(No Model.) 4 Sheets—Sheet 1.

J. A. BRADSHAW & M. LAPOINT.

MACHINE FOR MAKING CARTRIDGE SHELLS.

No. 370,761. Patented Oct. 4, 1887.

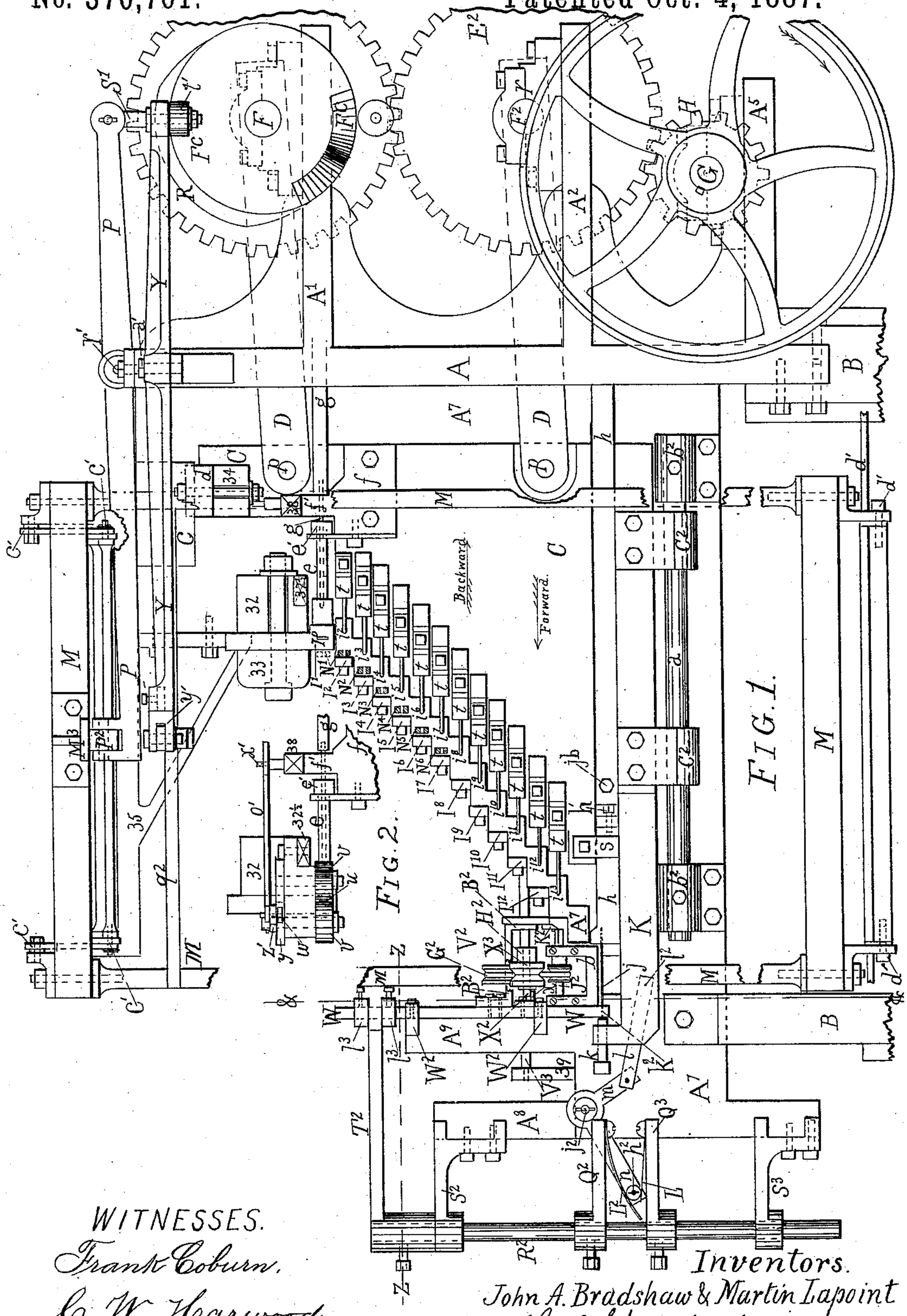

FIG. 1.

FIG. 2.

WITNESSES.

Frank Coburn.

C. W. Harwood.

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per L. J. Cherrington Attorney.

(No Model.) 4 Sheets—Sheet 2.

