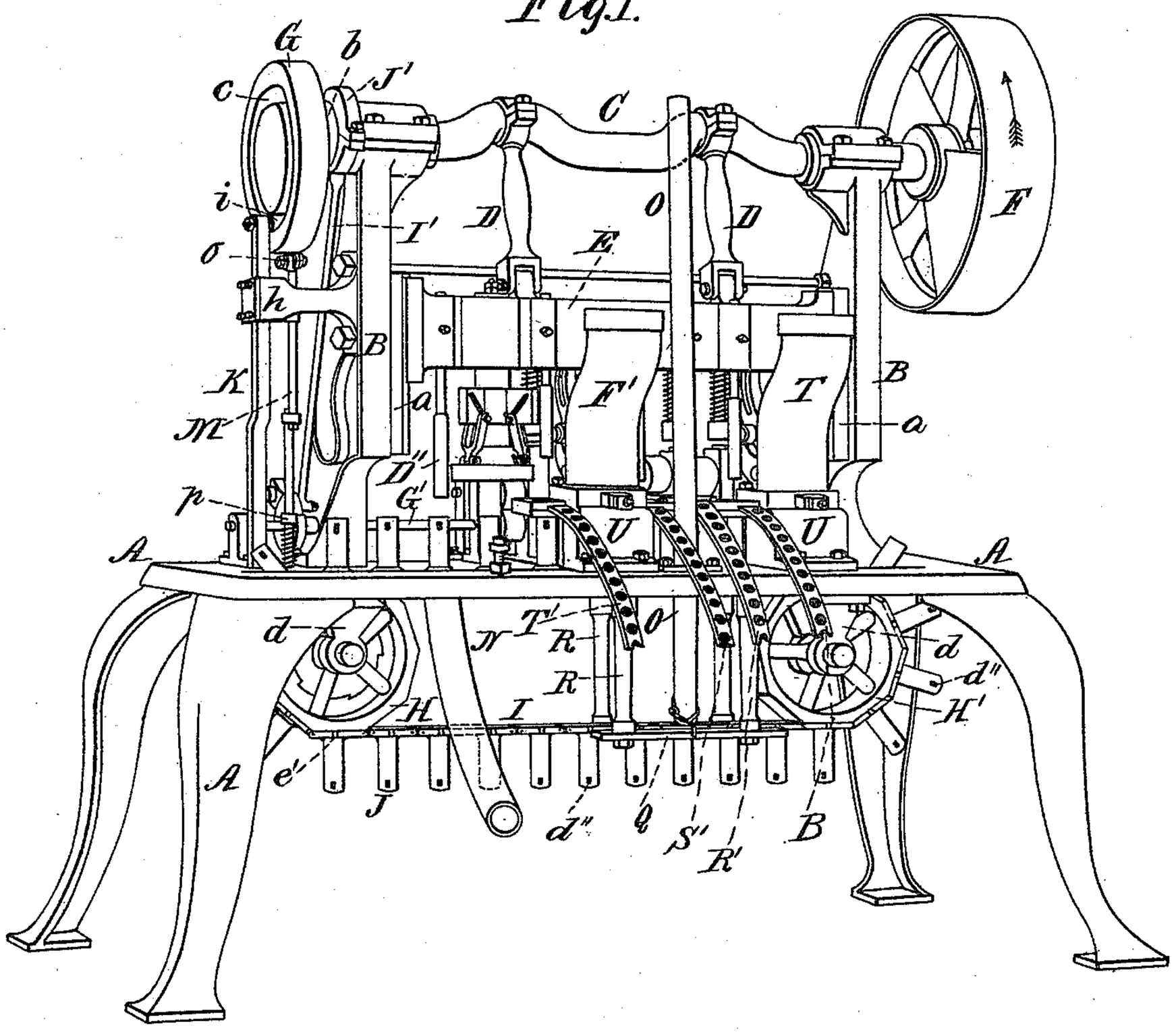
(No Model.) 4 Sheets—Sheet 1.

G. LIGOWSKY.

CARTRIDGE LOADING MACHINE.

No. 464,883. Patented Dec. 8, 1891.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

G. LIGOWSKY.

CARTRIDGE LOADING MACHINE.

No. 464,883. Patented Dec. 8, 1891.

Fig. 2.

