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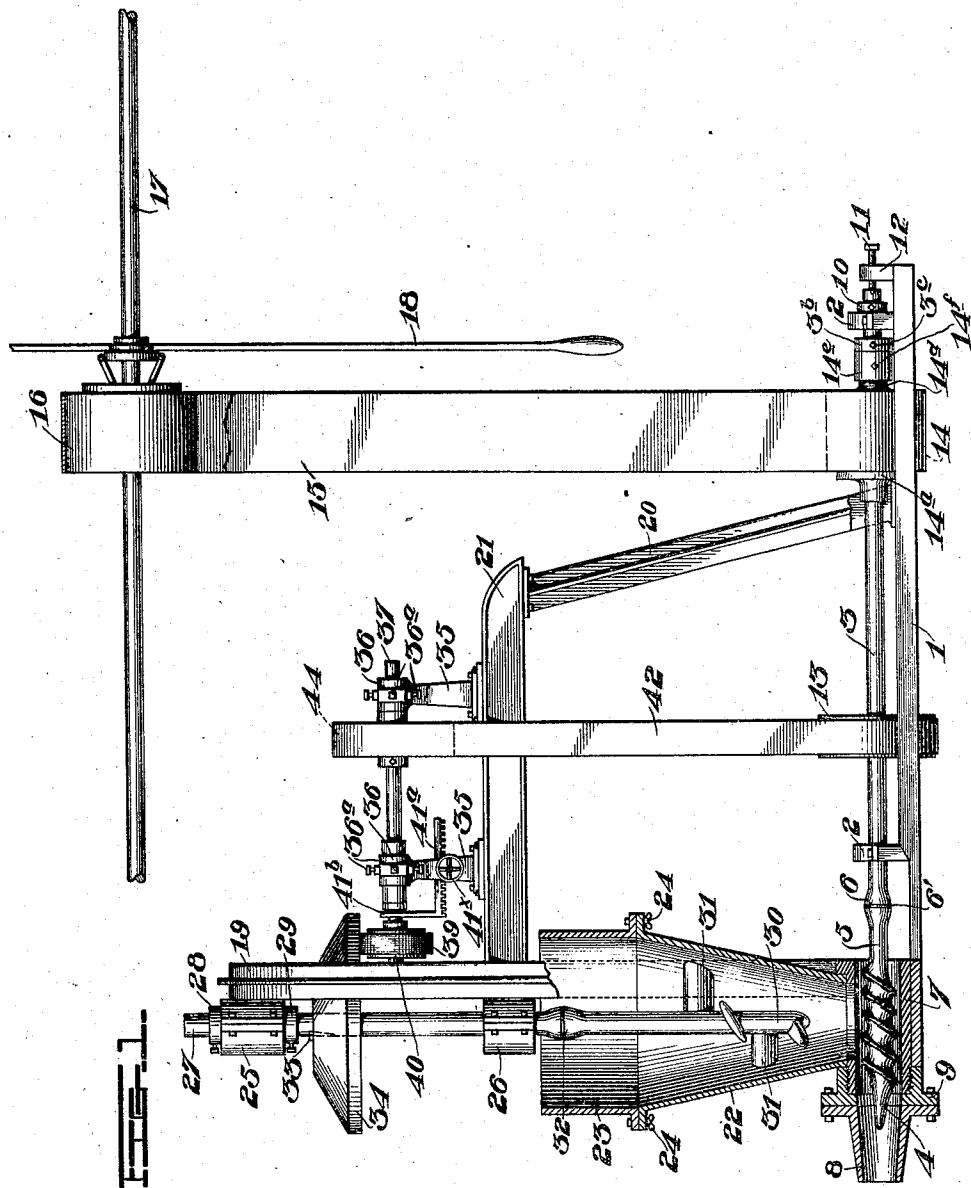
H. AUCHU.

PATENTED MAR. 10, 1908.

MACHINE FOR FORMING A CARTRIDGE ROPE FROM EXPLOSIVE GELATIN.

APPLICATION FILED NOV. 14, 1907.

10 SHEETS—SHEET 1.



Witnesses

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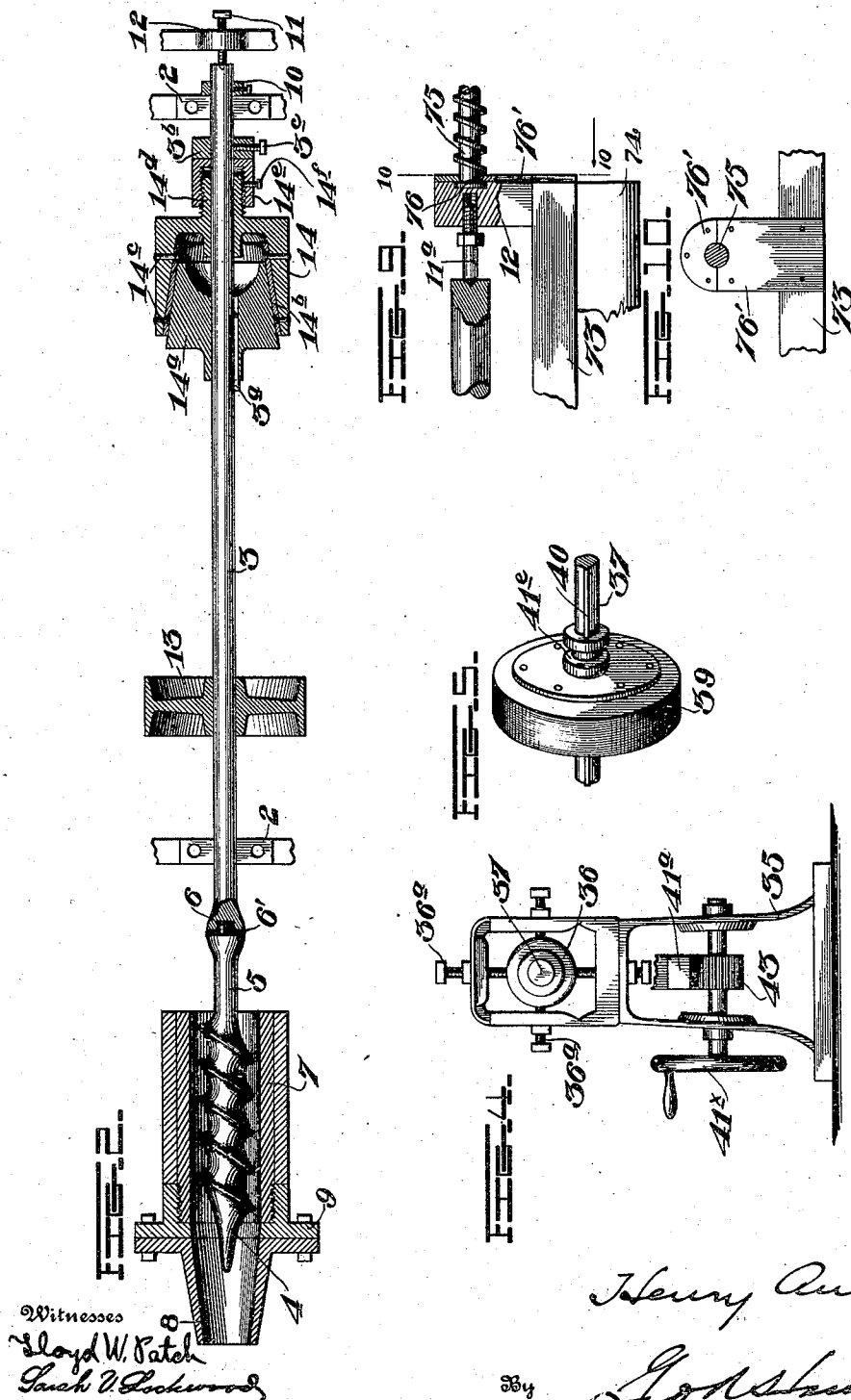
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10 SHEETS—SHEET 2.