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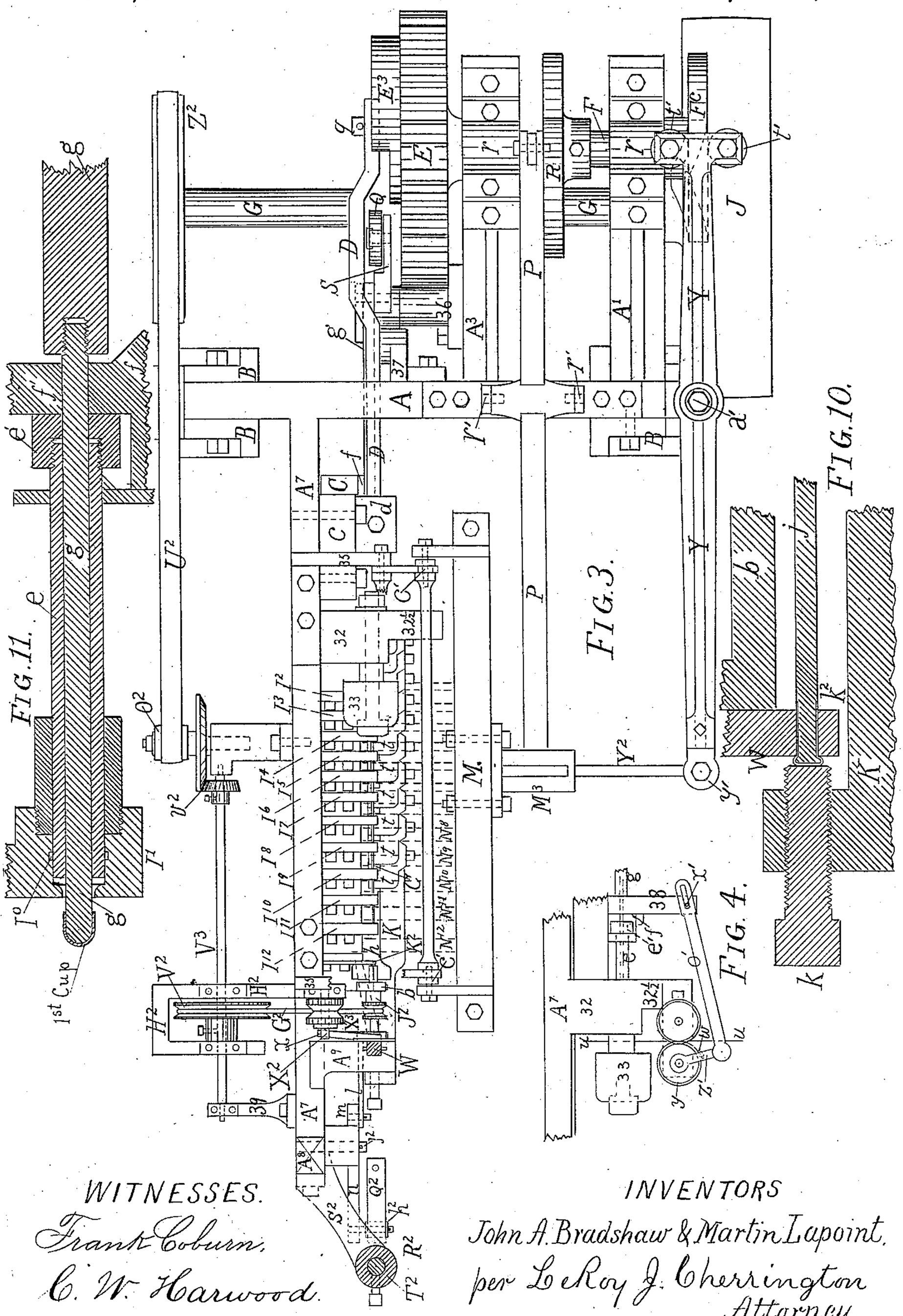

FIG. 10.

FIG. 3.

FIG. 11.

FIG. 4.

WITNESSES.

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(No Model.) 4 Sheets—Sheet 3.

J. A. BRADSHAW & M. LAPOINT.

MACHINE FOR MAKING CARTRIDGE SHELLS.

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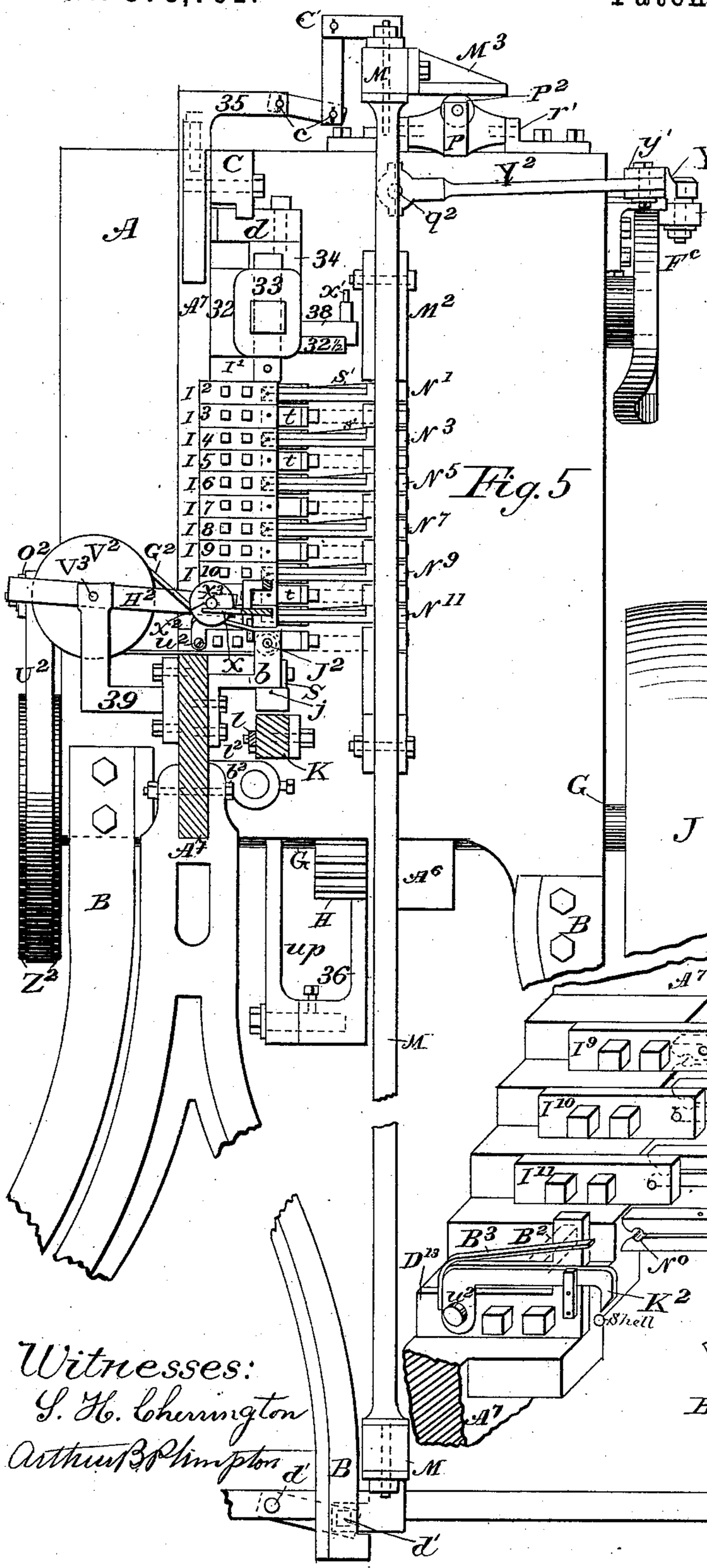