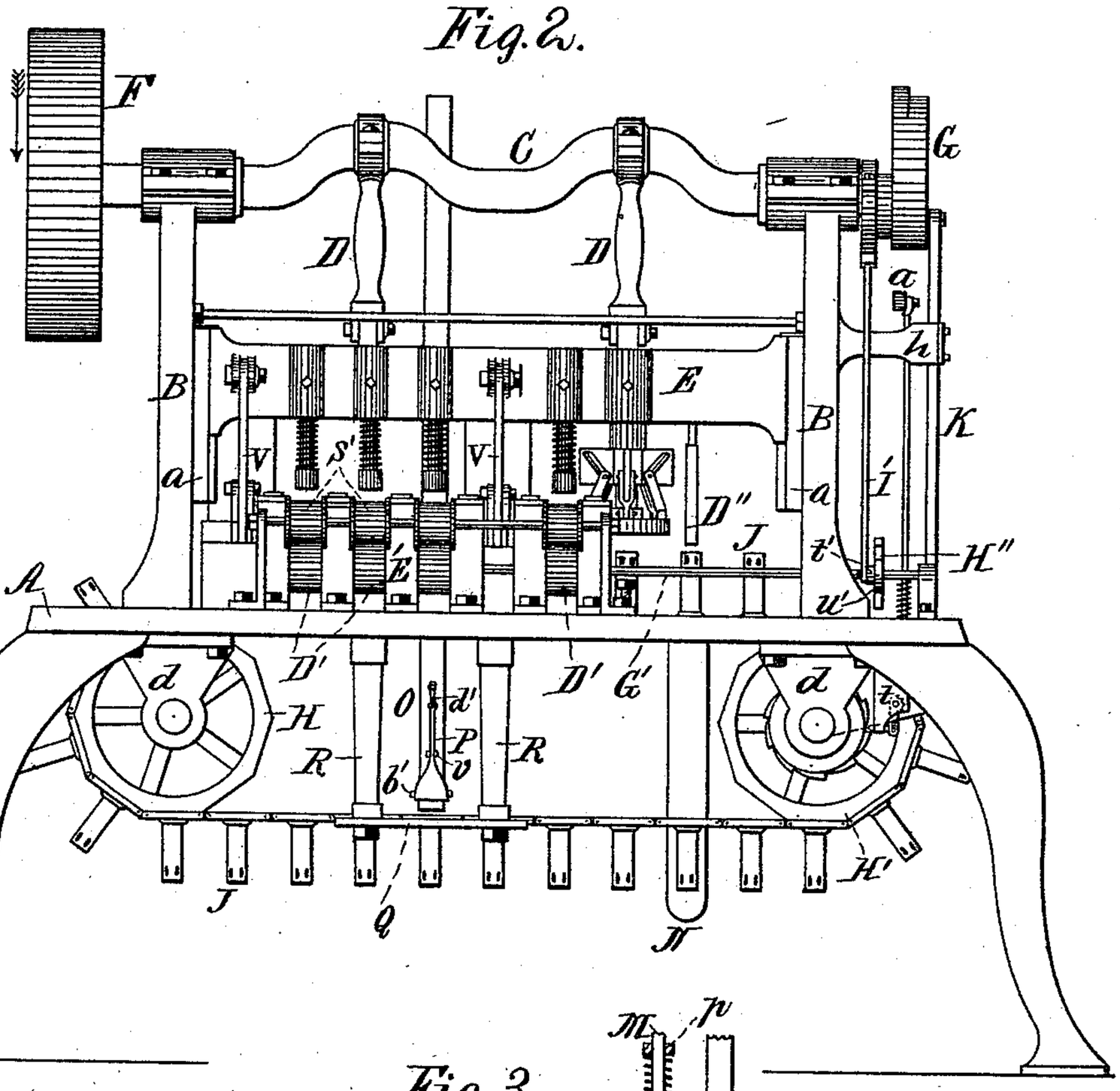


Fig. 3.

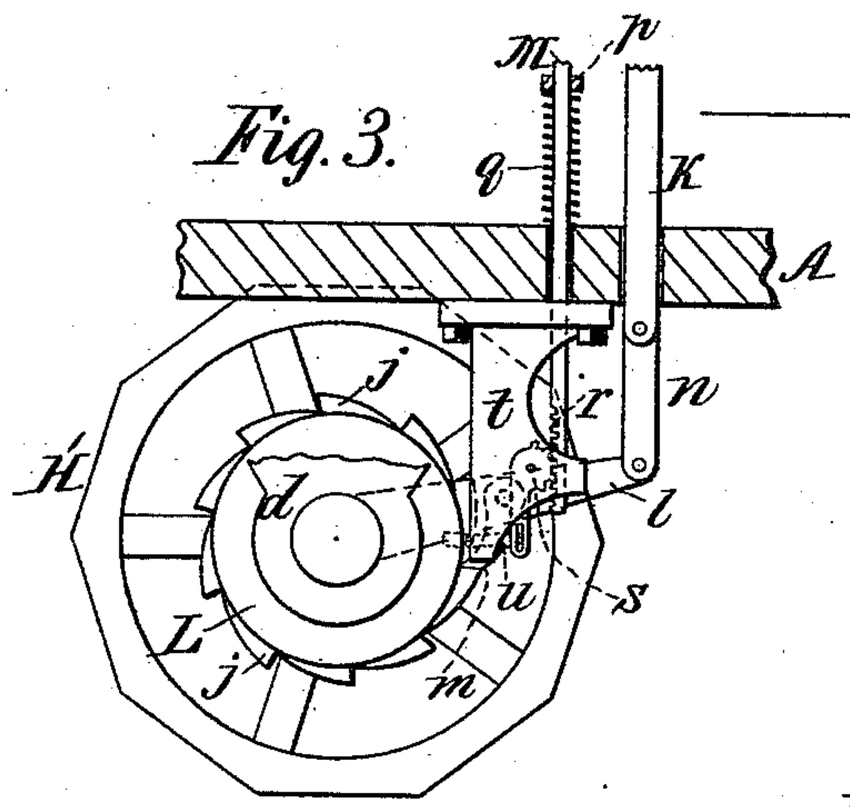
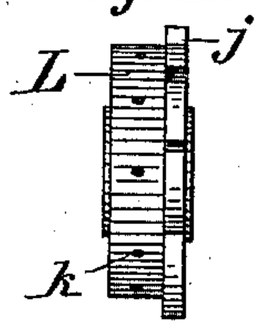


Fig. 4.



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(No Model.) 4 Sheets—Sheet 3.

G. LIGOWSKY.

CARTRIDGE LOADING MACHINE.

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Fig. 5.