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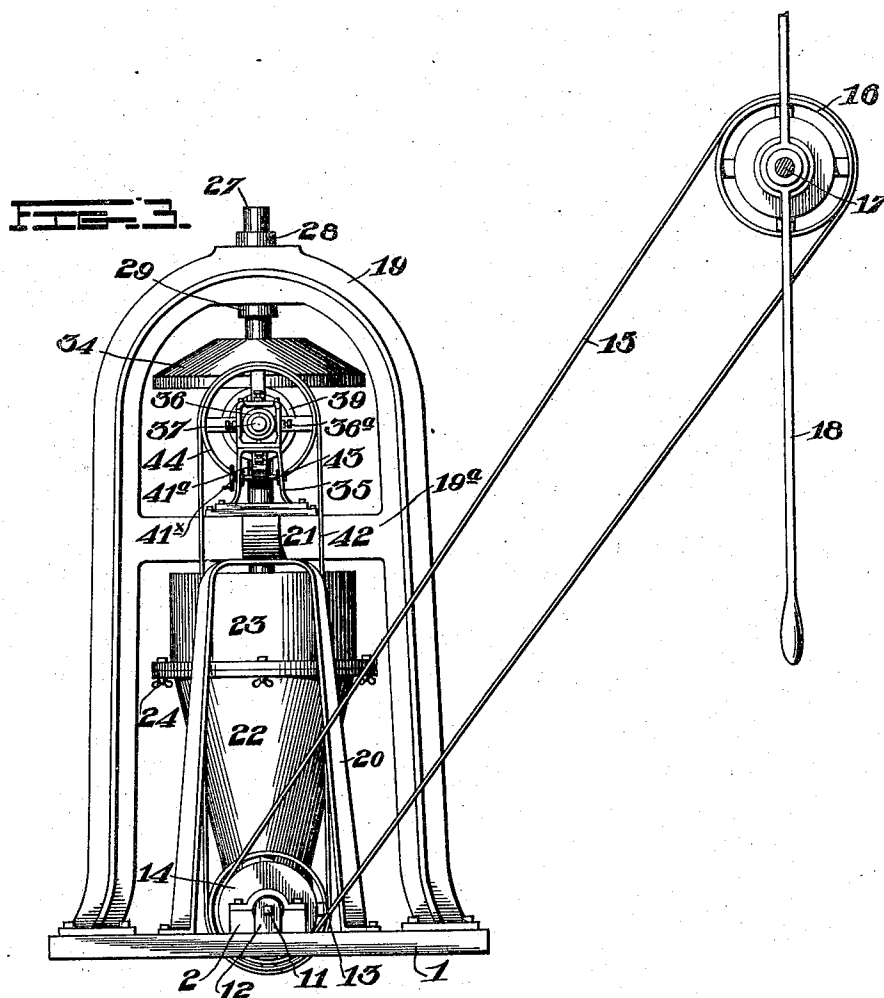
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10 SHEETS—SHEET 3.



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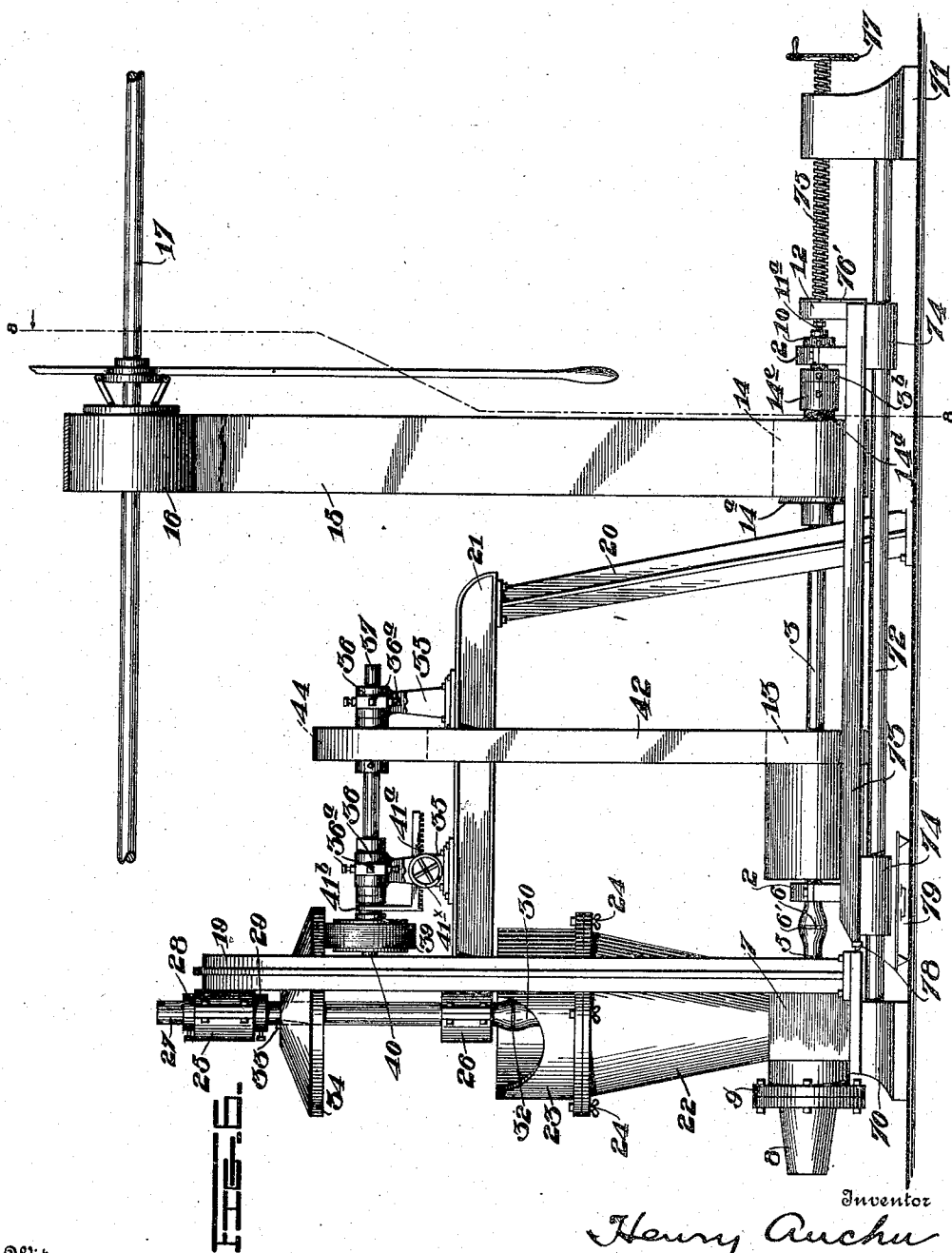
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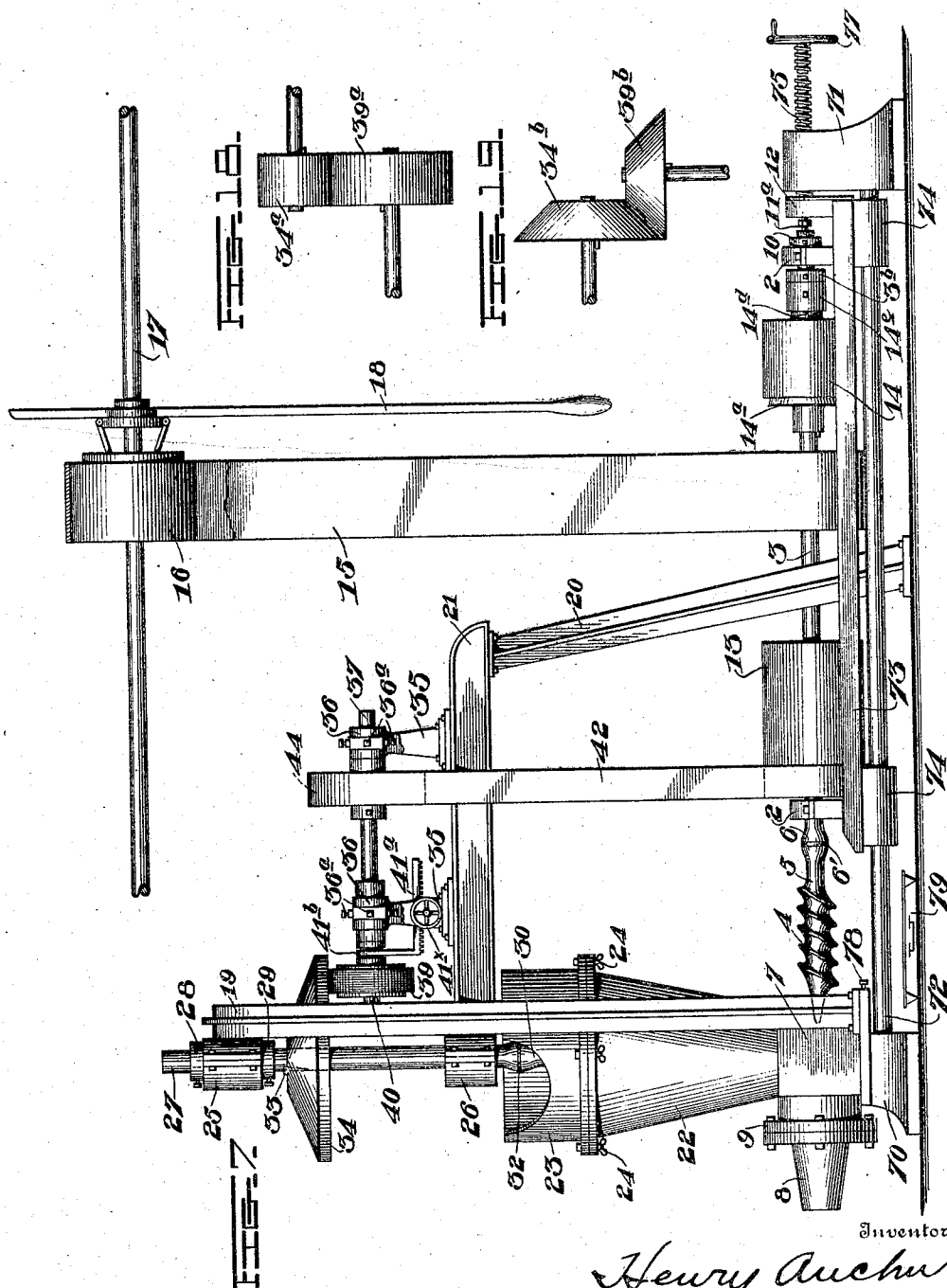
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10 SHEETS—SHEET 5.