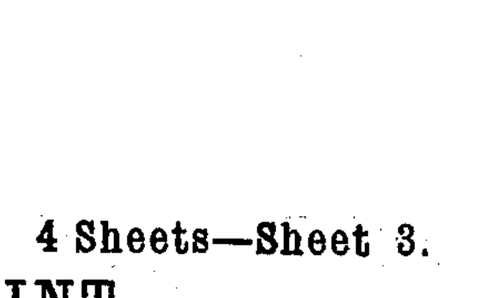

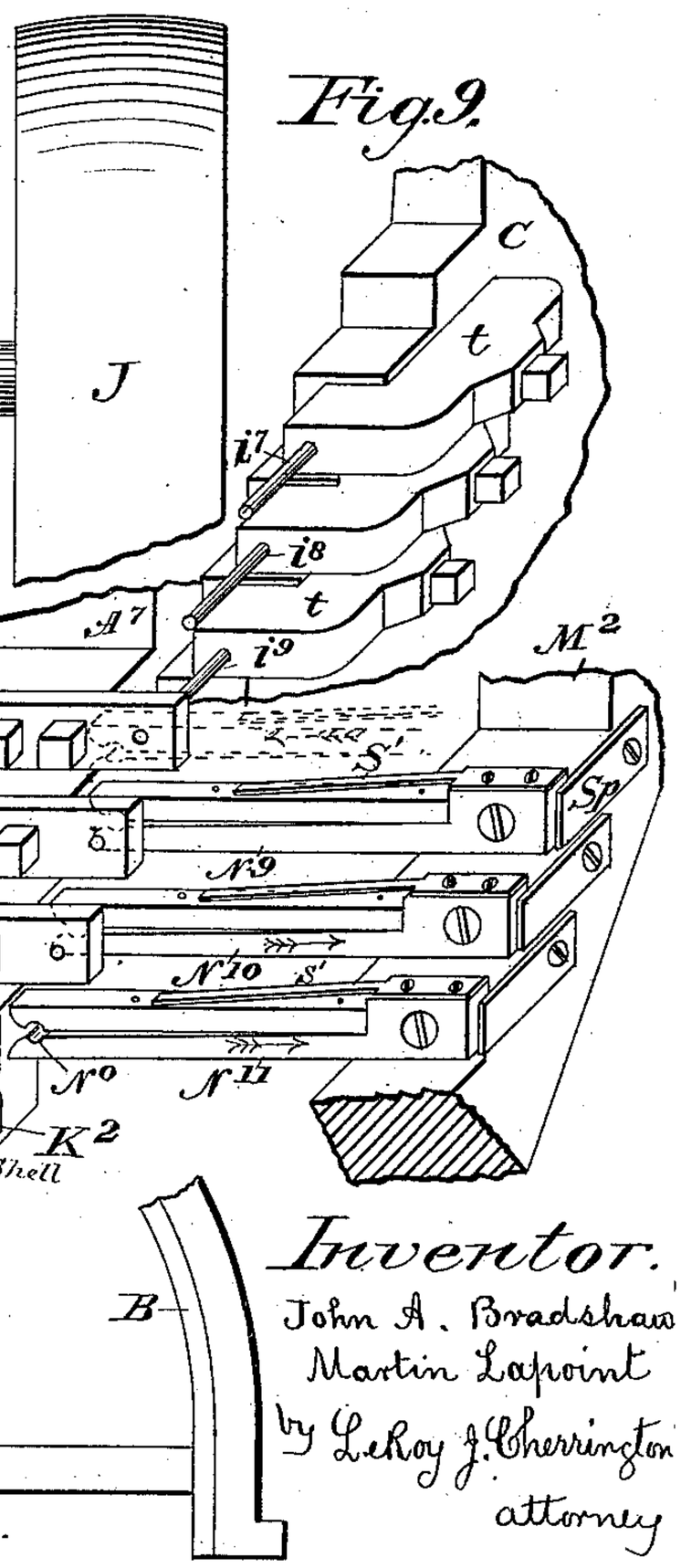

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4 Sheets—Sheet 4.

J. A. BRADSHAW & M. LAPOINT.

MACHINE FOR MAKING CARTRIDGE SHELLS.