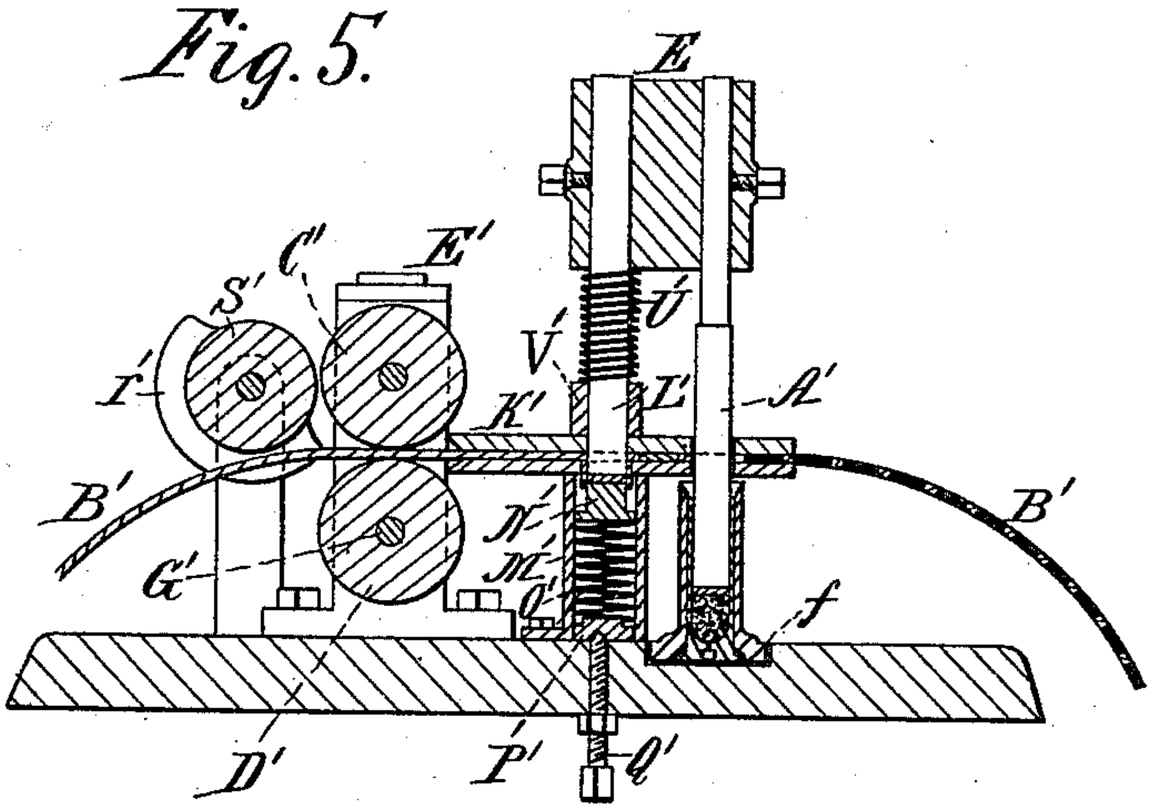


Fig. 6.

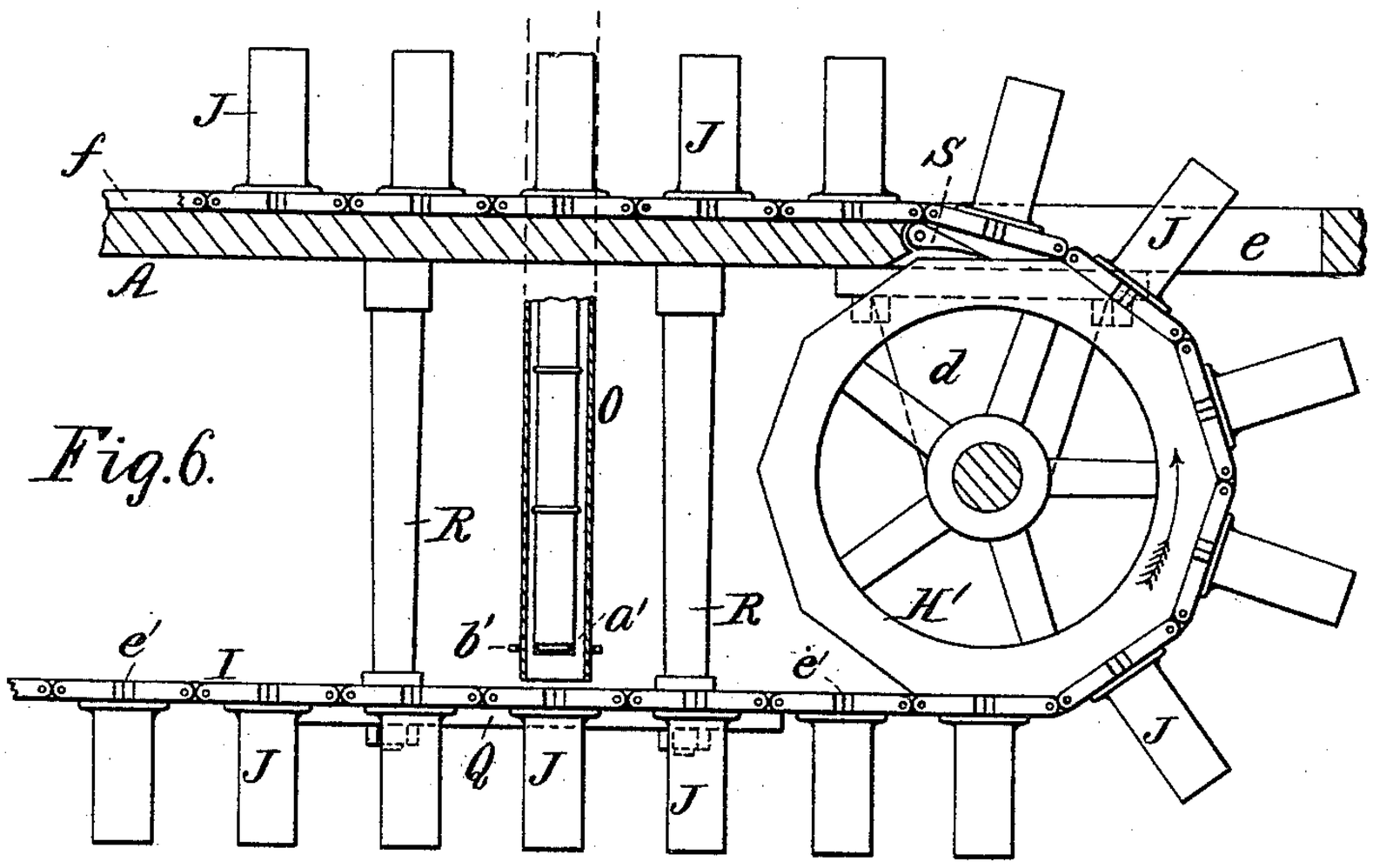
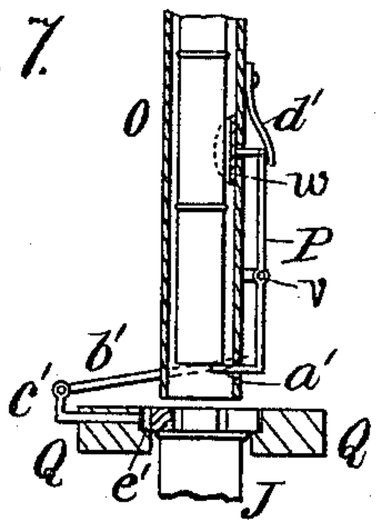


