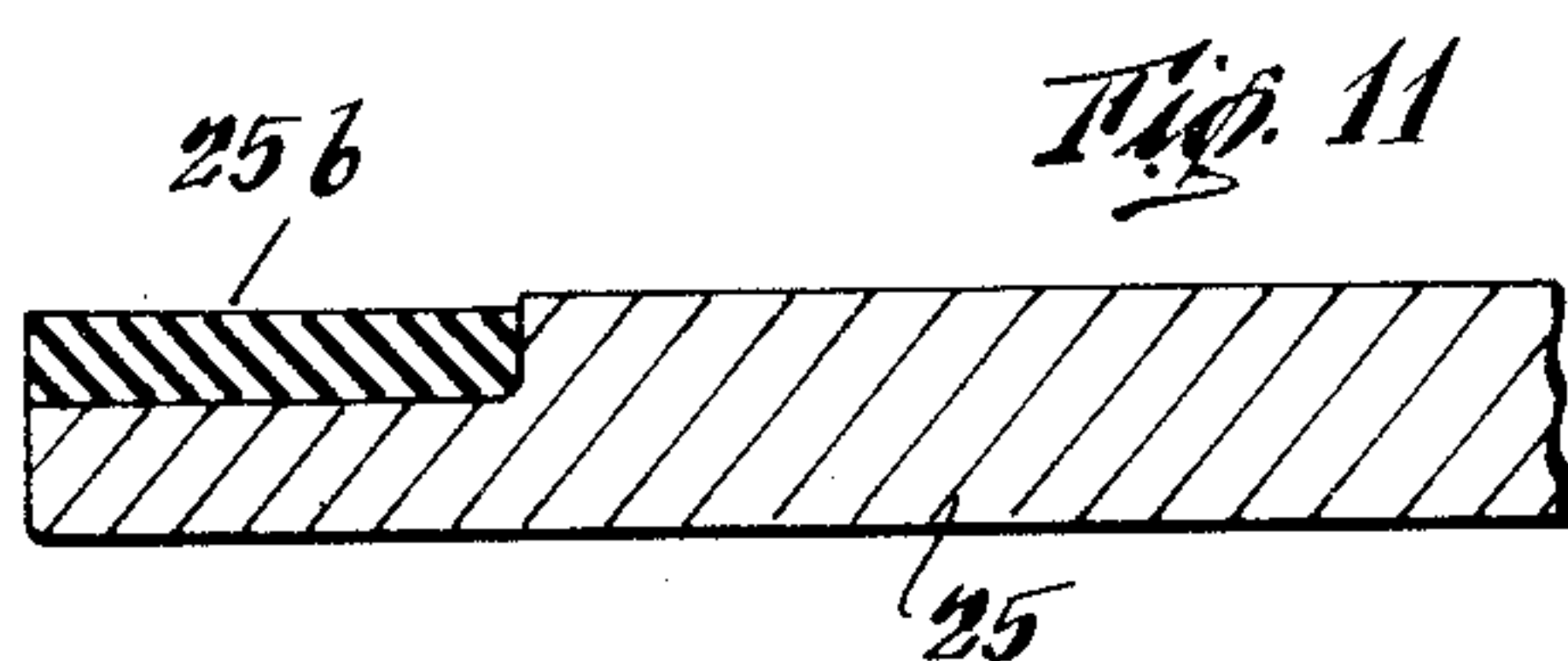
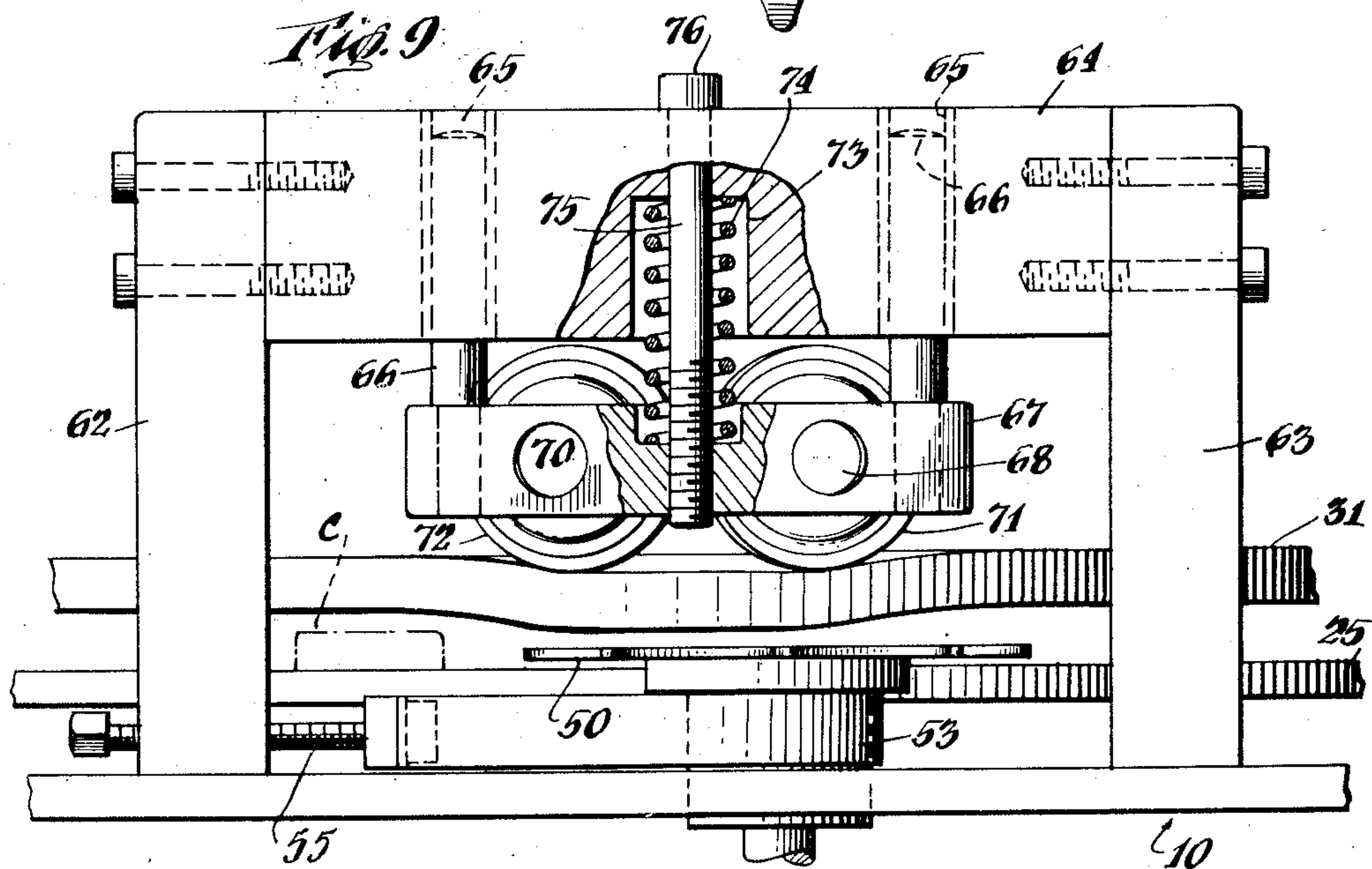
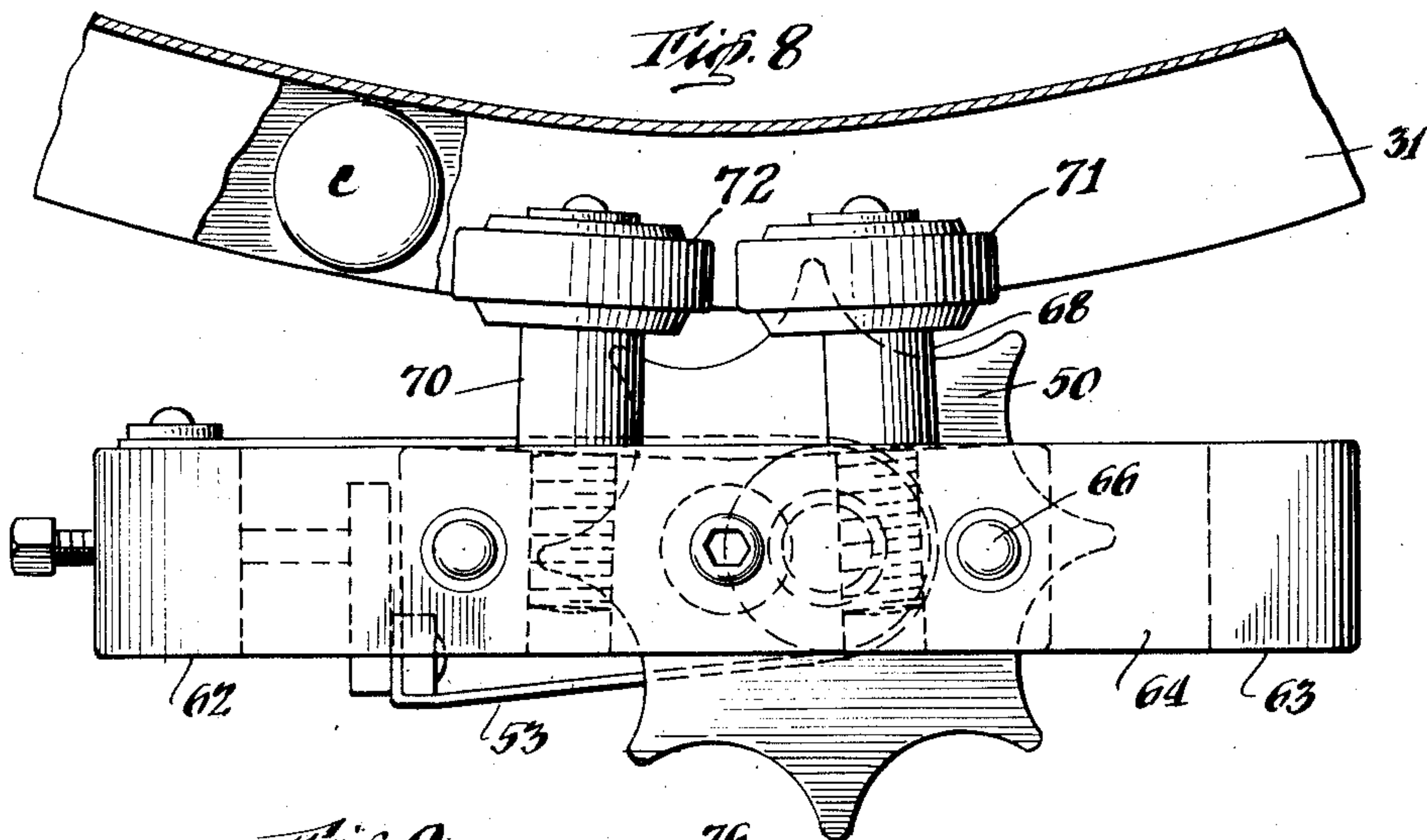
L. A. VON TILL ET AL