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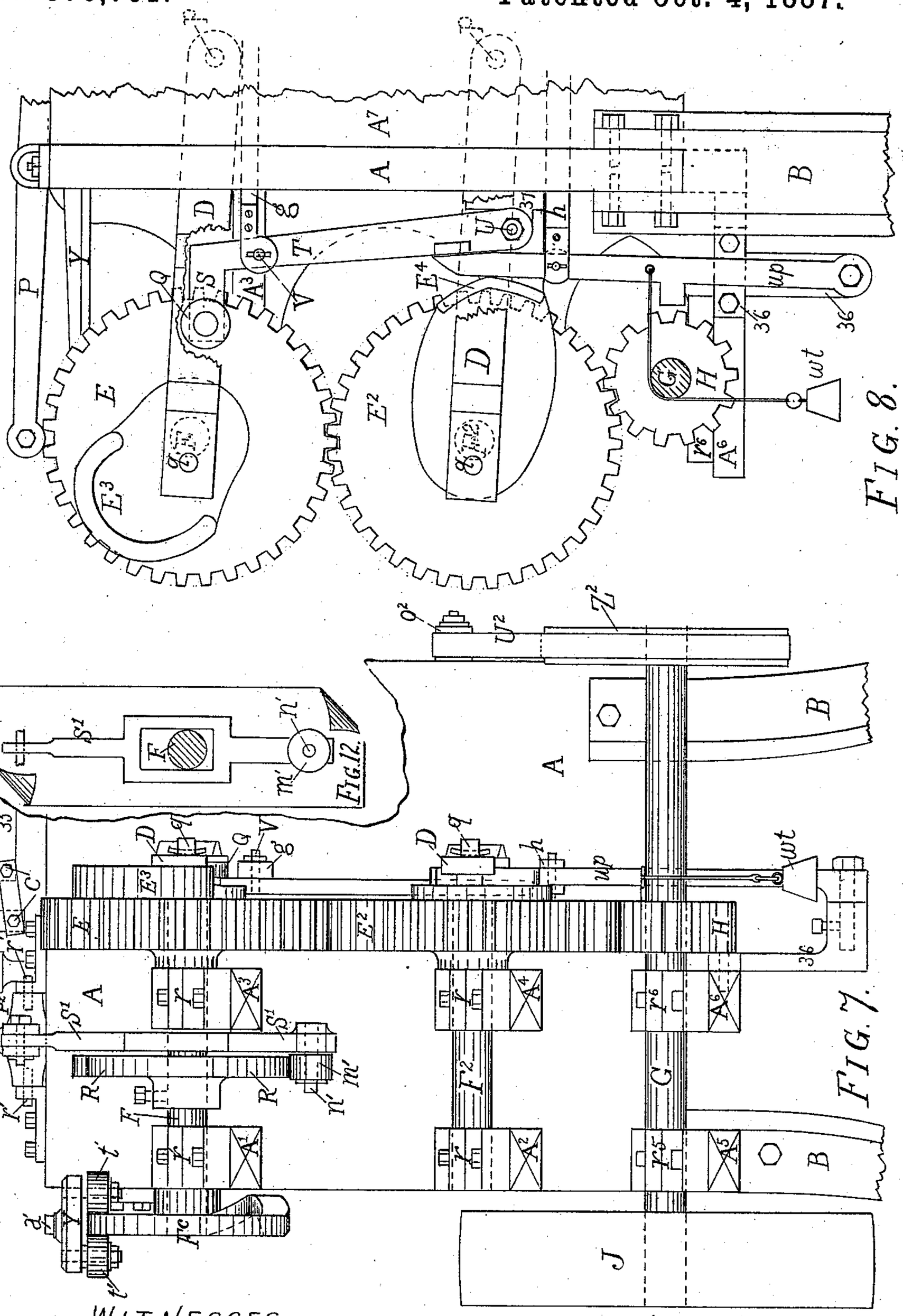

WITNESSES
Frank Coburn.
C. W. Harwood.

INVENTORS.
John A. Bradshaw & Martin Lapoint
per L. J. Cherrington Attorney

UNITED STATES PATENT OFFICE.

JOHN A. BRADSHAW AND MARTIN LAPOINT, OF LOWELL, MASSACHUSETTS, ASSIGNORS OF ONE-THIRD TO FREMONT C. FLETCHER, OF NEW YORK, N. Y.

MACHINE FOR MAKING CARTRIDGE-SHELLS.

SPECIFICATION forming part of Letters Patent No. 370,761, dated October 4, 1887.

Application filed September 20, 1886. Serial No. 214,096. (No model.)

To all whom it may concern:

Be it known that we, JOHN ALBERT BRADSHAW and MARTIN LAPOINT, citizens of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented a new and useful Cartridge-Shell-Forming Machine, of which the following is a specification.

Our invention consists in grouping a series of gradually-varying dies designed for use in the work of drawing and forming a cartridge-shell from its material in a plate of ductile metal to a completed shell, on stepped bearings running in an inclined direction, similar to the rises of a flight of steps, the shell in its progressive stages toward completion being transferred from its position after passing through one die to its position to enter the succeeding die on the next riser of the steps by a system of finger mechanism. The punching and drawing of the shell is done, in connection with said dies, by a group of correspondingly-varying punches coinciding with said dies, said punches being set on and affixed to a reciprocally-sliding carriage, which moves certain of the punches simultaneously toward and into the dies.

It also consists in automatic trimming and heading devices combined and operating in harmony with said punching and drawing mechanism. The metal from which the shells are made is automatically fed into the machine at the first cutting and drawing operation by and between feed-rolls.