Fig. 7.



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(No Model.) 4 Sheets—Sheet 4.

G. LIGOWSKY.

CARTRIDGE LOADING MACHINE.

No. 464,883. Patented Dec. 8, 1891.

Fig. 8.

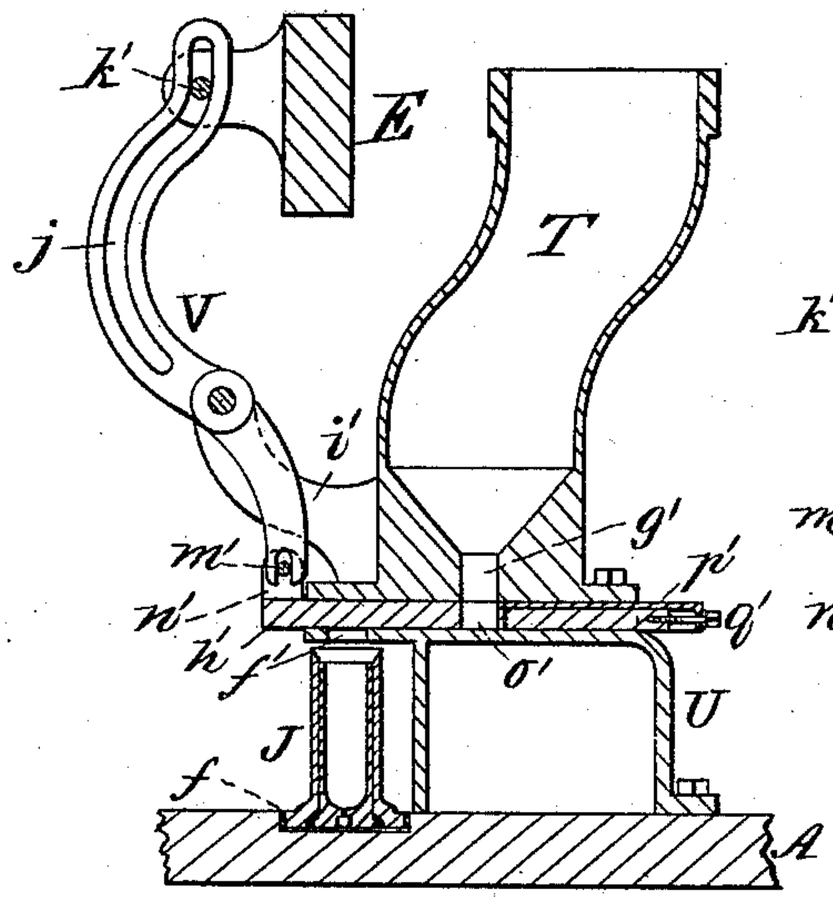


Fig. 9.

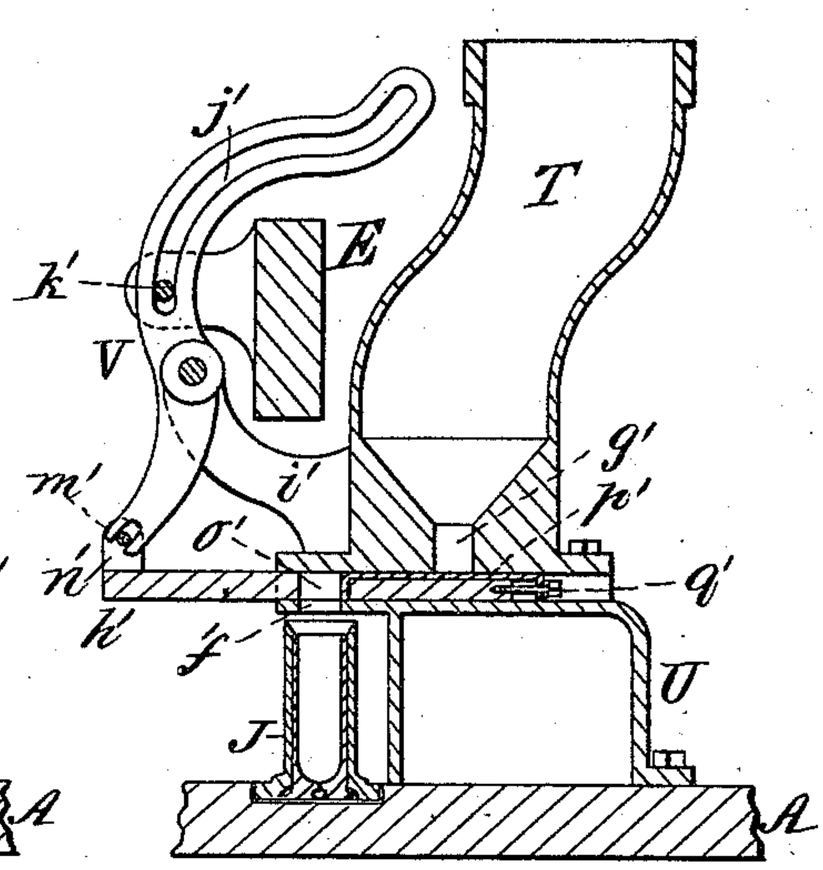


Fig. 10.