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CAP COUNTING DEVICE FOR PACKAGING MACHINES

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6 Sheets-Sheet 5



INVENTORS
Louis A. von Till
BY *Fred Schallenkammer*
Duell and Kane
ATTORNEYS

Oct. 31, 1950

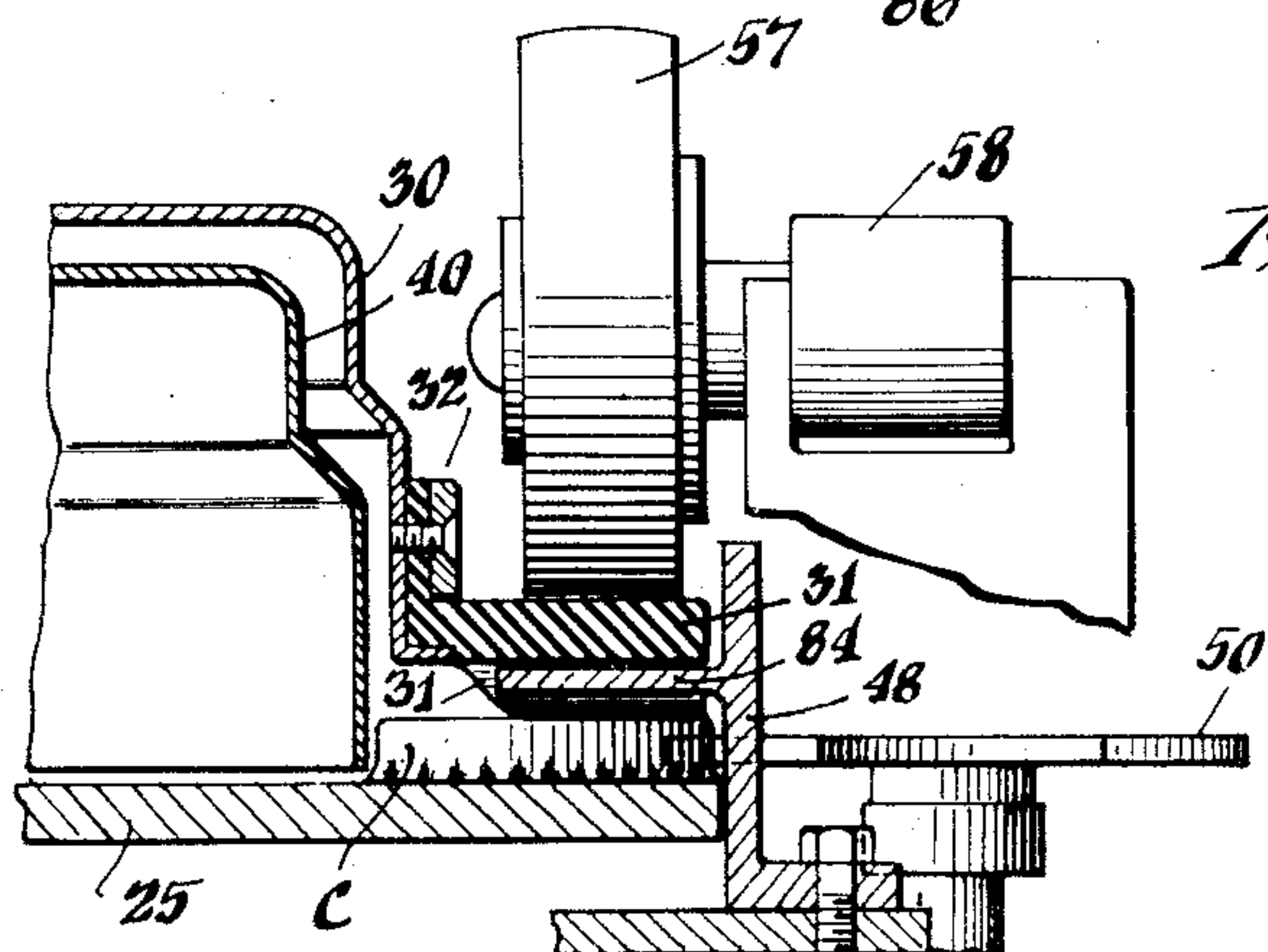
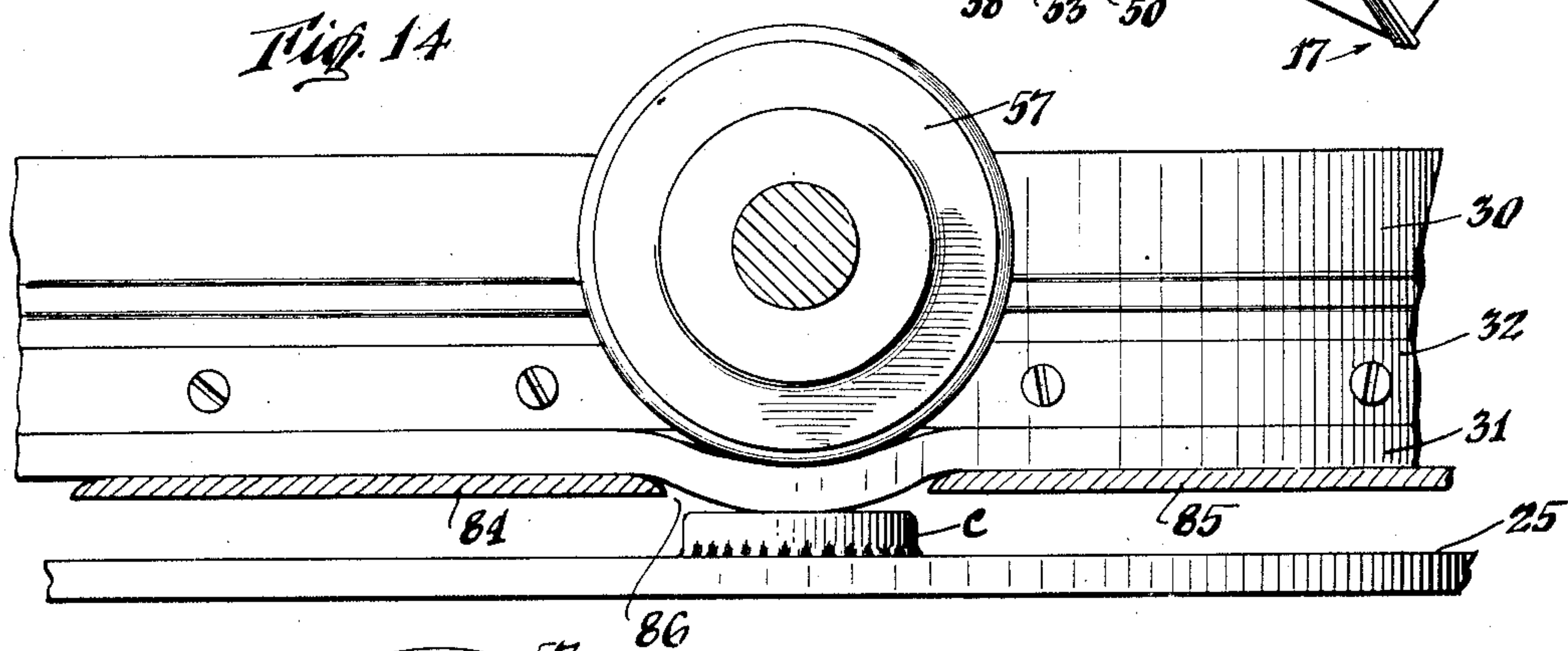
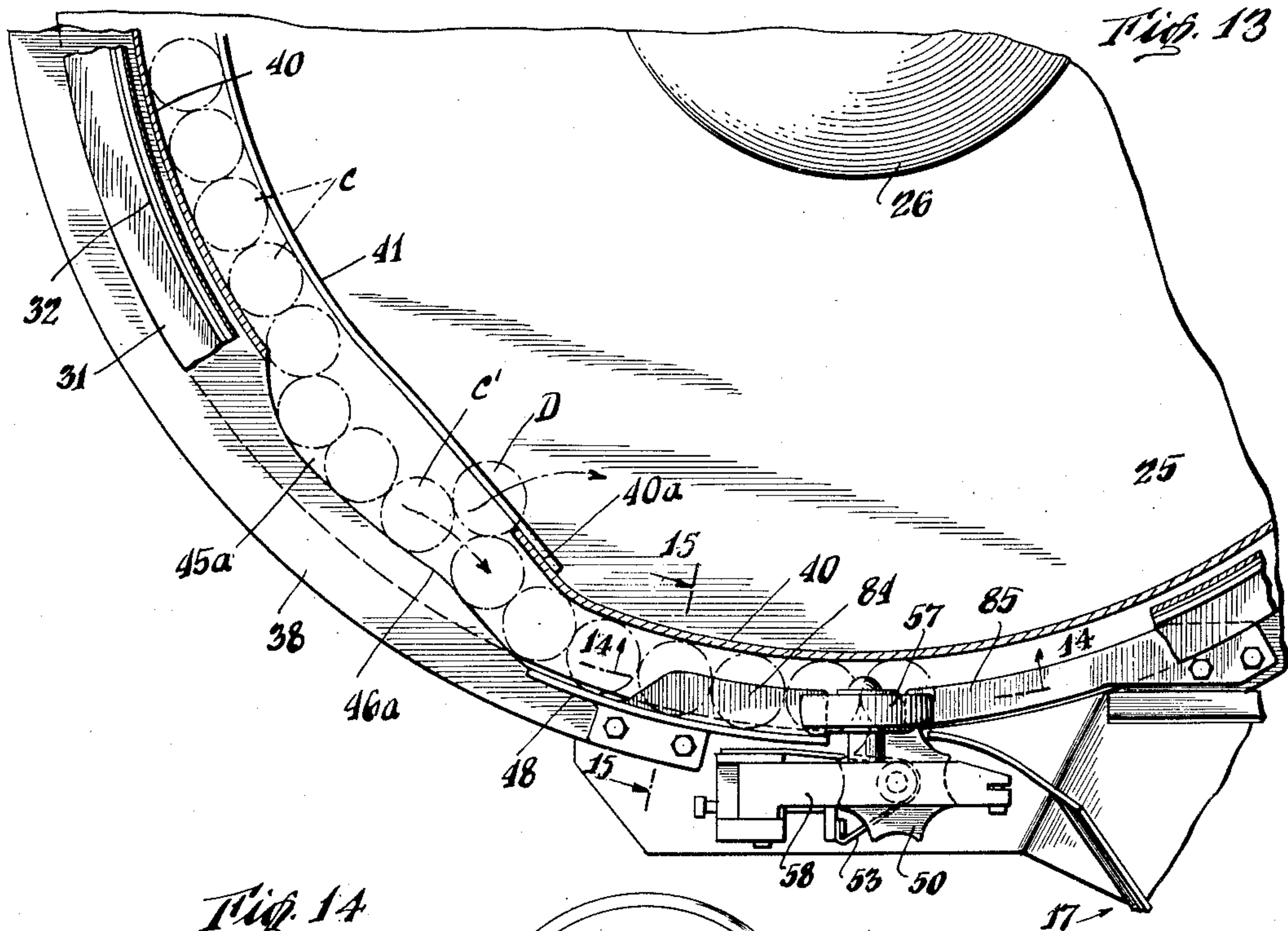
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CAP COUNTING DEVICE FOR PACKAGING MACHINES