Our invention is fully illustrated in the accompanying drawings, of which—

Figure 1 is a longitudinal elevation looking on one side of the length of the punches with their settings *t t*, &c., and at the ends of the dies, (the said punches pointing toward the face of the dies,) the fingers and the inclined transverse piece M^2 of the frame for supporting them being removed, in order to clearly show the punches and their settings by which they are attached to the reciprocating carriage, and their relationship with the dies. Fingers N′ to N^6 are, however, shown in vertical section in their position in front of the dies I^2 to I^7, the line of section of said fingers coinciding with the center line of the punches and the holes in their respective dies. Fig. 2 is a view of the detached feed-roll mechanism for feeding the metal ribbon into die I′, it being a view of said mechanism as would appear looking at the same in its position in front of said die in Fig. 1. It is detached to show said die and adjacent parts. The vertical sides of the frame M, for carrying the fingers N′ N^2, &c., are broken out at certain places, in order to show parts which would be otherwise obscured, and a piece of each of said sides, near the bottom thereof, is broken out and the bottom of the frame raised to save space of drawing. The arm B^2, which extends out from the delivery-bar W to the trimming-cutter K^2, is broken out in the middle to show other parts behind it. Fig. 3 is a plan, partly in section, on line Z Z of Fig. 1, a piece of one of the top rails of the swinging guides of the finger-frame M being broken out in order to show the arbor J^2 and the mechanism for trimming or squaring up the shells and other parts which would be otherwise obscured. The position of the fingers N′ to N^{12} is shown in dotted outlines thereof to avoid complication in drawings. The arm B^2, extending from the delivery-bar W to a point above the spring B^3, over the trimming-cutter K^2, (see Fig. 9,) is shown in dotted lines to more clearly depict the parts below said arm. Fig. 4 is a top view of the detached feed-roll mechanism, it being a view of the same as would appear if it were in its position in Fig. 3. Fig. 5 is an end elevation looking from the length of vertical line & & of Fig. 1 toward the exit sides of the dies I′ to I^{12}. Fig. 6 is a view of the feed-roll mechanism detached, it being a view of the same as it would appear if it were in position in Fig. 5. Alternate fingers are dotted in outline, thus fully showing the punch-settings *t t*, &c., which are bolted to the carriage C. Fig. 7 is an elevation of the end opposite to that shown in Fig. 5. Fig. 8 is an elevation of the main gears H, E, and E^2, connecting-rods D D, which extend to and connect with the reciprocating carriage C, and the main cams and shafts, being a view of the side opposite to that shown in Fig. 1. Fig. 9 is an enlarged isometric perspective view of three punches, i^7, i^8, and i^9, and their settings *t t t*, a piece of carriage C, three pairs of fin-

gers, N^9, N^{10}, and N^{11}, in juxtaposition with dies I^9, I^{10}, and I^{11}, the shell-trimming cutter K^2 and its attachments U^2 and B^3, supporting piece D^{13}, by which the cutter mechanism is fastened to the rigid body A^7, a cross-section of a shell in its position at the cutting-point of the cutter K^2, and a piece of the cross-bar M^2 of the finger-frame M. Fig. 10 is an enlarged view of a vertical section through lower part of the delivery-bar W, (the section cutting lengthwise the hole for receiving the cartridge,) and a section of the other parts connected therewith for upsetting the cartridge-head. Fig. 11 is an enlarged vertical section of the die I′, its contained punches *e* and *g*, and the piece *f*, which latter connects said punches with the carriage C, the position of said punches in their relation with the die being such as would obtain when the first cup has been formed and punched through said die by and upon the end of the punch *g*. Fig. 12 is an elevation of the yoked connecting-rod S′ and a cross-section of shaft F, which passes through it.

Similar letters refer to similar parts throughout the several views.

The parts A, A′, A^2, A^3, A^4, A^5, A^6, and A^7 constitute the rigid body of the machine supported on legs B B B.

C is the reciprocating carriage provided with the boxes C^2 C^2, which slide on the rod *a*, which is set-screwed into bearings b^2 b^2, which latter are bolted to the part A^7 of the rigid body, said carriage being held upright by another slide-bearing at the top by means of piece *c*, attached to the body A^7, and the piece *d* on the carriage. To this carriage are securely bolted the punch-settings *t t*, &c., the piece *f*, which loosely holds the hollow punch *e* and the following-punch *g* within said punch *e*. The carriage also holds in a groove the sliding bar *h*, which reciprocates independently of said carriage and is held in place by the plate *s*, and carries the heading-punch *j*. The carriage also has firmly secured to it by bolts the header-bar K, in the offset end of which is the head-upsetter *k*, which latter is adjustable in said bar by a screw movement. To the header-bar K is also attached by a pin the connecting-rod *l*, which swings on said pin and operates the crank *m n*. The carriage C is caused to slide on the rod *a* and upper bearing, *c d*, by the connecting-rods D D, secured to said carriage by the pins *p p* at one end and by the crank-pins *q q*, connected to the gears E E^2 at their outer end, the gears turning with the shafts F F^2, respectively, which have their bearings in boxes *r r r r*, resting on projecting parts A′, A^2, A^3, and A^4 of the rigid body. The driving-shaft G is engaged by gear H (which latter turns with said shaft) with gear E^2, and is moved by power imparted to the driving-pulley J.

The remaining letters of reference will be explained in the following description of the operation of the machine:

The position of the principal collective parts shown in the drawings is such as would be when the machine was ready to begin the first operation in the forming of a cartridge-shell.