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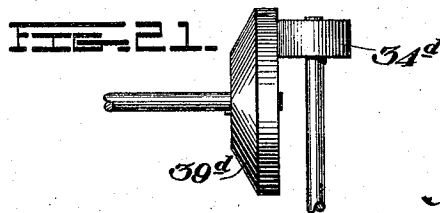
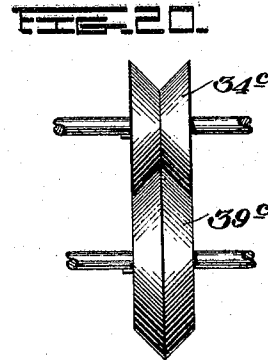
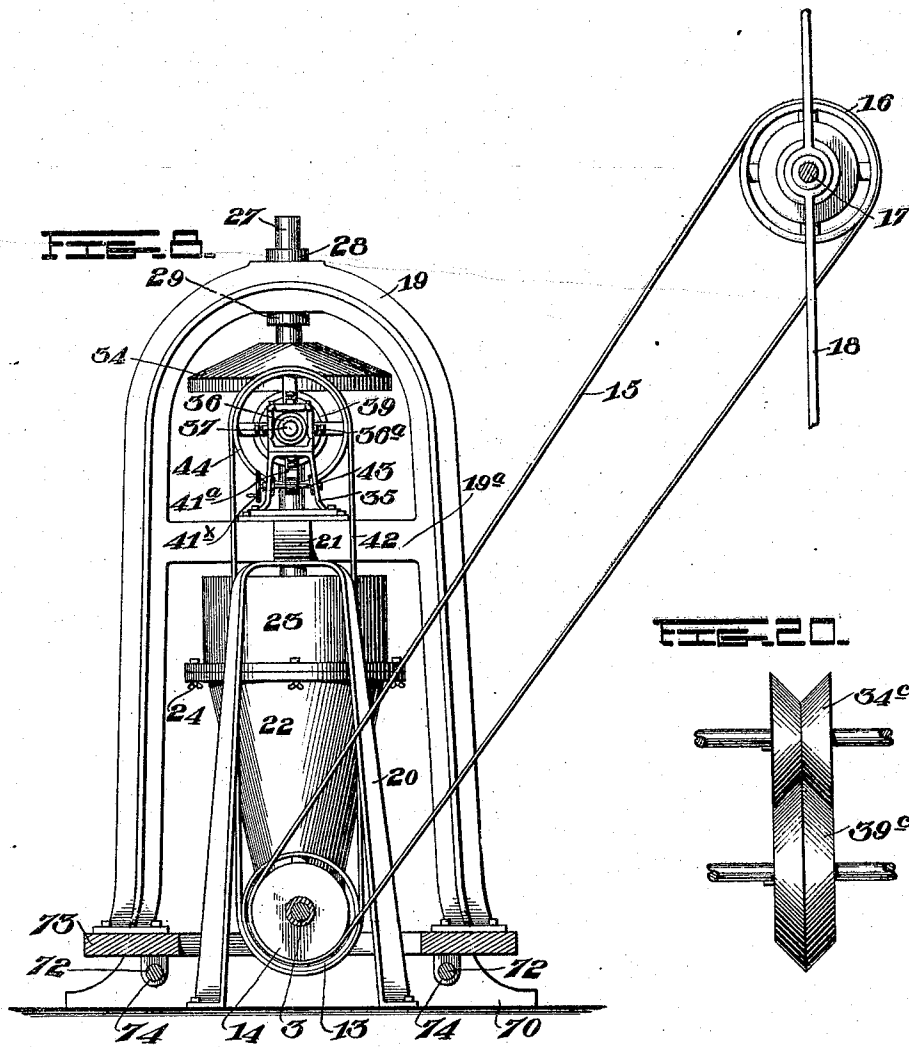
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10 SHEETS—SHEET 6.



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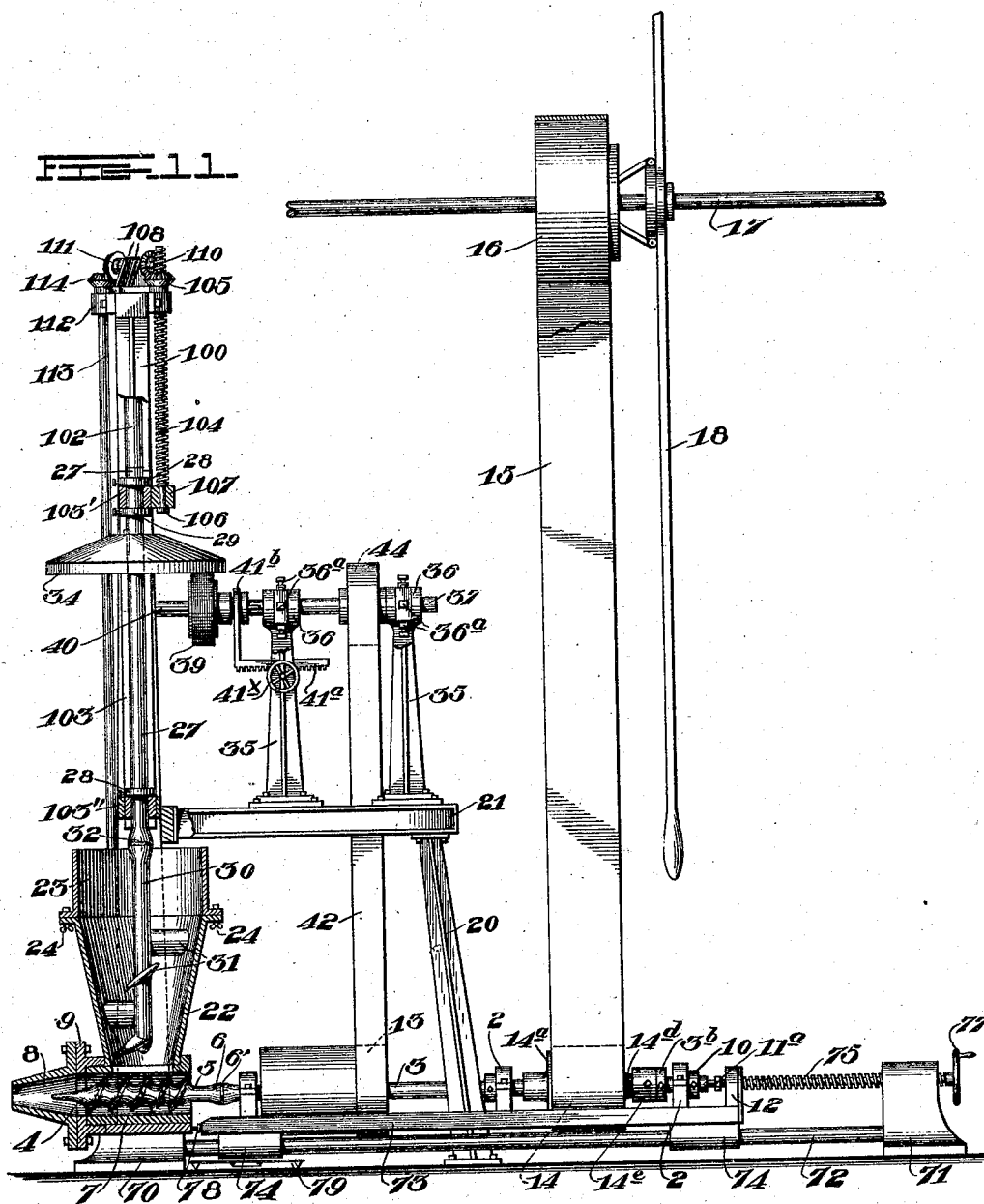
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10 SHEETS—SHEET 7.



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10 SHEETS—SHEET 8.