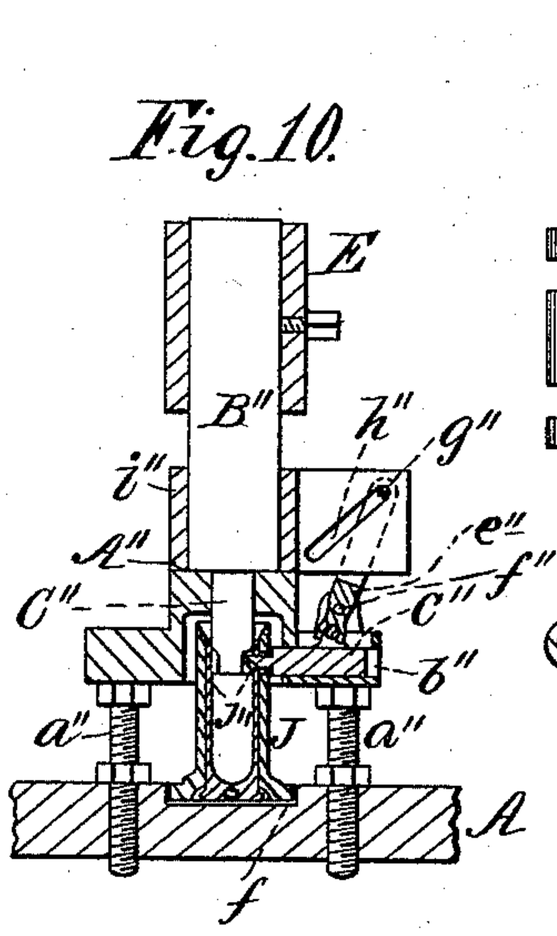


Fig. 11.

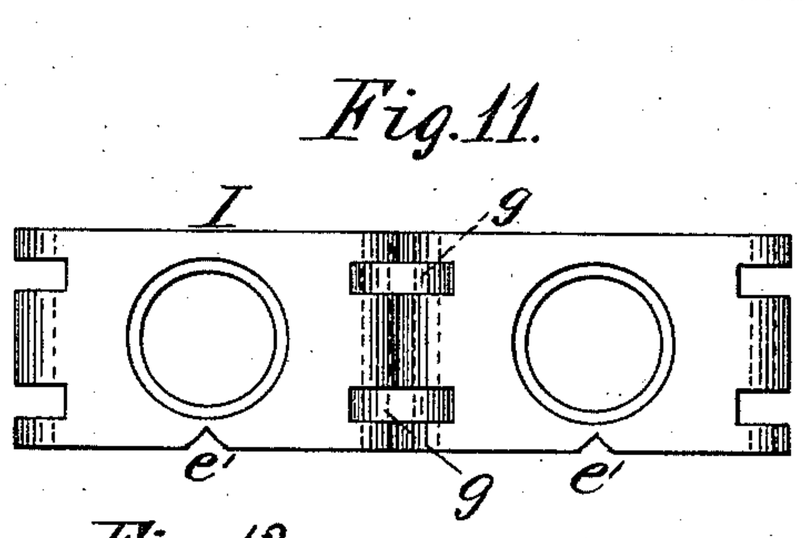


Fig. 12.

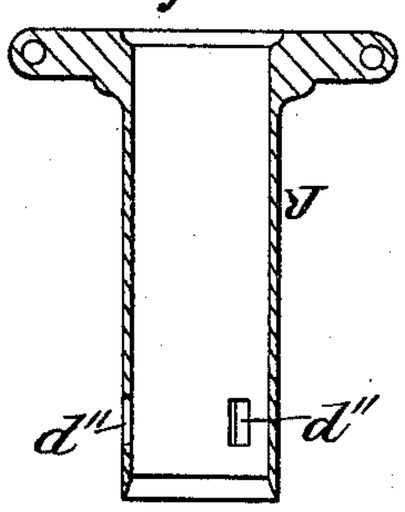
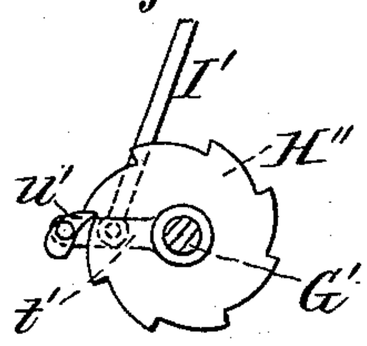


Fig. 13.



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UNITED STATES PATENT OFFICE.

GEORGE LIGOWSKY, OF CINCINNATI, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PETERS CARTRIDGE COMPANY, OF SAME PLACE.

CARTRIDGE-LOADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 464,883, dated December 8, 1891.

Application filed June 20, 1889. Serial No. 314,929. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LIGOWSKY, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Cartridge-Loading Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to that class of machines for loading shell-cartridges with powder and shot in which the operations are continuous, the empty shells being fed into the machine and then automatically passed through it and subjected to the different operations of loading and finally discharged from the machine loaded, indented, and crimped.