A ribbon of copper, *u*, or other ductile metal being inserted between the feed-rolls *v v*, it is during a backward movement of the carriage C fed into the entrance I^9 in the die I′, toward and closing the round passage through which the hollow punch *e* and the following punch *g* move. This feeding motion is communicated to the rolls *v v* by the pawl *w*, which is attached to the radial reciprocating arm *z′*, and engages with the teeth on the circumference of the gear *y*. This gear *y* is fixed to the top of the vertical shaft of one of the rolls *v* and engages with a gear of the same size fixed to the top of the shaft of the other feed-roll. The radial arm *z′* is operated by the connecting-rod *o′*, which is pinned by one end to said arm, and by the other end through a slot therein by the pin *x′* to a post standing up from an offset on top of piece *f*. When the metallic ribbon *u* has been fed into the die I′, the hollow punch *e* advances toward it by the forward motion of the carriage C and the pressure of the shoulder *f′* on the piece *f* against the nut *e′* on the outer end of the said hollow punch. The inside following punch *g* also loosely passes through the piece *f* on its way out to its contact with the eccentric-cam E^3, by which it is operated. As soon as the hollow punch *e* has cut a round disk from the metallic ribbon the inside following punch *g*, which has a convex end, advances toward said disk by the pressure of the eccentric-cam E^3 against the friction-wheel Q, said friction-wheel turning on a pin which connects it with an arm, S, extending from the vertical stay T, which stay is hinged at its bottom on bolt U and at its top by the pin V through a hinge-joint to the outer end *g* (see Figs. 3 and 8) of the punch *g*. The metal disk cut by the hollow punch *e* is next forced through the smaller hole in the delivery side of the die I′, and is thus formed into the shape of a cup, which covers the end of the punch *g* as it protrudes beyond the delivery side of the die I′. This cup or rudimentary shell is next to be conveyed down to the entrance of die I^2 by the pair of fingers N′. This pair of fingers, and the others N^2 to N^{12}, are securely affixed by their outer ends to the cross-bar M^2, which extends obliquely from side to side of the finger-frame M, the obliquity corresponding to the incline of the line of dies. This cross-bar is stepped for convenience in attaching the fingers. It is shown perspectively in part in Fig. 9. The lower half of each pair of fingers is firmly secured to the said cross-bar M^2, and the upper half is loosely secured to the lower half by pins driven into the latter, the loose half closing upon the fixed half by the pressure of the spring *s′*.

The operation of the fingers is as follows: The pair of fingers N′, which during the punching of the disk in the die I′ and the forming of the first cup or rudimentary shell has

been at rest beneath the exit side of die I′ and in front of die I², is now moved in a horizontal direction outward from the line of dies, as shown by the arrows, Fig. 9, by the swinging movement of the finger-frame M on its hinge-joints *d′ d′* at each side of the bottom thereof, the other hinge-joints, *c′ c′*, at the top, permitting said movement, while the bracket M³, which projects from the frame M, moves on the friction-roller P², which supports it. This horizontal movement of the finger-frame M is produced by the cam F *c*, set-screwed to the end of the shaft F, the motion being communicated to the finger-frame M through the lever Y, which swings on the fulcrum-pin *a′* and the connecting-rod Y², the latter being jointed at one end to the cross-bar *q′* on the finger-frame M, and at the other end by a hinge-joint to the piece *y′*, which has a slight swivel motion in the end of the lever Y. The friction-wheels *t′ t′*, revolving on axle-pins projecting from the under side of the other end of the lever Y, embrace the cam F *c* and take up the horizontal motion it conveys. The position of this cam in the drawings is such as it would be when the fingers N′ are at rest in front of the entrance of the die I². When the group of fingers has been moved horizontally away from the entrance to the dies by the cam movement just narrated, the finger-frame M, with its fingers, is then lifted (the hinge-joints *d′ d′* at each side of the bottom and that of *c′ c′* at the top permitting such upward movement and preserving its proper distance from the line of the punches) by the upward movement of one end of the tilting lever P, the roller P² pressing upward against the bracket M², attached to the upper rail of said frame. This lever P tilts on the fulcrum-pins *r′ r′*, and motion is communicated to it by the connecting-rod S′, which has a yoke at its lower end, which yoke embraces the shaft F, said shaft holding it in vertical position. A friction-wheel, *m′*, on a pin, *n′*, projecting at right angle from near the bottom of said yoke, is pressed downward by the eccentric-cam R, secured to and revolving with said shaft F. This downward pressure of the cam R raises the other end of the tilting lever P and with it the finger-frame M. When the finger-frame has been raised to its highest point by this cam-pressure, it is quickly carried toward the dies again by a reverse movement horizontally imparted by the cam F*c*, (and with it the group of fingers,) so that the hollows N° of the fingers which receive the shell occupy a position in front of and coinciding with the holes in the dies and directly above the position said fingers occupied at the first instance before being moved horizontally outward and upward. Just as the frame and fingers are completing this last horizontal movement toward the dies the upper and lower half of the fingers N′ (for instance) open by striking their inside beveled surfaces against the circumference of the cup, which has been punched through the die I′ by the inside following punch, *g*, and remains covering the point of said punch, the fingers firmly closing on the shell by the pressure of the spring *s′*. (See Fig. 9.) The spring Sp, which presses against the fixed end of the lower half of the fingers, permits a slight downward leverage movement of the other end, so it may slide under the shells and spring up again to centralize the shells with the punches and holes in the dies. The raised position of the fingers N′ is shown in section with dotted outline in Fig. 1. When fingers N′ have clutched the first cup and the punch *g* has been drawn out of it by a backward movement imparted by cam E³, and the other punches have been drawn out of and away from their respective dies, then, by the turning of the eccentric-cam R and the movement of its eccentric projection away from contact with and downward pressure upon the friction-wheel *m′*, at the foot of connecting-rod S′, the frame is allowed to gravitate to its former position with the fingers N′ in front of the die I², and the first cup or rudimentary shell is then in position to receive into it the punch *i²*, when the carriage C shall again move forward. At the same time that the carriage again moves forward the process of punching another disk and forming another rudimentary shell is repeated, as before, and so continues as often as the carriage is reciprocated. As the several pairs of fingers alternately take a shell in process from a punch above and deliver it to the punch and die below, the shells are progressively drawn from the shallow rudimentary cup to the lengthened and completely-drawn shell, the drawing being accomplished by the dies and punches being gradually smaller all the way from die I′ and punch *g* to die I¹² and punch *i*¹². When the shell in process of drawing has passed through die I¹², it is delivered in front of the revolving hollow arbor J², and is pushed by the advancing punch *i*¹³ into the end of said arbor. This arbor is supported by and revolves in the upright parts of the lathe-head *b* by means of the belt G², which runs in the V-shaped groove around the enlarged circumference of said arbor. Leaving for the time being this arbor and going to the header-bar K (see Fig. 1) it will be seen how the belt G² revolves the arbor J². The header-bar K being bolted to the carriage C when the carriage moves forward, carrying the punches toward their respective dies, a swinging movement of the double crank *m n* on its axle-pin *j²* is produced through the connecting-rod *l*, one end of which rod swings on a pin, *l²*, in the back of said header-bar, the other end being pinned to the crank-arm *m*. By this movement of the arms *m n* the friction-wheel *h²* on the arm *n* presses upward against the spring L², which is fastened to the outer end of the arm Q². This arm is set-screwed to the movable rod R², which has a vertical movement in the bracketed boxes S² and S³, bolted to the upright piece A⁸ on the rigid body A⁷. The spring L² is sufficiently stiff to support the weight of the rod R² and its attachments and