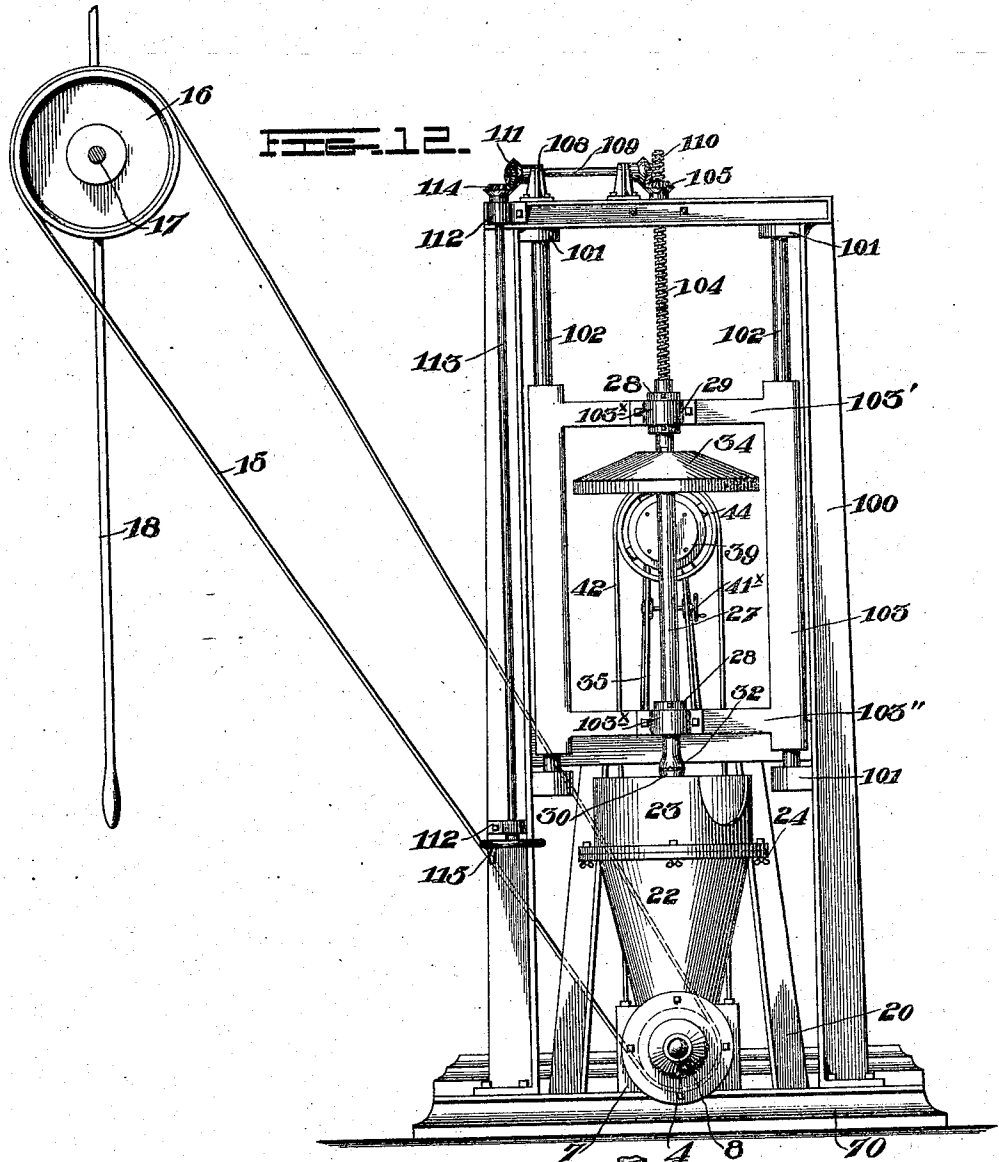


FIG. 13.

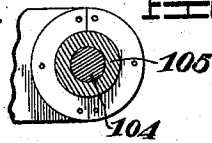
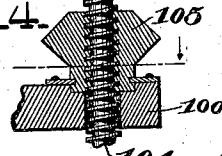


FIG. 14.



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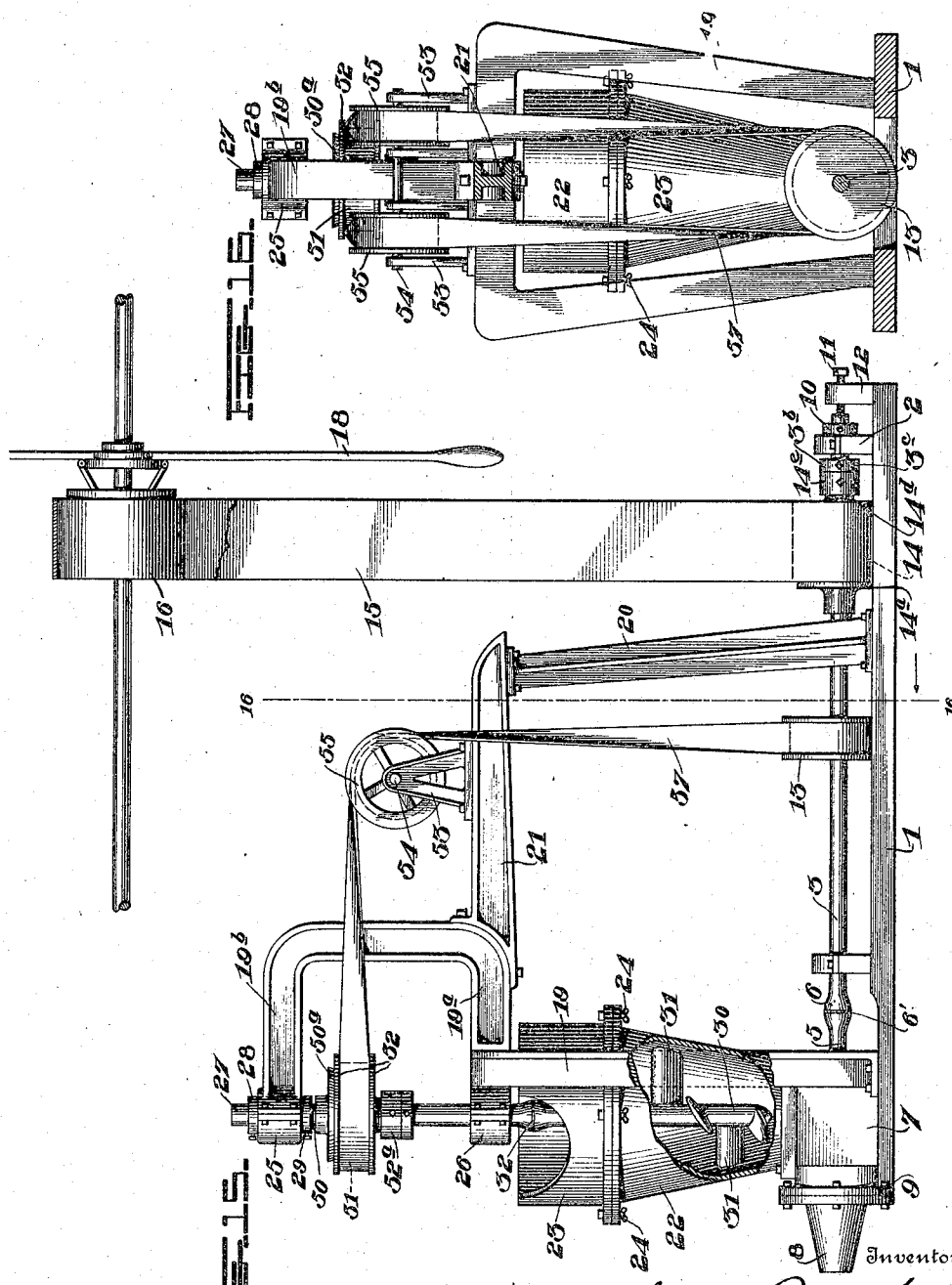
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10 SHEETS—SHEET 9.