It has for its object the improved construction of this class of machines, and its novelty will be herein set forth, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1, Sheet 1, is a perspective front elevation of a machine embodying my invention. Fig. 2, Sheet 2, is a rear elevation of the same. Fig. 3, Sheet 2, is an enlarged sectional detail of the operating mechanism for the endless chain. Fig. 4, Sheet 2, is an end elevation of the combined ratchet and brake wheel of Fig. 3. Fig. 5, Sheet 3, is an enlarged sectional side elevation of the wad-strip feeding and cutting mechanism and associated parts. Fig. 6, Sheet 3, is an enlarged elevation of one end of the endless chain and associated parts. Fig. 7, Sheet 3, is an enlarged sectional side elevation of the shell-feeding mechanism. Fig. 8, Sheet 4, is an enlarged sectional side elevation of one of the magazines and associated parts under one position of the stroke. Fig. 9, Sheet 4, is a corresponding view to Fig. 7 under the opposite position of the stroke. Fig. 10, Sheet 4, is an enlarged sectional side elevation of the shell-crimping mechanism. Fig. 11, Sheet 4, is an enlarged plan of two connected links of the endless chain. Fig. 12, Sheet 4, is a sectional elevation of the combined link and shell-case. Fig. 13, Sheet 4, is an enlarged side elevation of the ratchet-and-pawl mechanism for feeding the wad-strips.

The same letters of reference are used to indicate identical parts in all the figures.

The frame of the machine, Figs. 1 and 2, is composed of any suitable table A, from which uprights B extend at each end. Suitably journaled in the upper ends of the uprights is a horizontal crank-shaft C, with two coincidently-set cranks, from which pitmen D extend down and are pivoted to the upper side of a cross-bar or head-block E, whose ends are guided in ways *a* upon the inner side of the uprights B.

Upon one end of the shaft C is secured a driving-pulley F and upon its opposite end two eccentric disks *b* and G, the latter of which has a cam-slot *c* in its outer face.

In bracket-lugs *d* upon the under side of the table near its front edge are journaled two wheels H H′, in this instance having polygonal peripheries of ten sides, around which are passed, so as to be taut, the shell-carrier, composed of an endless belt or chain I, which passes through slots *e*, Fig. 6, in the table at each end and has its upper part confined in a groove *f*, Fig. 5, in the upper side of the table and connecting the two slots *e*, so as to bring the top surface of the belt or chain flush with the top surface of the table. Where a metal chain composed of links is employed, as illustrated in the drawings, each link, Figs. 10 and 11, is of the exact length of one of the polygonal sides of the wheels H H′, and is pivoted at each end to its adjacent links by two smaller links *g*, or in any other suitable manner to prevent lateral flexure. Secured to and preferably integral with each link is a tubular shell-holder J (see Fig. 11) with a coincident opening through the link, which opening is countersunk to receive the flanged cap of the shell and thereby retain the latter in the holder, into which it snugly fits, as will be readily understood. The shell-holders all project from the outer surface of the links, and the slots *e* are of sufficient length to permit their free passage through the table as the wheels H H′ are rotated.

The mechanism for operating the chain and

carriers is illustrated in Figs. 1, 2, and 3, where K is a vertical rod guided in a bracket *h*, projecting from the adjacent upright B and through a slot in the table, and has at its upper end a laterally-projecting pin carrying a friction-roller *i*, confined in the cam-slot *c* of the disk G. By the side of the wheel H′ and secured upon the same shaft is a disk L, provided on one side of its periphery with ratchet-teeth *j* and on the other side with locking holes or perforations *k*. (See Fig. 4.) Between the disk L and wheel H is hung a dog-carrier *l*, to which is pivoted a gravitating or spring dog *m*, which engages with the teeth *j*, and to the outer end of which is pivoted a link *n*, which is in turn pivoted to the lower end of the rod K. By the side of the rod K and guided in the same manner is a second vertical rod M, having at its upper end under the disk G a friction-roller *o* and near its lower end a collar *p*, between which and the table is confined a coiled spring *q*, surrounding the rod. The lower end of the rod M beneath the table is formed into a rack *r*, which constantly meshes with a mutilated pinion-arm *s*, pivoted to a bracket *t* and engaging, by means of a slot and pin, a horizontal bolt *u*, guided in the bracket *t* and in line with the perforations *k* in the disk L. From this construction and the shape of the cams and relative set of the cranks of the shaft C it will be seen, assuming the machine to be in the position of Fig. 2, that at every complete revolution of the shaft C and disk G the rod K will be given a downward and then an upward stroke. In its downstroke it turns the wheel H one-tenth of its revolution and advances the shell-carrier I and its holders J one step, the carrier I imparting a corresponding rotation to the wheel H. In its upward stroke the dog *m* merely slips back into engagement with the next ratchet-tooth *j*. The periphery of the disk G is so shaped and the upper end of the rod M is of such length that immediately after this downstroke of the rod K has taken place the rod M becomes engaged by the disk G and is pressed down, thereby instantly shooting the bolt *u* into one of the perforations *k* of the disk L, thus locking the wheel H and carrier I, the position of the various parts of the machine at this point being shown in Fig. 1, where it will be seen that the cranks of the shaft C have passed their upper centers and are just ready to throw the cross-head E down, and the shape of the disk G is further such that it will continue to engage the upper end of the rod M and hold it pressed down and the disk L and wheel H′ thereby locked until the cranks of the arms C have passed their lower centers and have lifted the cross-head E high enough for the plungers carried by it to be freed from the holders of the shell-carrier. Just as the cross-head E has finished its upstroke the disk G has released the roller *o* and the spring *q* gives the rod M its upstroke and instantly retracts the bolt *u* just at the moment the rod K is ready to begin its next downstroke to effect another partial rotation of the wheel H and advancement of the carrier I and its holders J. In this manner the carrier and its holders are advanced step by step and after each advancement are held locked while the cross-head E, with its various mechanisms to be presently explained, make their down and up stroke in the work of loading the shells contained in the holders. There are eight adjacent shells being acted on simultaneously at each downstroke of the cross-head E. The last nearest the wheel H′ receives its charge of powder, the seventh previously charged receives its first paper wad, the sixth receives the felt wad on the previously-inserted wad, the fifth receives a second paper wad on the previously-inserted felt wad, the fourth receives over the powder and three wads the charge of shot, the third receives a paper wad over the shot, the second entirely loaded is indented or crimped, and the first, completely loaded and crimped, is ejected from its carrier through a registering hole in the table and into a discharging-tube N, Figs. 1 and 2.