connections, which are all lifted by the upward swinging of the arm *n*. The purpose of this spring is to permit of a continuous forward movement of the carriage C and header-bar K while the delivery-bar W, with its connections, remains at rest after being lifted to its full height and during the time it is receiving a shell from the delivery or exit end of the hollow arbor J^2. To the rod R^2, at its top part, is also set-screwed the longer arm, T^2, which reaches out to and receives the just-mentioned delivery-bar W, said bar passing through a hole near the outer end of the said arm T^2. Two collars, l^3 l^3, one above and the other below said arm, are fixed to the delivery-bar W, which collars carry the bar up and down in its bearings W^2 W^2, which project from the upright pieces A^9 on the rigid body A^7, with the corresponding movement of the rod R^2.

Attached to the delivery-bar W is an arm, *x*, (see Figs. 1 and 3,) reaching out to and supporting the short shaft or axle pin X^2, on which revolves the grooved loose wheel X^3. This wheel is attached by its axle-pin to the frame H^2, and by its superior weight presses downward upon and tightens the slack belt G^2 when the delivery-bar W is in its downward place before it is raised by the just-described movement of its various connections to the header-bar K. The tightening of the belt G^2 sets the arbor J^2 into revolution by power communicated from the pulley Z^2 on the end of the main driving-shaft G through the belt U^2, pulley O^2, beveled gears v^2, shaft V^3, and grooved wheel V^2 thereon, over which runs the belt G^2.

Going back to the shell after it has been pushed into the end of the hollow arbor J^2 by the punch i^{13}, it will be seen that the revolution of the arbor revolves the shell also, because the end of the arbor being split longitudinally for a little distance is thus converted into spring-jaws, which close with sufficient pressure on the circumference of the shell to firmly hold it. When the hollow arbor J^2 with its contained shell has been set into revolution in the manner described, and before the delivery-bar has been carried to its lowest point, the arm B^2, attached to and projecting out from the said bar, presses downward upon the spring B^3, (see Fig. 9,) attached to and overhanging the cutter K^2, by which pressure the cutting end of the cutter swings downward on pin u^2, and by the continuous downward pressure of the delivery-bar and the arm B^2 the cutting-point of the said cutter is pressed against the circumference of the shell near its ragged end, which projects beyond the end of the arbor J^2, and by the revolution of said arbor, together with the pressure aforesaid on the spring B^3, and through said spring on the cutter K^2, the cartridge shell is trimmed and its end squared at right angles with its sides. While the shell is being trimmed, the punch i^{13}, moving with the other punches, is drawn backward from the end of the arbor, allowing the waste end of the cartridge-shell to drop away. A continuous entrance of trimmed shells into the arbor pushes them along in contiguous order through its whole length until the first one entered is finally discharged at the other end, when it is driven by the row of shells in the interior of the arbor into a hole, k^2, (see Figs. 1 and 10,) in the delivery-bar, which hole, when the delivery-bar is raised to its highest point, coincides with the hollow which extends longitudinally through the arbor J^2. After a trimmed shell is driven into the delivery-bar it descends with said bar to the level of and opposite to the end of the heading-punch *j*. Then by the forward movement of the sliding bar *h*, operated by the cam E^4 on the gear E^2, the heading-punch *j* advances toward the delivery-bar and into the descended shell therein contained, the trimmed end of the shell bearing against a shallow shoulder turned on said punch. At the same time the carriage C is just completing its backward movement, and while the shell is held with its closed end slightly projecting beyond the exit side of the delivery-bar the end of the head-upsetter *k*, screwed into the offset of the header-bar K, forcibly presses against the closed end of the cartridge-shell with sufficient power to upset the required head upon it. When the head is formed on the shell, the heading-punch *j* on bar *h* moves backward out of the perfected shell (leaving said shell in the delivery-bar) by the backward movement of the cam E^4, assisted by the weight *wt* and lever *up*. This backward movement of the heading-punch leaves the perfected shell free to be lifted with the next upward movement of the delivery-bar, and when it has been so lifted and another trimmed, but unheaded, shell is pushed out of the arbor J^2 it drives out and sets free the perfected shell from the delivery-bar. The space between the spring L^2, at its point of contact with the friction-wheel h^2, and the arm Q^3, below said wheel, is sufficient to allow the said wheel to move downward a little away from the spring L^2, while the header-bar K and head-upsetter *k* are moving the slight distance required for the upsetting of the head on the shell, and this slight downward movement of the friction-wheel h^2 is taken up by the weaker spring, L, which is fastened to the outer end of the arm Q^3. The set-screw *h'*, by being turned in the part of the bar *h* behind the plate *s* and bearing against the other part of said bar, (the joint-bolt *jb* permitting of endwise motion of the two parts of the bar *h*,) the point of the heading-punch *j* is adjusted to a suitable contact with the trimmed cartridge-shell while it is being headed.