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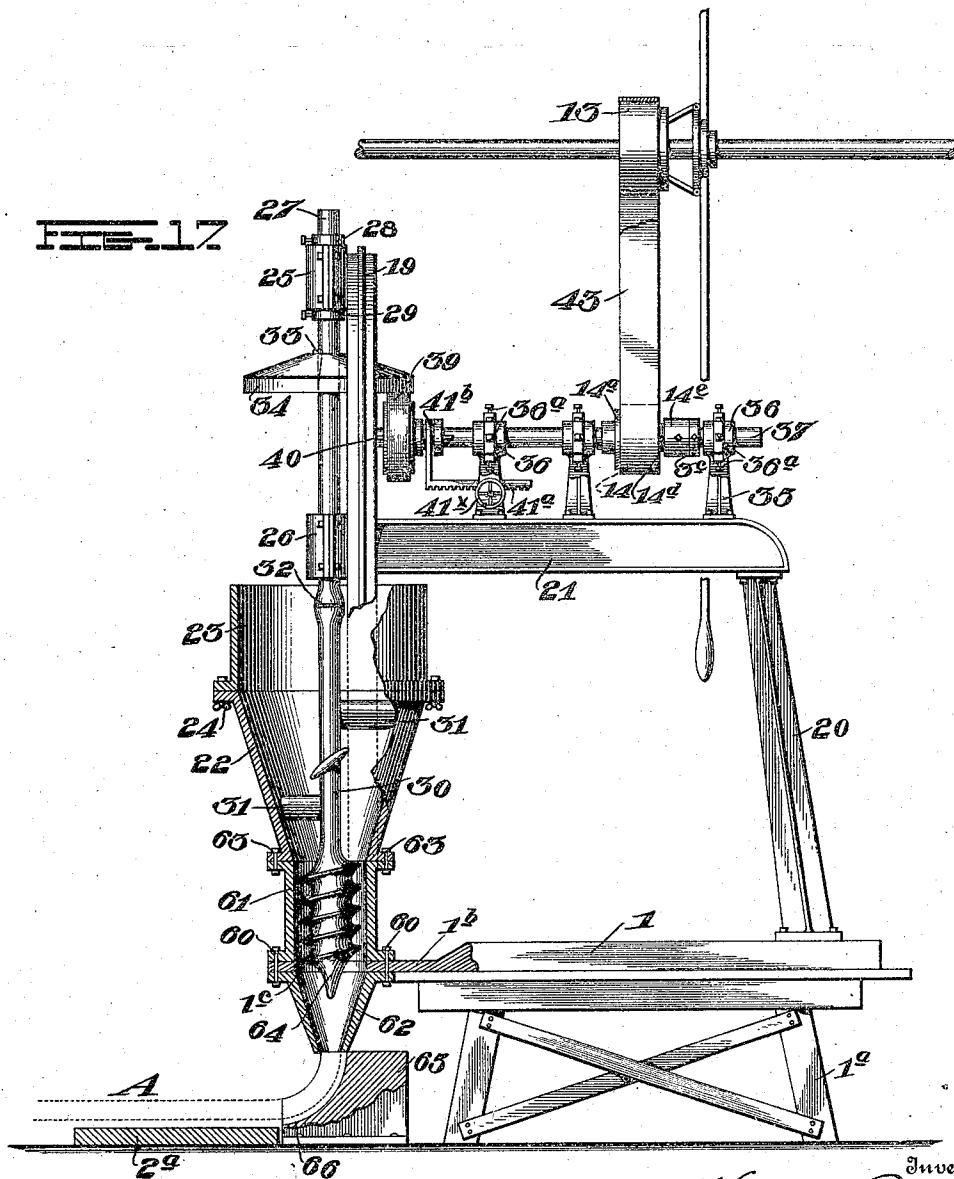
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APPLICATION FILED NOV. 14, 1907.

10 SHEETS—SHEET 10.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING A CARTRIDGE-ROPE FROM EXPLOSIVE GELATIN.

No. 881,368.

Specification of Letters Patent.

Patented March 10, 1908.

Application filed November 14, 1907. Serial No. 402,114.

To all whom it may concern:

Be it known that I, HENRY AUCHU, a citizen of the United States, residing at Emporium, county of Cameron, and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Forming a Cartridge-Rope from Explosive Gelatin, of which the following is a specification.

This invention relates to machines for forming a cartridge rope from explosive gelatin.

The manufacture of cartridges from explosive gelatin, which is a plastic substance of a consistency depending upon various conditions, is generally carried on by forcing it, under pressure, through a nozzle from which the gelatin emerges as a continuous rope, the diameter of which may be from less than an inch to upwards of three inches, this rope being cut into suitable lengths, usually about eight inches, after emergence from the nozzle, to thereby form the cartridges which are then suitably wrapped so as to be ready for commercial use.

Machines of the character set forth have usually employed a horizontal screw, termed by skilled workers in explosives a "packing screw", for forcing the explosive gelatin through the nozzle, and associated with this packing screw means have been employed to feed the plastic gelatin to the screw. It has heretofore been proposed to employ a feeder for causing the gelatin to be fed to the packing screw, which will more or less automatically yield if the pressure of the feeder on the gelatin becomes so great that further augmentation would render continued operation of the machine dangerous on account of the subjection of the gelatin to too great pressure with incident heightening of the temperature of the mass and frictional action of the packing screw and nozzle thereon. In machines of this character, it is desirable to be able to quickly regulate the action of the feeding mechanism so that as batches of the explosive gelatin are introduced to the feeding mechanism, the conditions of feed may be readily varied according to the consistency of the gelatin and the observed action of the machine.

Furthermore, great danger sometimes arises by reason of the fact that foreign bodies, such as nails, screws, small pieces of

metallic or gritty substances, etc., fall into the hopper or gain admission through carelessness in the operation of the machine or when making the "dope" out of which the explosive gelatin is made, such bodies finally becoming lodged as an obstruction in the packing screw case and by the packing screw ground against the interior walls of the packing screw case with such force as to cause sparks or give rise to a temperature sufficiently high to explode the mass of explosive gelatin.

In my earlier applications Serial Nos. 375,296; 375,298; 375,299, filed May 23, 1907, I have disclosed certain machines for packing explosive gelatin which are provided with novel means so constructed and arranged that the feeder itself will automatically stop whenever the pressure upon the gelatin becomes too great, rather than merely ease up or lessen the feeding action as has heretofore been proposed to be accomplished, using for this purpose friction gearing, the driving and driven members of which become instantly disengaged on the slightest endwise movement of the gelatin forcing means, such endwise movement being very small in magnitude and permitted by having the shaft of the gelatin forcing means only movable lengthwise to the minimum degree usual in shafting to prevent binding action at the shaft bearings.

In my application Serial No. 375,298, I have disclosed a machine wherein the packing screw and the feeder which delivers the explosive gelatin thereto are connected to rotate together so that reactionary pressure of the explosive gelatin on either the packing screw or feeder will regulate the action of both, and in my other applications, I have disclosed machines wherein the packing screw and feeder are operated independently, although the feeder is driven from the packing screw. In those applications, while not disclosing the packing screw as itself provided with an automatic regulating means employed in connection with the feeder, such means are just as adaptable to the packing screw as to the feeder.

I have discovered that separation, that is, disengagement of the driving and driven members used to control the operation of either the feeder or packing screw, or both, is not essential to attain the desired auto-

matic regulation of the feeder, packing screw, or both, and that the driving and driven elements, such as friction wheels, may be held by suitable means against separation and means employed to hold them in engagement with any desired pressure and that if undue reactionary pressure on the gelatin forcing device be exerted by the explosive gelatin or its rotation hindered by any foreign body which may be in the gelatin, the gelatin forcing device will at once stop and the driving wheel of the frictional driving means will slip and may continue to rotate without causing rotation of the driven wheel, damaging it in any way, or engendering undue heat, giving the operator ample time to throw out the clutch which controls the operation of the entire machine.

The present invention has for one of its objects the provision of novel driving means for either the feeder or the packing screw which will be so constructed that a relative slipping or yielding action of the driving and driven elements thereof will automatically occur when required by abnormal reactionary pressure of the explosive gelatin on the gelatin forcing means or when the rotation of such gelatin forcing means is hindered or delayed by some foreign body becoming engaged with the gelatin forcing means or from some other source.

Where the packing screw and feeder are not connected, that is, where they are separately driven, the most convenient and satisfactory driving arrangement is to rotate the packing screw from a counter-shaft and drive the feeder from the packing screw by suitable belting or other means, or, in other words, drive the feeder from the packing screw or the packing screw from the feeder. This being the case, the present invention has for its second object the provision of novel driving means for whichever of these elements is, as between the two, the driver, which will permit relative slipping of the driving and driven elements of such driving means and simultaneously control the rotation of both the packing screw and the feeder.

By the employment of novel means for changing the relative positions of the friction wheels, the gelatin forcing device may be driven faster or slower to increase or diminish the feed of the gelatin, the operator being enabled to instantly change the feed while watching the machine, so that successive batches of the explosive gelatin may be fed faster or slower according to their consistency and the requirements of operation.

Both objects of the invention are accomplished by the provision of novel driving means having the characteristics heretofore set forth, but which may be constructed in a variety of ways, and I desire it understood that I consider my invention comprehends all specific forms of driving means in connection

with the feeder or the packing screw, or both, and having the characteristics or functions heretofore set forth and I do not limit myself to the specific driving devices which are described hereinafter and shown in the accompanying drawings.

For a full disclosure of such constructions embodying my invention as I have at this time produced, reference is to be had to the following specification and to the claims wherein the novel features of the invention are set forth, and to the accompanying drawings, in which:—

Figure 1 is a side elevation with certain parts in section, showing one form of the invention; Fig. 2, a horizontal section through the packing screw case, nozzle, and driving means; Fig. 3, a rear elevation; Fig. 4, a detail rear elevation of the shifter for the driving friction wheel of the feeder and showing one of the adjustable bearings; Fig. 5, a detail view of the shiftable friction wheel for the feeder, showing its sliding connection to its shaft; Figs. 6 and 7, side elevations showing a modified construction of the lower part of the machine; Fig. 7 illustrating how the packing screw is withdrawn; Fig. 8, a section on line 8—8 of Fig. 6; Fig. 9, a detail view showing the adjusting means for the carriage and packing screw shaft of the machines of Figs. 6, 7 and 8; Fig. 10, a detail section on line 10—10 of Fig. 9; Fig. 11, a side elevation, partly in section, of another form the machine may assume in embodying the invention; Fig. 12, a front elevation thereof; Figs. 13 and 14, details of the bevel gear coöperating with the screw that raises and lowers the feeder; Fig. 15, a side elevation, partly broken away, of another machine embodying the invention; Fig. 16, a section on line 16—16 of Fig. 15; Fig. 17, a side elevation, partly in section, of a machine embodying the invention where the packing screw and feeder are connected together; and Figs. 18, 19, 20 and 21, detail views of a few other forms of friction wheels which are adapted for use in carrying out the invention.