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6 Sheets-Sheet 6



INVENTORS
Louis A. von Till
BY Fred Schallenkammer

Duell and Kane
ATTORNEYS

UNITED STATES PATENT OFFICE

2,528,196

CAP COUNTING DEVICE FOR PACKAGING MACHINES

Louis A. Von Till and Fred Schallenkammer,
Brooklyn, N. Y., assignors to Mundet Cork Corporation, North Bergen, N. J., a corporation of New York

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13 Claims. (Cl. 235—98)

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This invention relates to machines for receiving large volumes of articles such as bottle and container caps, or elements thereof, and for delivering said articles at high speed, to an assembling machine or to containers in which the devices are to be transported.

For example, the machine may be used as a hopper to receive indiscriminately deposited metallic crown caps, and to discharge said caps into the machine which affixes to the inner wall of said caps, the cork or composition liners with which crown caps are provided. Presently known hoppers are relatively complex, and deliver no more than 400 crowns per minute. By affixing a conventional helicoid separating chute to the discharge end of a machine constructed according to the present invention, an average of 1500 crowns per minute may be discharged; and the crowns may be delivered uniformly mouth up or mouth down, as preferred. It is to be understood that the helicoid separator is an accessory to, but is not a part of, the present invention.

A machine according to our invention may be used to count crown caps and the like at high speed and with maximum accuracy, and deliver a predetermined quantity of caps to a carton or other container, and then divert succeeding caps to a second container which is to be filled with a quantity of caps.