Having described our invention and its operation, what we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination, in a machine for forming cartridge-shells, of the suitably-supported reciprocating carriage C, punch *e*, collection of graduated punches i^2 to i^{12}, or any number of said graduated punches requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, the punch *g*, said punch advancing independently of the

movement of said carriage C, die I′, the collection of graduated dies I^2 to I^{12}, or any number of said graduated dies requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, and the rigid body A^7, all substantially as set forth.

2. The combination, in a machine for forming cartridge-shells, of the suitably-supported reciprocating carriage C, punch *e*, graduated punches i^2 to i^{12}, or any number of said graduated punches requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, the punch *g*, advancing independently of the movement of said carriage C, die I′, the collection of graduated dies I^2 to I^{12}, or any number of said graduated dies requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, punch i^{13}, the rigid body A^7, the intermittingly-revolving arbor J^2, lathe-head *b*, and the trimming-cutter K^2, all substantially as shown, and for the purpose or purposes set forth.

3. In a machine for forming cartridge-shells, the combination of the suitably-supported reciprocating carriage C, header-bar K, head-upsetter *k*, connecting-rod *l*, rigid parts A^7, A^8, and A^9, crank *m n*, spring L^2, arms Q^2, Q^3, and T^2, vertical shaft R^2, delivery-bar W, heading-punch *j*, and reciprocating bar *h*, all substantially as shown, and for the purpose set forth.

4. In a machine for forming cartridge-shells, the combination of the suitably-supported reciprocating carriage C, rigid body A^7, punch *g*, punch *e*, die I′, one or more dies, I^2 to I^{12}, one or more punches, i^2 to i^{12}, one or more pairs of fingers, N′ to N^{12}, and finger-frame M, said frame being suitably supported in connection with body A^7 and moving in juxtaposition to and with said punches, substantially as described, all as and for the purpose or purposes set forth.

5. In a machine for forming cartridge-shells, the combination of a series of punches and corresponding dies adapted and adjusted to punch and draw a cartridge-shell, and means for supporting and bringing together said punches and dies with one or more pairs of fingers, N′ to N^{12}, said fingers being suitably supported and alternating in their movement from one punch or die to another punch or die, substantially as and for the purpose or purposes set forth.

6. In a machine for forming cartridge-shells, the combination, with an intermittingly-rotating arbor, J^2, means to actuate the same, heading-punch *j*, head-upsetter *k*, and means to actuate said punch and upsetter toward one another, of the delivery-bar W and means to reciprocally actuate said bar, all substantially as set forth.

7. In a machine for forming cartridge-shells, the combination, with an intermittingly-rotating arbor, J^2, and means to rotate the same, of the trimming-cutter K^2 and means to actuate said cutter in trimming a cartridge-shell simultaneously with the rotation of said arbor, all substantially as set forth.

8. In a machine for making cartridge-shells, the combination of the rigid body A^7, die I′, graduated dies I^2 to I^{12}, or any number of said graduated dies requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, the suitably-supported reciprocating carriage C, punch *e*, punch *g*, graduated punches i^2 to i^{12}, or any number of said graduated punches requisite to completely draw a cartridge-shell after the rudimentary cup therefor is formed, punch i^{13}, intermittingly-revolving arbor J^2, lathe-head *b*, heading-punch *j*, reciprocating bar *h*, header-bar K, head-upsetter *k*, connecting-rod *l*, crank *m n*, the arm *n* of said crank lifting against the spring L^2 with or without the intervention of the friction-wheel h^2, supports S^2, S^3, and A^8, shaft R^2, arms T^2, Q^2, and Q^3, spring L^2, supports A^9 and W^2, delivery-bar W, arm *x*, tension-weight wheel X^3, said wheel being suitably supported in connection with belt G^2 and grooved pulley V^2, arm B^2, trimming-cutter K^2, and spring B^3, all substantially as set forth.

9. A machine for making cartridge-shells, consisting of the combination of the rigid body and parts A, A′, A^2, A^3, A^4, A^5, A^6, A^7, A^8, and A^9, shafts G, F, and F^2, gears H, E, and E^2, connecting-rods D D, suitably-supported reciprocating carriage C, cam E^4, reciprocating bar *h*, die I′, two or more graduated dies, I^2 to I^{12}, cam E^3, punches *e* and *g*, two or more graduated punches, i^2 to i^{12}, punch i^{13}, header-punch *j*, header-bar K, head-upsetter *k*, intermittingly-revolving arbor J^2, lathe-head *b*, connecting-rod *l*, crank *m n*, the arm *n* of said crank lifting against the spring L^2 with or without the intervention of the friction-wheel h^2, bracket-boxes S^2 and S^3, shaft R^2, arms T^2, Q^2, and Q^3, spring L^2, delivery-bar W, supports therefor W^2, arm B^2, trimming-cutter K^2, spring B^3, arm *x*, tension-weight wheel X^3, belt G^2, pulley V^2, said pulley being operated by any suitable mechanism in connection with shaft G, finger-frame M, said frame being suitably hung to rigid body A^7, so as to operate, as described, one or more pairs of fingers N′ to N^{12}, connecting-rod Y^2, horizontally-reciprocating lever Y, cam F*c*, tilting lever P, connecting-rod S′, eccentric-cam R, and feed-rolls *v v*, said feed-rolls being operated by any suitable mechanism, and all substantially as set forth.

JOHN A. BRADSHAW.
MARTIN LAPOINT.

Witnesses:
FRANK COBURN,
S. H. CHERRINGTON.