Referring first to Figs. 1 to 5, inclusive, the metal base 1 of the machine is provided with bearings or boxes 2 in which is journaled the packing screw shaft 3, which is of steel, while the packing screw itself 4 has a short shaft-section 5, the shafts 5 and 3 being connected by a screw coupling 6, the threads of which are so arranged that rotation of the packing screw and the shaft tends to tighten the joint 6, a rubber or paper washer 6' being located between the parts to insure a tight union and also to prevent the possibility of the two hard metallic surfaces from coming in contact with each other, which might be dangerous should nitro-glycerin or explosive gelatin become lodged between them. This formation of the shaft and packing screw

permits ready detachment and necessitates the use of bronze only in the packing screw itself.

To prevent too far entry of the packing screw in its lead or Babbitt metal case 7 and nozzle 8, the collar 9 being also employed, there is provided a set collar 10 on shaft 3, but in order to adjust the packing screw 4 in its case 7 to bring its tip as near as possible to the inside of the nozzle without touching the latter, I provide an adjusting screw 11 threaded through an extension or lug 12 on base 1 and bearing against the rear end of shaft 3. When working on small sized cartridges, it is advisable to have the packing screw penetrate as close to the inside of the nozzle as possible without touching it, as the gelatin will then be forced through the nozzle with greater facility, and the pressure which would otherwise arise, be relieved. The nozzle 8 and collar 9 are bolted together and the collar 9 is also detachably connected to packing screw case 7, permitting separation of these parts for purposes of cleaning.

Rigidly secured to the shaft 3 by splining or otherwise, is a belt pulley 13. Rigidly connected by a key 3^a to the shaft 3, is a cone-shaped friction wheel 14^a. Loose or free to turn on the shaft 3 is a friction pulley 14 whose inner face is conical, corresponding to the exterior of the friction wheel 14^a, and which is equipped with hard vulcanized fiber 14^b (Fig. 2) attached by copper rivets 14^c which are countersunk so as to present a smooth surface on both sides. The friction pulley 14 is provided with an exteriorly screw-threaded hub 14^d with which is engaged an interiorly screw-threaded sleeve 14^e, which is also loose on shaft 3. A set collar 3^b is secured to the shaft 3 in the desired position by screw 3^c, this collar being thus set to form an abutment for the sleeve 14^e so that by turning the latter, the friction pulley 14 may be adjusted with any-desired degree of friction on the friction wheel 14^a and made to retain its engagement therewith with such delicacy that it will cause rotation of the packing screw shaft and packing screw under all conditions of normal operation, enabling the packing screw to properly extrude the gelatin through the nozzle, but should the pressure of the gelatin become abnormal, or an obstruction such as a foreign body, be encountered by the packing screw, the packing screw and its shaft and the friction wheel 14^a will cease rotating and the friction pulley 14 will turn upon friction wheel 14^a without causing it to rotate, thus providing an automatic regulation which is capable of adjustment to insure continuance of rotation up to any desired point of reactionary pressure which is safe and yet permit stopping of the packing screw, when an obstruction is encountered. In this automatic regulation there is no separation of the

engaging surfaces of the friction pulley and friction wheel and the regulation is accomplished by the slipping of the friction pulley upon the friction wheel. When adjusted, the sleeve 14^e is held by screw 14^f.

The pulley 14 may be conveniently driven from a counter-shaft carrying a clutch pulley 16 which is connected by a belt 15 to pulley 14, the clutch of the friction pulley 16 being thrown into and out of operation by a hand lever 18, whereby the entire machine may be started or stopped at will.

Rising from base 1 and suitably bolted thereto is a yoke-upright 19 to which is bolted a horizontal frame-piece 21. This construction affords a rigid bracing for the yoke-upright 19 and also a support for certain parts described presently. Bolted to the top of the packing screw case 7 is a conical hopper 22 whose upper part 23 is in the form of a cylindrical ring which is detachably connected to the lower part thereof by the flanges and bolts 24, permitting removal of the upper part for purposes of cleaning. The ring 23 is cut out at one side to facilitate introduction of the gelatin into the hopper.

Detachable shaft-boxes or bearings 25 and 26 are provided on cross-piece 19^a and apex of yoke-upright 19, the said boxes being vertically alined in the vertical axis of the hopper.

The numeral 27 designates the feeder shaft, which is journaled in the boxes or bearings 25 and 26, said shaft carrying set collars 28 and 29 above and below the bearing 25, the collar 28 suspending or sustaining the feeder shaft and the feeder and the collar 29 holding the feeder shaft and feeder against the slightest upward movement, the object of these two collars being to prevent any endwise movement of any degree whatsoever of the shaft 27 and the feeder, but the collars provide means whereby the feeder shaft and feeder may be adjusted upwardly or downwardly and then positioned so that said shaft and feeder cannot move lengthwise, the set screws carried by the collars enabling this adjustment to be had when necessary or desired.

The feeder is made of bronze and comprises a shaft 30 having horizontal blades or paddles 31 which are substantially elliptical in cross-section and are disposed with their faces at an angle to the length of the shaft 30, said shaft 30 having the detachable screw-threaded coupling 32 with the lower end of shaft 27, this coupling being in all respects similar to the coupling 6 and having the rubber or paper gasket or washer between its parts. The detachability of the ring 23, together with the detachability of the feeder from shaft 27, makes it possible to remove the feeder or to gain access thereto or to the hopper at any time. Rigidly secured to shaft 27 by a key 33 is a friction wheel 34, the

lower face of which is by preference perfectly flat.

Mounted upon and connected to the frame-piece 21 are bearing standards 35 which have horizontally and vertically adjustable bearings 36, made so by the four screws 36^a, mounted in which is a horizontal shaft 37. Splined upon the projecting end of shaft 37 by a feather 40 carried by the shaft, is a friction wheel 39 which may, owing to said splined connection 40, be slid lengthwise of the shaft by a racked shifter 41^a having a yoke 41^b engaging a groove 41^c in the hub of wheel 39. A hand wheel 41^x on the same shaft with a pinion 43, engaged with the rack, affords means for shifting the wheel 39 on shaft 37.

The friction wheel 39 bears against the flat under face of the friction wheel 34 and, as the shaft 37 is in the same plane as shaft 27, the friction wheel 34 will be driven faster or slower according as the friction wheel 39 is moved toward or away from shaft 27. The shifting of friction wheel 39 may be instantly accomplished by the operator, who thus has the rate of rotation of the feeder under absolute control so that if the operator finds that the feeder is crowding the packing screw by feeding too much gelatin to it, or if the consistency of the gelatin demands a different rate of feed, the operator can at once change the feed as his experience may dictate is advisable. A belt 42 connects pulley 13 with a pulley 44 on shaft 37.

By adjusting the screws 36^a, the friction wheel 39 may be made to bear, with any desired upward thrust or pressure, against the lower face of the friction wheel 34 so that the revolution of wheel 39 will cause revolution of wheel 34 and hence the feeder, when working under any predetermined normal pressure of the gelatin in the hopper and up to any desired pressure of feed of the gelatin from the hopper to the packing screw, but should the pressure of the feeder on the gelatin in the hopper or of the gelatin on the packing screw become abnormal, either by reason of over-feed or from the presence of an obstruction to the motion of the feeder, the feeder and friction wheel 34 will cease their rotation and the friction wheel 39 may continue to rotate and in so doing will merely slip against the under surface of wheel 34 and the feeder will not recommence its rotation until the pressure has been reduced to normal by the relief of the surcharged condition of the hopper as the packing screw removes the congested gelatin from beneath the feeder paddles or on the removal of whatever obstruction may exist. Thus, the rotation of the feeder is independently controlled by the slipping of its friction driving wheels 34 and 39 and the rotation of the packing screw is regulated by the slipping of its driving and driven friction wheels 14 and 14^a. When,

however, there is a slip of the friction wheels 14 and 14^a, the shaft 3 ceases its rotation, the belt 42 stops, and hence the shaft 37 also stops and the feeder ceases to rotate, and hence there is provided both independent and simultaneous regulation for the feeder and packing screw.

In the operation of the machine, the feeder forces the gelatin from the hopper 22 to the packing screw case and the packing screw presses or advances the gelatin through the nozzle 8 in the form of a continuous cartridge rope which is afterward severed into marketable lengths of about eight inches which are subsequently inclosed in paper shells and constitute the complete cartridges.