The empty shells are fed mouth downward into a vertical feeding-tube O, which extends down through the table and has its lower open end directly over and close to the chain I. This tube is kept constantly full of shells and the mechanism for automatically dropping one at a time into the directly-subjacent holder is seen in Figs 6 and 7. Upon a lug *v*, projecting from the rear side of the tube O near its bottom, is a combined clamping and dropping arm P, having at its upper end a clamping-pad *w*, extending through an aperture in the tube O and at its lower end a flange *a′*, extending through an aperture near the mouth of said tube and engaging with the edge of the lowermost shell to hold it and the column of shells in the tube up during the shifting of the carrier and holders. An arm *b* extends from the lower part of the arm P around to the front of the tube O and is pivoted to a downwardly-extending finger *c′*, which extends through a bearing in the rib Q and bears constantly against the front edge of the chain under the tension of a spring *d′*, secured to the rear side of the tube O and bearing against the upper end of the arm P. Each link of the chain has a notch *e′*, Fig. 11, cut in its front edge at the middle, and the adjustment of the parts is such that directly the chain has been shifted each step and the mouth of the subjacent holder registers with the lower end of the tube O the finger *c′* slips into the notch *e′* of the chain under the pressure of the spring *d′*, thereby throwing back the flange *a′*, which releases the bottom shell and permits it to fall into the subjacent holder. At the same time by the tilting of the arm P, as the finger *c′* slips into the notch *e′*, the pad *w* is forced in against the shell directly above the bottom one and binds it against

the side of the tube O, thereby holding up the column of shells in said tube until the chain starts again for the next shifting, whereupon the finger c' is forced out of the notch e', and the flange a' is reinserted under the mouth of the tube O as the pad w releases its clamped shell, which, with those above it, then drops and is caught and held until the notch of the next link comes under the finger c', when the operation is again repeated, as just above described, and so the feeding of the empty shells into the holders of the carrier goes on automatically. That part of the chain under and directly adjacent to the tube O is supported on each side by guide-ribs Q, supported by standards R, secured to the under side of the table, as seen in Figs. 1, 2, and 6. As the chain, with its holders containing shells, leaves the wheel H to enter to the groove f in the top of the table there might be a tendency on the part of the shells to partially drop out of their carrier and become caught on the edge of the groove, and to overcome this the hinged follower S, Fig. 6, is provided. This consists of a wedge-shaped plate hinged in the slot e, as shown, and whose free end rides upon the periphery of the wheel H. If a shell should partially drop from the carrier, it will be caught upon the top of the follower and be pressed back to its place as the chain is shifted from the wheel into the groove of the table, as will be readily understood. Passing along from the wheel H onto the table the first shell in its carrier comes first directly under the discharge-orifice f' of the powder-magazine. (Seen in Figs. 8 and 9.) This magazine T is supported on a base U and has a feeding-throat g' directly over a horizontal slide-bar h', provided with a perforation o' of just sufficient size to receive the requisite charge of powder and which also serves as a cut-off. Pivoted to an arm i' is a curved lever V, whose upper end is slotted, as at j', to receive a pin k', carried in lugs l' upon the rear side of the cross-head E, and whose lower end is slotted to engage a pin m' between lugs n' on the rear end of the slide h'. The adjustment of the parts is such that when the cross-head E is up to its highest point the perforation o' registers with the throat g' to receive the charge of powder, as seen in Fig. 8, and when the cross-head E is down to its lowest point the slide-bar h' has been drawn back by the action of the pin k' on the lever V to cause the perforation o' to register with the discharge-orifice f' and so drop the charge of powder into the shell in the directly-subjacent holder J. To regulate the size of the charge an adjustable slide p', fitting upon the slide h', may be provided and acts to diminish the charge by being projected by a set-screw q' over the perforation o', as will be readily understood. The next shifting of the chain brings the shell with its powder under the first paper-wad rammer A', Fig. 5, which is a vertical cylinder carried by and made adjustable on the cross-head E. Associated with this rammer is the wad cutting and feeding mechanism. The paper B' is in strips and is fed in between feeding-rollers C' D', journaled in suitable boxes E', and is guided by flanges r' upon a stationary block s'. There are four of these wad feeding, cutting, and ramming mechanisms, three of which are directly side by side, and the fourth on the other side of a shot-magazine F', Fig. 1, identical in construction and mode of operation with the powder-magazine and its associated and actuating parts, so that the description of one wad feeding, cutting, and ramming mechanism (illustrated in Fig. 5) will answer for all and will be presently given.

The lower feed-wheels D' are secured to a horizontal shaft G', the end of which directly under the eccentric b is provided with a ratchet H'', Figs. 1 and 13. A pitman-rod I', with a ring J' engaging the eccentric b, has its lower end pivoted to a dog-carrier t', hung upon the shaft G' by the side of the ratchet and carrying a pivoted spring or gravitating dog u', engaging with said ratchet on its rear side. On each upstroke of the cross-head E the rod I' is lifted and turns the ratchet sufficiently to feed in the wad-strip to the required distance, and on each downstroke the dog slips back into fresh engagement, leaving the ratchet-shaft G' and feed-wheels D' stationary, as will be readily understood. The wad-strip B' passes from the wheels C' D' into and through a slotted plate K', Fig. 5, having two perforations through it, one for the passage of the rammer A' into the shell, by which the previously cut-out and replaced wad is driven down into the shell, and the other directly under a cutting-punch L', carried by and adjustable on the cross-head E directly in rear of the rammer A'.