It is well known that the use of various weights of material used in making even the same types of caps, and the hygroscopic qualities of the cork, cardboard, and other inserts comprising an element thereof, make it impossible accurately to count such articles on the basis of weight. It has therefore been proposed to count such articles by causing them individually to actuate mechanical counting means or to interrupt a source of energy, such as a light beam, whereby through electronic means a counter or appropriate device is operated. Presently known mechanical counters are deficient for the reason, among others, that the sweepers, belts or other means for transporting the caps to and through the counting apparatus are complex and cumbersome, and unless precisely adjusted, may damage the finish or structure of the cap. To avoid damage to the articles being counted, and to reduce breakdowns and time losses resulting from faulty adjustment, the contemporary machines sacrifice speed of operation. Electronic machines are delicate and complex and require highly skilled maintenance personnel.

It is therefore an object of the invention to

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provide means for receiving a number of container caps or the like and to discharge said articles at high speed and for example in single file to a chute or container.

It is another object of the invention to provide means in which indiscriminately deposited articles such as crown caps or parts thereof are positively, and at a controlled rate, discharged from the machine.

It is a further object of the invention to provide means which prevent the clogging or jamming of the articles at the discharge portion of the machine, notwithstanding the high speed at which the articles are being discharged.

It is also an object of the invention to provide a cap handling machine which is capable of high speed operation without damage to the articles being handled thereby.

It is another object of the invention to provide a cap counting machine having improved means for positive propulsion of a cap through a mechanically actuated counter mechanism.

It is another object of the invention to provide a cap counting machine in which it is immaterial whether or not the caps pass through the machine with their skirt portions extending downwardly or upwardly.

It is still another object of the invention to provide a cap counting machine having improved means for engaging the cap for propulsion through a counter mechanism, said engagement means affording a high rate of operation without damage to the cap body or the surface finish thereof.

It is a still further object of the invention to provide a machine having improved means for counting caps or the like and for successively filling cartons with a predetermined number of units.

It is a still further object of the invention to provide a cap counting and handling machine which is simple and rugged in construction, capable of operation over long periods of time without mechanical failure, and which may be adjusted and serviced by workmen possessing ordinary mechanical skill.

Other features and advantages will be apparent from the following detailed description and reference to the accompanying drawings, in which:

Fig. 1 is a vertical elevation, partly in section, of one form of machine embodying the present invention;

Fig. 2 is a top plan view, a portion of the top structure being broken away to reveal underlying construction;

Fig. 3 is a view taken on lines 3—3 of Fig. 2;

Fig. 4 is a view taken on lines 4—4 of Fig. 2 and showing details of the resilient cap engagement means;

Fig. 5 is a top plan view of the machine with its cover plate removed and particularly showing construction at the discharge portion of the machine;

Fig. 6 is a view taken on lines 6—6 of Fig. 5;

Fig. 7 is a schematic wiring diagram for operation of the discharge gate means;

Figs. 8 and 9 are respectively a plan view and a partially sectional vertical elevation showing a second form of resilient cap engagement means;

Figs. 10 and 11 are vertical sectional elevations of other embodiments of the turntable construction;

Fig. 12 is a vertical section of another form of resilient cap engagement means;

Fig. 13 is a view similar to Fig. 5, showing another embodiment of the invention;

Fig. 14 is a view taken on lines 14—14 of Fig. 13; and

Fig. 15 is a view taken on lines 15—15 of Fig. 13.

Basic structure

A framework or chassis 10 is preferably mounted on casters 11 or the like, for portability. The unit is preferably completely self-contained, and therefore includes a motor 12 of suitable power, which may drive a shaft 13 through speed reduction means encased at 14. The framework supports the rotor or distributing means 15 receiving the crown caps, jar caps and the like to be counted, and for discharging them in succession for passage through the discharge control mechanism 16, whence they discharge into a two-branched chute 17, or to a helicoid separating chute (not shown). As illustrated, it is contemplated that beneath the respective branches of chute 17 may be placed cartons to be filled with a pre-determined quantity of caps. The mechanism 16 includes an automatic switch 18 (see Fig. 7) which at the end of a pre-determined run of caps energizes one of a pair of solenoids 19, 20 (see Fig. 5) coupled to the common armature linkage 21, to which is pivotally attached a swingable gate 22 controlling the passage of the counted caps into one or the other of the branches of the chute 17. An appropriate solenoid is energized after a carton placed beneath the one branch has received a pre-determined number of articles, whereupon the gate swings to close such branch and divert the caps into the other branch to deposit the articles in an empty carton placed therebeneath, all as later described.

There may also be associated with the device a totalizer 23 which totals either the number of caps passing through the counter during the operation thereof, or the number of cartons which have been filled during such operation, as desired. It is to be understood that the switch 18 and totalizer 23 are per se not our invention; we employ commercially available devices such as the counter-operated switch manufactured and sold under patents owned or controlled by Adde and Company of Portland, Maine, the Veeder-Root Company of Hartford, Connecticut, and others.

The cap distribution means

Referring now to Fig. 3, an extension of shaft 13 is suitably journaled in framework 10, and affixed to this shaft for rotation therewith is a circular turntable or rotor 25. The shaft also

mounts a distributing cone or the like, 20, the purpose of which is to cause caps or other devices to be counted to roll or slide toward the outer rim of the rotor. The rotor operates in a horizontal plane, and may comprise a flat or slightly crowned disk, or may have a bevelled edge 25a, as shown in Fig. 10. An alternative rotor construction is to provide a rubber or cushion insert 25b about the periphery, as is Fig. 11. The surface of this insert is preferably below the surface of the rotor as indicated. Such construction is advantageous for relatively frail articles, such as plastic caps.

The diameter and speed of rotation of the rotor 25 are selected according to the size and type of the objects being counted. When used with standard crown caps, which are approximately one and one-quarter inch in maximum diameter, a thirty inch diameter rotor, operating at forty-four R. P. M. gives excellent results. At such speed, the machine will satisfactorily handle and count more than 1,000 caps per minute; with a simple modification, later described, the speed of rotation may be increased to fifty-six R. P. M. and will count and discharge about twice that quantity, with negligible error.