In Figs. 6 to 10, inclusive, there is shown a machine which is in all respects similar to the machine heretofore described as regards the feeding mechanism and allied devices, but the lower part of the machine embodies certain different constructions permitting relative shifting of the packing screw and its case to facilitate cleaning, replacement, or repairs, without necessitating taking the machine apart. The base of the machine consists of a base part 70, which supports the packing screw case 7 and is bolted thereto, and a tail base-piece 71, the parts 70 and 71 being rigidly connected by parallel guide-rods 72. The sub-base 73 has sleeves 74, which slide on the guide-rods 72, this sub-base carrying bearings 2 in which the packing screw shaft 3 is journaled and coupled at 6, as heretofore set forth. A screw 11^a serves the purpose of the screw 11, but is a little differently arranged as the head and the tip are on the same side of the lug 12 instead of being on opposite sides thereof. To shift the sub-base, which may be termed a carriage, 73 back and forth on the rods or guides 72, a screw 75 is employed, the same being threaded through the tail-piece 71 and having a head 76 swiveled in the lug 12 by detachable plates 76' so that the carriage or sub-base may be retreated as well as advanced. A suitable hand-wheel 77, carried by the screw, is used for advancing or retreating the carriage. To limit the movement of carriage 73 and prevent too far insertion of screw 4 in case 7, there is employed an adjustable iron screw 78, whose head carries a wooden pin which serves as a buffer to deaden the concussion arising from the impact of the carriage thereagainst, thereby rendering impossible the explosion of any small amounts of nitro-glycerin or explosive gelatin which may adhere to its head or to the carriage. A removable pan 79 may be set underneath the place where the packing screw will be positioned when retreated from its case so that any loose pieces of gelatin will be caught and not allowed to drop around and get on the parts.

As will be seen from Fig. 7, when the packing screw is retreated from its case, it is ex-

posed and both it and the interior of the packing screw case may be readily cleaned or the parts replaced or repaired, obviating the labor, time, and expense of taking the machine apart. The engagement of the wheels 34 and 39 prevents the paddles of the feeder from ever dropping and touching the inner sides of the hopper or the packing screw and supplements the suspending function of the collar 28.

The machines of Figs. 1 to 10, in so far as the means for shifting the packing screw into and out of its case, and for adjustment of the friction wheel 39 relative to the wheel 34 are concerned, are claimed in my copending application, Serial No. 375,296, filed May 23, 1907, but in that application the automatic control of the feeder is effected by actual, though very small, separation of the wheels 34 and 39, whereas in the machines of these figures in the present application, the automatic control is effected by relative slip, without any separation whatsoever, of the friction wheels, and in addition to this, the packing screw is controlled by its own automatically acting friction wheels and the control of the feeder may also be simultaneous with the control of the packing screw, as heretofore explained.

In Figs. 11, 12, 13 and 14, I have shown the present invention applied to a machine having means for raising and lowering the feeder out of and into the hopper, this machine having its lower part similar to that shown in the machine of Figs. 6 and 7 and being of the same general construction as the machine set forth in my copending application, Serial No. 375,299, filed May 23, 1907, except for the employment of the novel automatically controlling friction wheels which do not separate but merely slip relatively, as heretofore set forth.

Specific reference to the lower part of this machine is not necessary as its parts are similar to those described in connection with Figs. 6, 7, 8, 9 and 10, and it is sufficient in this connection, to state that the friction wheel 14^a, friction pulley 14, adjusting sleeve 14^b, and collar 3^b, constructed according to the present invention, are used in connection with the packing screw shaft 3. Rising from and bolted to the base part 70 on opposite sides of the packing screw case 7, is a frame 100 having an upper cross-piece. This frame is provided with lugs 101 in which are secured parallel vertical guide-rods 102. A carriage 103 has its vertical parts sleeved upon or slidable on the guide-rods 102, this carriage having cross-pieces 103' and 103'' in bearings 103^x of which is journaled a feeder shaft 27, said shaft carrying set collars 28 and 29 above and below the bearings 103^x, the collar 28 suspending or sustaining the feeder shaft and feeder and the

collar 29 holding the feeder shaft and feeder 65 against the slightest upward movement in the manner heretofore set forth. In this machine the feeder and hopper are constructed as heretofore described. Rigidly keyed to shaft 27 by key 33 is a friction wheel 34 of the same construction heretofore described.

As in the machine previously described, there are employed bearing standards 35 bolted to frame-piece 21, which is supported 75 by the frame 20, said standards having adjustable bearings 36 which are adjusted by four screws 36^a. The same kind of shaft 37, friction wheel 39, and shifting mechanism is employed for shifting the wheel 39 lengthwise on shaft 37, and the friction wheel 39 bears against the flat under face of friction wheel 34 and always remains in contact therewith, slipping thereagainst when there is undue pressure of gelatin on the feeder or 85 the feeder is obstructed in its rotation, all as heretofore set forth. Connecting belts 15 and 42 and other parts are employed as before set forth.

Passing loosely through the cross-piece of 90 the upright frame 100, is a coarse-thread screw 104 which is threaded through a bevel gear 105, which rests upon said cross-piece. The lower end of the screw 104 is provided with a head 106 which is rigidly held against 95 turning in the box 107 on the upper cross-piece 103', said box having removable parts permitting attachment and detachment of the head 106.

Journaled in bearing standards 108 on the 100 upper cross-piece of frame 100, is a shaft 109 to the opposite ends of which are fastened bevel gears 110 and 111, the former meshing with bevel gear 105. Journaled in bearings 112 on frame 100, is a shaft 113, which has 105 secured to its upper end a bevel gear 114 meshing with bevel gear 111, while the lower end of this shaft has a hand-wheel 115 located at one side of the packing box or case 7 in convenient position to be turned by the 110 operator.

In the operation of the machine, the feeder within the hopper 22—23, forces the gelatin to the packing screw case 7, and the packing screw 4, in turn, presses the gelatin out 115 through the nozzle 8 in the form of a continuous cartridge rope, which is afterward severed into marketable lengths of about eight inches and then wrapped, as previously explained. 120

The wheel 34 always remains on wheel 39 during the operation of the machine and the automatic regulation of the feeder is accomplished as heretofore set forth by the slippage of the wheel 39 against the face of wheel 34 125 when the pressure of the gelatin on the feeder becomes too great or the rotation of the feeder is obstructed. The regulation of

action of the packing screw is accomplished by a similar slippage of the friction wheel 14^a and friction pulley 14^b.

When it is desired to inspect the feeder for purposes of cleaning or to replace or repair it, it may be lifted bodily out of the hopper by turning the hand-wheel 115, which operation causes rotation of the bevel gear 105, which in turn, draws upon the screw 104, lifting it, and lifting the carriage 103, shaft 27 and wheel 34, and the feeder itself, the carriage 103 sliding vertically on the guides 102. With this arrangement the entire feeder may be lifted out of the hopper or the feeder may be only partly raised. The lifting of the carriage 103 causes the wheel 34 to be raised out of contact with friction wheel 39 and this can be done without stopping the machine. The means for raising the feeder being self-locking, the carriage and feeder will remain in any position to which they may be raised. The elevating means employed obviates the necessity of forming the hopper in sections unless it is desired to do so, or of taking the machine apart for cleaning or repairs. The engagement of the wheels 34 and 39, when the feeder is lowered, prevents the lower end of the feeder from striking the packing screw or the paddles from striking the interior of the hopper, thereby rendering lowering of the feeder entirely safe.

In Figs. 15 and 16, I have illustrated the present invention applied to a machine in which the feeder is driven by a belt, this machine having its lower part similar to that shown in the machine of Fig. 1 and the entire machine being of the same general construction as the machine set forth in my copending application, Serial No. 375,297, filed May 23, 1907, except for the employment of the novel automatically controlling friction wheels which do not separate, but merely slip relatively, as heretofore set forth. The lower part of this machine being in all respects similar to the lower part of the machine of Fig. 1, no specific description thereof is necessary, and it is sufficient in this connection to state that the friction wheel 14^a, friction pulley 14, adjusting sleeve 14^e, and collar 3^b, constructed according to the present invention, are used in connection with the packing screw shaft 3.

Rising from base 1 and suitably bolted thereto are yoke-uprights 19 and 20, the former being provided with integral substantially parallel horizontal arms 19^a and 19^b, while the latter is substantially bolted to a horizontal frame-piece 21, which in turn is bolted to the rear part of arm 19^a. This construction affords a rigid bracing for the yoke-upright 19 and also a support for certain parts described presently. Detachable boxes 25 and 26, a hopper with a detachable upper part, feeder 30, and the shaft 27, journaled in the boxes 25 and 26 are all employed.

Collars 28 and 29 on shaft 27 hold it against any lengthwise movement as in the machines heretofore set forth.

Rigidly secured by key 50 to shaft 27 is a friction wheel 50^a similar to friction wheel 14^a, and loose on shaft 27 is a friction pulley 51 having flanges 52, said pulley being concave interiorly and faced with fiber to engage the surface of the friction wheel 50^a in the same manner described in connection with Figs. 1 to 5, inclusive, regarding the parts 14, 14^a, 14^b, and, similarly, a sleeve 52^a is screw-threaded onto the pulley and by which the tenacity of frictional engagement of the pulley and wheel may be regulated.