Beneath the perforation under the punch L' is a tube M', in which is a yielding follower N', supported on a coiled spring O', and whose upper end fits into the perforation and comes flush with the bottom of the slot in the plate K', and whose office is to yield as the punch comes down and cuts out the wad and then to return the cut-out wad back into the place it occupied in the strip, so as to be advanced by the next feed of the strip and on through the slot in the plate directly under the rammer A' and over the mouth of the shell.

P' is an adjustable washer in the tube M', adjusted by a set-screw Q' to regulate the tension of the spring O'. Next to the paper strip B' is a felt strip R', Fig. 1, and then a second paper strip S', whose wads, in the order named, are, after being punched and fed, rammed into the shell upon the powder. Then comes the shot-magazine F', corresponding in construction and operation to the powder-magazine shown in Figs. 8 and 9, by which the charge of shot is placed in the shell, and then the last paper strip T', whose punched and fed wads are rammed over the

shot in the manner before described. After having the last wad rammed in the shells are designed to be finished by being indented or crimped in any suitable way; but in the present case I have particularly shown and will specially describe a form of indenting mechanism which is effective in its operation. The shells come successively under the indenting mechanism, Figs. 1, 2, and 10, consisting of a recessed head-block A″, supported on the table straddling the groove *f* by bolts *a″* and having three horizontal guides *b″*, in which slide punches *c″*, whose inner ends on the downstroke of the cross-head enter perforations *d″* in the holders J of the carrier and indent the shells over the last wad to lock it and the charge in place, and are retracted by the upstroke of the cross-head, and which punches are actuated by levers *e″*, pivoted to lugs *f″* on the head-block, engaging the punches at their lower end and having pins *g″* at their upper ends confined in inclined slots *h″* in projections from a collar *i″* upon a plunger B″, secured to the cross-head E. This plunger has at its lower end a cylindrical anvil-block C″, which passes through a perforation in the block A″ and into the top of the shell, and has indentations or grooves *j″* on its lower edge, into which the points of the punches *c″* press the inturned portions of the shell. From the indenting or crimping mechanism the shells come successively under a rammer D″, Figs. 1 and 2, which forces them on the downstroke of the cross-head E out of the holders of the carrier through a hole in the table into the discharge-tube N, as before explained. In this way eight shells in a straight line are being acted on simultaneously at each downstroke of the cross-head and the carrier is advanced one step after each upstroke of the cross-head to bring the holders successively under each of the actuating mechanisms, and the operation is rapid, continuous, and automatic throughout.

While a jointed metal chain for the shell-carrier I and polygonal wheels for supporting and revolving the same have been illustrated as the preferred form, it is to be understood that the invention as to this feature is not to be limited to such construction, for it is only essential that the carrier be of the general form of an endless belt having the shell-holders secured thereto, and within those limits it may be of any suitable material and construction, and may be supported upon and moved by either round or polygonal wheels H H′, or in any other suitable or convenient manner; but I do not mean to comprehend within the term "carrier" as employed in this application a rigid rotating table or round table carrier with shell-cases projecting therefrom, for such a form of carriers is not of my invention; Nor, so far as the mechanisms for loading the shells is concerned, is the invention to be limited to those illustrated in combination with an endless shell-carrier operating in the manner described, for any suitable or well-known forms of loading mechanism may be employed without departure from the invention. To prevent jar in the downstroke of the cross-head E the punches for cutting the wads are surround with coiled springs U′, Fig. 5, confined between the cross-head and collars V′, resting upon the plate K′ and through which the punches play.

Having thus fully described my invention, I claim—

1. In a cartridge-loading machine, the combination, with shell-loading devices, of an endless belt, band, or carrier suitably actuated, said belt, band, or carrier being provided with shell-cases secured thereto and projecting therefrom, substantially as and for the purpose set forth.

2. In a cartridge-loading machine, the combination, with an endless belt, band, or carrier provided with shell-cases secured thereto and projecting therefrom, of loading devices arranged and located over both and in line with such endless belt, band, or carrier, and mechanism for giving the carrier intermittent motion and for operating the loading devices, substantially as and for the purpose set forth.

3. In a cartridge-loading machine, the combination, with an endless belt, band, or carrier provided with shell-cases secured thereto and projecting therefrom, of a shell feeding or delivery device located in the path of the carrier, substantially as and for the purpose set forth.

4. In a cartridge-loading machine, the combination, with an endless belt, band, or carrier provided with shell-cases secured thereto and projecting therefrom, of a shell feeding or delivery device located in the path of the carrier, loading, finishing, and ejecting devices arranged over, above, and in line with said endless belt, band, or carrier, and mechanism for giving the carrier intermittent motion and for operating the loading, finishing, and ejecting devices, substantially as and for the purpose set forth.

5. In a cartridge-loading machine, the combination, with shell-loading mechanism, of the endless carrier I in operative connection with said mechanism, provided on its outer surface with open-ended projecting tubular shell-holders J, constructed and operating substantially in the manner and for the purpose specified.

6. In a cartridge-loading machine, the endless carrier I, provided with shell-holders J, in combination with a vertically-reciprocating cross-head carrying wad punchers and rammers, powder and shot magazines having valves actuated by said cross-head, and operating mechanisms for said carrier and cross-head, substantially as described.

7. In a cartridge-loading machine, the combination, with the endless carrier I, provided with shell-holders J, of the feeding-tube O,

and an automatic shell-dropper located at the lower end of said tube and actuated by the carrier I, substantially as and for the purpose described.

8. In a cartridge-loading machine, a shell-carrier made in the form of an endless chain or belt provided with projecting tubular shell-holders and carried on wheels, in combination with a table on the upper surface of which the upper part of said carrier is supported and guided and shell-loading mechanism, substantially as and for the purpose described.

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