Disposed about rotor 15 and affixed thereto are cylindrical posts or spacers 27 which fixedly support cover member 28. That cover therefore turns with the rotor. The cover is formed with a downwardly extending rim 30 to the lower margin of which is affixed a flexible flange 31. The flange extends outwardly in parallelism with the rotor 25 and may be affixed to the side wall of the cover 28 by suitable means as, for example, a metal ring 32 clamping a thin web or extension of the flange against the wall 30 and securing it thereto by screws or equivalent means. Alternatively a clamp may be used. The lower surface of flange 31 is spaced above the surface of the rotor 25 a distance slightly greater than the maximum depth of the cap C or other item to be handled or counted. The flange is preferably of gum rubber or the like with a core or reenforcement comprising a single layer of cotton or synthetic fiber fabric. A flange so constructed will have little or no stretch in a lateral direction and yet will be completely flexible under the influence of the pressure wheel later to be described.

Supported by rigid outriggers 35 affixed to the framework is a circular inside guard structure 36 concentric with respect to the rotor 25. This support may include a spacer ring 37 or equivalent which secures a rigid annular web 38 with adequate clearance above the surface of the rotor 25 and beneath the lower surface of flange 31. Affixed to the web 38 to be supported rigidly thereby is the circular wall 40 of the guard structure, said wall projecting downwardly toward the rotor 25 in a clearance relationship which will prevent the caps or other articles being counted from being thrown outwardly beneath the wall. As the caps C are dumped on the rotating turntable centrifugal force throws them outwardly, and means are provided to cause said caps to be ejected in single file at a particular point beneath the flange 31, which rotates with the rotor 25. Said means advantageously comprises an inner wall 41 fixed to a portion of the wall 40 and extending therearound in uniform spaced relationship therewith as shown in Fig. 2, to provide a passage 44 along which the caps may travel in single file. The length of said wall 41 may comprise any suitable circumfer-

ential arc of wall 40. We prefer to make the length of said wall slightly less than one-half of said circumference. Any suitable means such as spacer blocks 42 may be used to secure the wall 41 to the wall 40. Said spacer blocks also support a flat arcuate member 43 which forms the roof of the said passage 44. It will be noted from Fig. 3 that the wall 41 terminates above the surface of the rotor 25 suitably to afford a height of the passage 44 slightly more than the thickness or depth of the articles to be counted but substantially less than twice such thickness so as to avoid an overlapping or piling up of the articles within the passage. The width of the passage is slightly greater than the width of the caps. Under centrifugal force engendered by the rapidly rotating rotor 25, the caps will slide into the passage 44, and assume a single one-high series near the rim of the rotor, the wall 40 retaining said caps on the rotor.

At a suitable location the lower edge of wall 40 is removed to provide a window or exit passage 45 having a height slightly greater than the height of the caps or the like being counted, and a length approximately twice the cap diameter. To complete the exit passage a portion of the web 38 is cut away. The resulting edges 46 and 47 of said web respectively guide the ejecting caps toward the discharge control and the exit chute. As shown in Fig. 5, wall 31 curves gently inwardly to join wall 40; the caps therefore being guided outwardly to the edge of the rotor 25, and beneath the flange 31. A guard rail 48 prevents the caps from dropping off of the rotor.

Fig. 13 illustrates an alternative construction which provides for increasing the rate of discharge of the caps without increasing the diameter of the rotor 25 and according additional means of protection against the crowding of the caps beneath the flange 31. The speed of the rotor in the Fig. 13 embodiment is increased from forty-four to fifty-six R. P. M. It will be noted in this figure that the window 45a is increased in length to approximately four cap diameters and that the edge 46a of the web 38 is cut into the shape of a flat ogee curve rather than the straight edge 46 shown in Fig. 5. It will not be noted that the end 40a of wall 40 is bent inwardly toward the center of the rotor. Preferably, the curvature of the exit passage defined by the edge 46a and the wall 40a is neither concentric with the circumference of the rotor 25 nor a straight tangent line. If a cap D tends to crowd in toward the line of caps passing through the window 45a, it will be carried along until its wall hits the end of skirt 40a whereupon an immediately adjacent cap C' will deflect cap D' toward the center of the rotor 25. Thus any cap which tends to crowd the regularly discharging line of caps at the exit of the window 45a will be immediately dislodged.

The mechanisms above described therefore comprise means for arranging an indiscriminate group or number of caps or the like in a single tier row and for ejecting them in single file at a fixed location.

The counting and discharge control

One of the important uses of the present invention is to deposit a pre-determined number of articles in one carton, and then to divert the succeeding articles to another, the filled one being replaced by an attendant. The manufacturer may wish to know the total number of cartons which have been filled with the desired number of articles, or may desire to know the total run,

i. e. the total number of articles which are passed through the counting machine during the operation.

The automatic switch 18 of the type previously described, is associated through the illustrated gearing with the shaft of the totalizer 23. Switch 18 operates after a pre-determined number of rotations of a star wheel 50 mounted on the end of the switch shaft 51 and projecting into the space between the rubber flange 31 and the surface of the rotor 25 as appears in Fig. 4. The teeth of the star wheel are spaced to accommodate a single cap and each cap which engages with the star wheel will effect a fractional rotation thereof according to the number of teeth. In the illustrated embodiment the star wheel has eight teeth and each cap will propel the wheel through $\frac{1}{8}$ of a complete rotation. The eight-toothed wheel has been selected because a common package size for crown caps contains 50 gross, that is, 7,200 caps, and such package will be filled after the star wheel has made 900 complete rotations. An adjustable brake, including a brake band 53 extending about the hub of the star wheel and anchored to a fixed block 54 which also screw-threadedly carries the adjustment screw 55, is used to prevent overrun of the star wheel as the cap is projected therethrough.