Mounted upon and connected to the frame-piece 21 are standards 53, in which a shaft 54 is fixed. Loose on the shaft 54 are two idler pulleys 55 which are entirely disconnected from each other and are sufficiently narrow so that they may slide on the shaft between their bearings and thus slip toward and away from each other to compensate for any movement of the belt 57 which passes over these idler pulleys, around friction pulley 51 and around pulley 13.

The operation of this machine is the same as that of the machines heretofore set forth, both the packing screw and the feeder being automatically regulated by the relative slip of the friction wheels and friction pulleys by which they are driven and the packing screw shaft controlling the feeder shaft. The lower part of this machine may be constructed with a slidable carriage carrying the packing screw as heretofore set forth in detail.

Reference being had to Fig. 17, which shows the present invention applied to a machine having its packing screw and feeder connected together and which is of the same general construction as the machine set forth in my copending application, Serial No. 375,298, filed May 23, 1907, there is employed a base and framework, hopper, feeder shaft and boxes therefor, all as set forth heretofore, the machine being supported on a framework 1^a. Secured detachably by bolts 60 to the upper and lower parts of a horizontal extension 1^b of base 1, which has an aperture 1^c, are a tubular packing screw case 61 and a nozzle 62, the former being preferably of Babbitt metal or suitable alloy, while the latter is preferably of bronze. The hopper 22 is bolted to the top of packing screw case 61 by bolts 63. The feeder 30 which has blades or paddles 31, is formed integral with the pressing or packing screw 64 which is contained within the case 61 and has its tip projecting into the nozzle 62. Set collars 28 and 29 are secured on the shaft 27 above and below the upper journal box to hold the shaft against any endwise play whatever as heretofore set forth. Rigidly keyed to the shaft 27 at 33, is a friction wheel 34 similar to those heretofore set forth. Bearing stand-

ards 35 having bearings 36 made adjustable by set screws 36^a, carry a shaft 37, on which is loosely splined a friction wheel 39, which coöperates with the friction wheel 34 in the manner heretofore set forth, the stoppage of the feeder and packing screw resulting in the slippage of the engagement of the friction wheel 34 with wheel 39 and not in a separation thereof. Means such as heretofore described, are employed for shifting the friction wheel 39 lengthwise of its shaft. The shaft 37 is driven from a counter-shaft by a pulley thereon which is connected by belt 43 to pulley 13 on said counter-shaft.

As it is usually desirable to deliver the continuous cartridge rope of explosive gelatin shown in dotted lines at A in a general horizontal direction on the table 2^a, the cartridge rope being delivered in a general downward direction as it issues from nozzle 62, I provide a deflecting or guide member or abutment 65 having a curved surface 66, against which the cartridge rope gently impinges and glides from a generally vertical to a generally horizontal position. In this machine, the automatic regulation of the packing screw and feeder is accomplished by the same means by reason of said devices being connected together.

In Figs. 18, 19, 20 and 21, I have shown a few of the numerous forms the friction gearing could assume for driving either the packing screw or the feeder, or both, of the machines described and shown, and as substitutes of friction wheels having the same function of slippage could be effected, I do not limit myself to any specific form. In Fig. 18, the friction wheels 34^a and 39^a are peripherally engaged. In Fig. 19, the friction wheels 34^b and 39^b are of bevel shape. Fig. 20 shows friction wheels 34^c and 39^c of concave and conical form. Fig. 21 discloses an arrangement of wheels 34^d and 39^d wherein the smaller wheel is arranged vertically instead of horizontally as heretofore set forth. These, and other, arrangements of friction wheels can be adapted to either the feeder or the packing screw to carry out the purposes of the present invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of means for forcing the gelatin through said mouth, and operating means for said gelatin forcing means comprising a driving member and a driven member which are adapted for relative slipping without disengagement to thereby automatically control the operation of the gelatin forcing means.

2. In a machine for forming a cartridge rope from explosive gelatin, the combination

with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of rotary means for forcing the gelatin through said mouth, and operating means for said rotary gelatin forcing means comprising a rotary driven member for rotating the rotary gelatin forcing means and a driving member engaged therewith, said driving and driven members being adapted for relative slipping without disengagement to thereby automatically control the operation of the rotary gelatin forcing means.

3. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of means for forcing the gelatin through said mouth, operating means for said gelatin forcing means comprising a driving member and a driven member which are adapted for relative slipping without disengagement to thereby automatically control the operation of the gelatin forcing means, and means for holding the driving and driven members together with any desired pressure, whereby their automatic action may be regulated.

4. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of means for forcing the gelatin through said mouth, and operating means for said gelatin forcing means comprising driving and driven friction wheels engaged with each other which are adapted for relative slipping without disengagement to thereby automatically control the operation of the gelatin forcing means.

5. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of rotary means for forcing the gelatin through said mouth, and operating means for said gelatin forcing means comprising driving and driven friction wheels engaged with each other which are adapted for relative slipping without disengagement to thereby control the operation of the gelatin forcing means.

6. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of rotary means for forcing the gelatin through said mouth, operating means for said gelatin forcing means comprising driving and driven friction wheels engaged with each other which are adapted for relative slipping without disengagement to thereby control the operation of the gelatin forcing means, and means for holding the said friction wheels together with any desired pressure, whereby their automatic action may be regulated.

7. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of a rotary feeder operating in said shell or case, and driving and driven friction wheels for said feeder which are adapted for relative slipping without disengagement to thereby automatically control the rotation of the feeder.

8. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of a rotary packing screw operating in said shell or case, and driving and driven friction wheels for said packing screw which are adapted for relative slipping without disengagement to thereby automatically control the rotation of the packing screw.

9. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of a rotary feeder operating in said shell or case, and driving and driven friction wheels for said feeder which are adapted for relative slipping without disengagement to thereby automatically control the rotation of the feeder, and means for holding the driving and driven members together with any desired pressure, whereby their automatic action may be regulated.

10. In a machine for forming a cartridge rope from explosive gelatin, the combination with a shell or case having a delivery mouth through which the gelatin is adapted to pass, of a rotary packing screw operating in said shell or case, and driving and driven friction wheels for said packing screw which are adapted for relative slipping without disengagement to thereby automatically control the rotation of the packing screw, and means for holding the driving and driven members together with any desired pressure, whereby their automatic action may be regulated.

11. In a machine for forming a cartridge rope from explosive gelatin, the combination with a feeder shell or case, of a packing screw case in communication with the feeder case and having a delivery mouth from which the gelatin is adapted to issue, a feeder in the feeder case for feeding the gelatin to the packing screw case, a packing screw in the packing screw case, said feeder and packing screw cooperating with each other, whereby one is driven from the other, driving means, and means for simultaneously controlling both the feeder and packing screw comprising driving and driven members or elements which are adapted for relative slipping without disengagement to thereby automatically control the action of both the feeder and packing screw.

12. In a machine for forming a cartridge rope from explosive gelatin, the combination

with a feeder shell or case, of a packing screw case in communication with the feeder case and having a delivery mouth from which the gelatin is adapted to issue, a feeder in the feeder case for feeding the gelatin to the packing screw case, a packing screw in the packing screw case, said feeder and packing screw being independently mounted but cooperating with each other, whereby one is driven from the other, driving means, and means for simultaneously automatically controlling both the feeder and packing screw by the reactionary pressure of the gelatin or the engagement of an obstruction or foreign body in the gelatin with the feeder or packing screw.

13. In a machine for forming a cartridge rope from explosive gelatin, the combination with a feeder shell or case, of a packing screw case in communication with the feeder case and having a delivery mouth from which the gelatin is adapted to issue, a feeder in the feeder case for feeding the gelatin to the packing screw case, a packing screw in the packing screw case, said feeder and packing screw being independently mounted but cooperating with each other, whereby one is driven from the other, driving means, and means for simultaneously automatically controlling both the feeder and packing screw by the reactionary pressure of the gelatin or the engagement of an obstruction or foreign body in the gelatin with the feeder or packing screw, said controlling means comprising frictional driving and driven elements which are adapted to maintain their engagement under normal conditions but will relatively slip when conditions become abnormal.

14. In a machine for forming a cartridge rope from explosive gelatin, the combination with a feeder shell or case, of a packing screw case in communication with the feeder case and having a delivery mouth from which the gelatin is adapted to issue, a feeder in the feeder case for feeding the gelatin to the packing screw case, a packing screw in the packing screw case, said feeder and packing screw cooperating with each other, whereby one is driven from the other, means for directly driving the feeder comprising friction wheels which are normally in engagement but are adapted to relatively slip without disengagement under abnormal conditions of operation of the feeder, and means for driving the packing screw comprising friction wheels which are normally in engagement but are adapted to relatively slip without disengagement under abnormal conditions of operation of the packing screw.

In testimony whereof, I hereunto affix my signature in presence of two witnesses.

HENRY AUCHU.

Witnesses:

CHARLES F. LOGAN,
GEO. P. JONES.