It has previously been noted that the articles to be counted are discharged in single file through the passage 45 and are guided beneath the rubber flange 31. The normal height of the said ring above the rotor 25 permits the caps to slide freely thereunder without engagement, although it may be desirable to provide freely-spinning rotors 56, or equivalent spaced about the web 38 and bearing on the underside of ring cap C, to keep the flange 31 from dragging thereon. The cap is being carried by the rotor at this point, but it is too light to have sufficient momentum to overcome the inertia of the star wheel and hence would not of itself pass into engagement with the star wheel and drive the same. Means are therefore provided to cause the rubber flange 31 to bear resiliently against the caps so that the flange, which is rotating with the rotor, will frictionally engage the cap and insure the passage thereof through the star wheel. In the Fig. 6 embodiment, we provide a freely rotatable pressure wheel 57 adjustably mounted to bear resiliently against the upper surface of the flange to deflect same into engagement with the cap or other article. Said wheel may be carried by a bar 58 pivotally affixed to the block 54 as shown in Fig. 1. A spring 60 urges the bar 58 in the direction of the flange 31 within the limits of movement established by the vertical adjustment post 61 which bears against the under side of said bar. Post 61 is adjusted to set the pressure wheel at the correct height to exert sufficient confinement of the article against the rotor 25 or the insert 25b thereof to cause the star wheel to rotate, but insufficient to deform or bend fragile articles. It is preferable that the axis of rotation of wheel 57 be parallel to the edge of the rotor 25.

In the embodiment of Figs. 8 and 9 there is shown a modified form of pressure member in which fixed frame members 62, 63 rigidly support a beam 64 having vertical passages 65 to freely receive the guide pins 66 affixed to a chassis plate 67. The said chassis plate secures the ends of the shafts 68, 70 on which are mounted the freely rotatable pressure wheels 71, 72. It will be noted that said shafts are radial with

respect to the flange 31. The beam 64 has a pocket 73 within which is seated a spring 74 bearing against the chassis 67 to urge it downwardly toward the flange. An adjustment screw 75 passes freely through the beam and screw-threadedly engages the chassis 67. The head 76 of the said adjustment screw operates as a stop to limit the downward movement of the chassis so as to establish the required amount of pressure exerted by the flange 31 on the tops of the caps C being passed through the star wheel. It will be noted in both the Fig. 1 and the Fig. 9 embodiment the initial area of deflection of the rubber flange 31 is suitably in advance of the axis of the star wheel. This is to insure the engagement of the crown caps by the flange in advance of the star wheel so that the said caps will be under positive propulsion during and through their association with the star wheel, and cannot climb one on the other after passage through the window 45.

Fig. 12 shows, in section, another embodiment of the pressure wheel. The wheel 80 is journaled in the beam 58 pivotally carried by post 54 and is resiliently urged in the direction of rotor 25 by a spring, not shown. Stop 61 may be included for establishing the extent of such movement, as formerly. Wheel 80 has a soft tire 81, which is preferably of the pneumatic or semi-pneumatic type so as to have a relatively large surface engagement with the rotor 25 so as to contact two or more of the caps C after passage thereof through the window 45.

The Fig. 12 embodiment does not utilize the pressure flange 31, and to accomplish the positive propulsion and control of the caps as they pass through the star wheel counter, wheel 80 is power driven at a speed synchronized with the peripheral speed of rotor 25. This may conveniently be accomplished by a suitable power take-off on shaft 13 (shown in dot-dash line in Fig. 1) and suitable chain and sprocket connection to the drive shaft 82 of the wheel 80.

It may be desirable to limit the area of contact of the flange 31 with the surface of the cap C, to protect the surface or decoration thereof. This may be done as shown in Figs. 13 to 15 by providing fixed guard plates 84 and 85 which project inwardly between the flange 31 and the rotor 25. Said guard plates have suitable clearance (say $\frac{1}{2}$ "') beneath the flange 31 and above the upper surface of a cap C. As shown in Fig. 14 said plates are spaced (or a single plate may be apertured) to provide an opening through which flange 31 will deflect for limited engagement with the surface of the cap as shown in Fig. 14. If the article being counted has a top or bottom surface of approximately 1" in diameter, for example, the aperture 85, which is located immediately beneath the pressure wheel 57, should have a width or diameter of from $\frac{1}{2}$ " to $\frac{3}{4}$ " and the engagement of the flange 31 with the cap surface will be limited accordingly.

The gate actuator

Reference is now made to Figs. 5 and 6 and the schematic circuit diagram of Fig. 7. Switch 18 is a momentary contact, normally open, single-pole, single throw switch. Relay 90 has a coil 91 which through a pawl and ratchet mechanism rotates shaft 92 which at its respective ends mounts cams 93, 94 respectively engaging with the spring-pressed levers of switches 95, 96. The cams are established to hold one switch open

when the other is closed. Common contacts of switches 93, 94 are bridged, as shown.

Assuming the apparatus to be in the course of a run of caps through the machine and master switch 97 closed, switch 18 is in its normally open position; coil 91 is deenergized. Switch 95 is closed, switch 96 is open. A circuit is therefore completed through solenoid 20, as is apparent from the circuit, and the armature 21 has, by means of lever 98 and its engagement with shaft 99 of gate 22, swung said gate into the Fig. 5 position.

Upon completion of a run through the star wheel 50—say 50 gross—the switch 18 closes momentarily to energize relay coil 91, causing rotation of shaft 92. Cams 93 and 94 are arranged so that switch 95 breaks ahead of the closure of switch 96. Coil 20 is deenergized ahead of the energization of coil 19, which occurs when switch 96 closes, and the movement of armature 21 into coil 19 swings the gate upward of Fig. 5 to divert the caps from the then-filled carton to the empty carton placed beneath the lower branch (as seen in Fig. 5) of the discharge chute 17.

The action of gate 22 is so rapid, as shown in actual production runs, that diversion of the caps to the new chute is accomplished before more than one extra cap is passed into the filled container.

It will be understood that the representation of relay 90 is purely schematic, but is typical of a relay such as the Struthers-Dunn 85AxA which we are presently using.

A switch 98', operated in tandem with switch 18, as schematically shown in Fig. 7, may be utilized to close a circuit to any suitable visual or audible signal S to indicate the completion of a run of caps through the machine.

The portability of the machine provides for positioning it suitably beneath the discharge chute or conveyer of conventional cap manufacturing apparatus (not shown) so that the caps or closures will fall directly on to the rotor 25. It will be understood by those skilled in the art that the several types of pressure wheels may have tires or rims having cross sectional shapes—flat, concave, or the like—for adaptability to the shape of the articles being handled thereby.

Thus, among others, the several objects of the invention as afore noted are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

We claim:

1. In a counting machine for Crown caps and the like, a counter mechanism having actuating means operable by contact with said articles therewith; a disc for conveying said articles into contact with said counter actuating means; means for rotating said disc; a flexible flange disposed above said disc in spaced relationship sufficient to permit the free passage of said articles beneath said flange; and means for deflecting said flange into contact with said articles to hold the same against displacement on said disc before and during engagement with said counter actuator, said flange rotating coaxially with said disc and at the speed thereof.

2. In a counting mechanism for Crown caps and the like articles, a disc upon which said articles may be indiscriminately deposited; means for rotating said disc at a fixed speed to throw said articles centrifugally outwardly; a flexible

flange member disposed above said disc concentrically thereof and overlying the peripheral surface of said disc sufficient to permit said articles to pass freely beneath said flange; means for guiding said articles in single file relationship beneath said flange; a counter including a star wheel for actuating the same, said star wheel projecting into the space between said disc and flange in the path of the articles carried thereon; and a pressure wheel disposed above said flange to deflect the same into firm contact with said articles to hold them against displacement on said disc during engagement of said articles with said star wheel.

3. In a counting mechanism for Crown caps and the like articles, a disc upon which said articles may be indiscriminately deposited; means for rotating said disc at a fixed speed to throw said articles centrifugally outwardly; a flexible flange member disposed above said disc concentrically thereof and overlying the peripheral surface of said disc sufficiently to permit said articles to pass freely beneath said flange; means for guiding said articles in single file relationship beneath said flange; a counter including a star wheel for actuating the same, said star wheel projecting into the space between said disc and said flange in the path of articles carried thereon; and a freely rotating pressure wheel disposed above said flange in engagement therewith to deflect said flange into firm contact with said articles to hold them against displacement on said disc during engagement of said articles with said star wheel.

4. In a counting mechanism for Crown caps and the like articles, a disc upon which said articles may be indiscriminately deposited; means for rotating said disc at a fixed speed to throw said articles centrifugally outwardly; a flexible annular flange member disposed above said disc concentrically thereof and overlying the peripheral surface of said disc sufficiently to permit said articles to pass freely beneath said flange; means for guiding said articles in single file relationship beneath said flange; a counter including a star wheel for actuating the same, said star wheel projecting into the space between said disc and said flange in the path of articles carried thereon; and a freely rotating pressure wheel disposed above said flange in engagement therewith to deflect said flange into firm contact with said articles to hold them against displacement on said disc during engagement of said articles with said star wheel; the axis of rotation of said pressure wheel being radial with respect to said disc and angularly disposed with respect to the axis of said star wheel.

5. In a counting mechanism for Crown caps and like articles, a disc upon which said articles may be indiscriminately deposited; means for rotating said disc at a fixed speed to throw said articles centrifugally outwardly; a flexible annular flange member disposed above said disc concentrically thereof and overlying the peripheral surface of said disc sufficiently to permit said articles to pass freely beneath said flange; means for guiding said articles in single tier, single file arrangement beneath said flange; a counter including a star wheel for actuating the same, said star wheel projecting into the space between said disc and said flange in the path of articles carried thereon; and a pair of freely rotatable pressure wheels disposed above said flange to deflect the same into firm contact with said articles to hold them against displacement

on said disc during engagement of said articles with said star wheel, the axes of rotation of said pressure wheels being radial with respect to said disc and at least one of said pressure wheels being angularly disposed with respect to the axis of said star wheel.

6. A counting machine according to claim 1 in which the upper surface of said disc slopes uniformly to a point of minimum thickness adjacent the rim thereof.

7. A counting mechanism according to claim 1 in which the upper surface of said disc adjacent the periphery thereof is bevelled.

8. A counting machine according to claim 1 in which the upper surface of said disc adjacent the rim thereof is surfaced with a cushioning material.

9. A counting machine according to claim 1 in which the upper surface of said disc adjacent the rim thereof has a layer of cushioning material, the surface of said layer being slightly below the surface of the central portion of the disc.

10. A machine for delivering relatively small flat articles in single file and at high speed, comprising a rotatable disc upon which said articles may be indiscriminately deposited; means for rotating said disc to move said articles outwardly on said disc by centrifugal force; means for guiding said articles in single file, single tier relationship to the outer edge of said disc; an annular flexible flange disposed above the outer edge of said disc in concentric spaced relationship sufficient to permit said articles to pass freely beneath said flange; means for rotating said flange at the speed and direction of rotation of said disc; a discharge chute communicating with said rotating disc; and a pressure wheel engaging with the surface of said flexible flange to distort the same into frictional engagement with each of said articles in succession to positively propel said articles toward said discharge chute.

11. A machine according to claim 10, having guard plate means disposed between said flexible flange and the top of said articles passing thereunder, said guard plate means being apertured beneath the area of engagement of said pressure wheel with said flange to limit the area of engagement of said flange with said articles.

12. A machine for delivering relatively small flat articles in single file and at high speed, comprising a rotatable disc upon which said articles may be indiscriminately deposited; means for rotating said disc to move said articles toward the periphery of said disc by centrifugal force; fixed wall means defining an elongate curved exit passage to direct said articles to the periphery of said disc, said passage having a width slightly greater than the maximum width of said articles, and one of said wall means providing an abutment to arrest any article attempting to crowd into said passage at the side thereof, whereby an article of the line of discharging articles will strike said crowding article and propel it toward the center of the disc; an annular flexible flange disposed above the outer edge of said disc in concentric spaced relationship sufficient to permit the articles discharging from said passage to pass freely beneath said flange; means for rotating said flange at the speed and direction of rotation of said disc; a discharge chute communicating with said rotating disc; and means for causing said flange to frictionally engage each of said articles in succession to positively propel said articles toward said discharge chute.

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13. A machine according to claim 12, in which said exit passage is in the form of a flat ogee curve.

LOUIS A. VON TILL.
FRED SCHALLENKAMMER.

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