5 Sheets--Sheet 1.

M. & D. HAIN.

Nail-Cutting Machines.

No. 133,935. Patented Dec. 17, 1872.

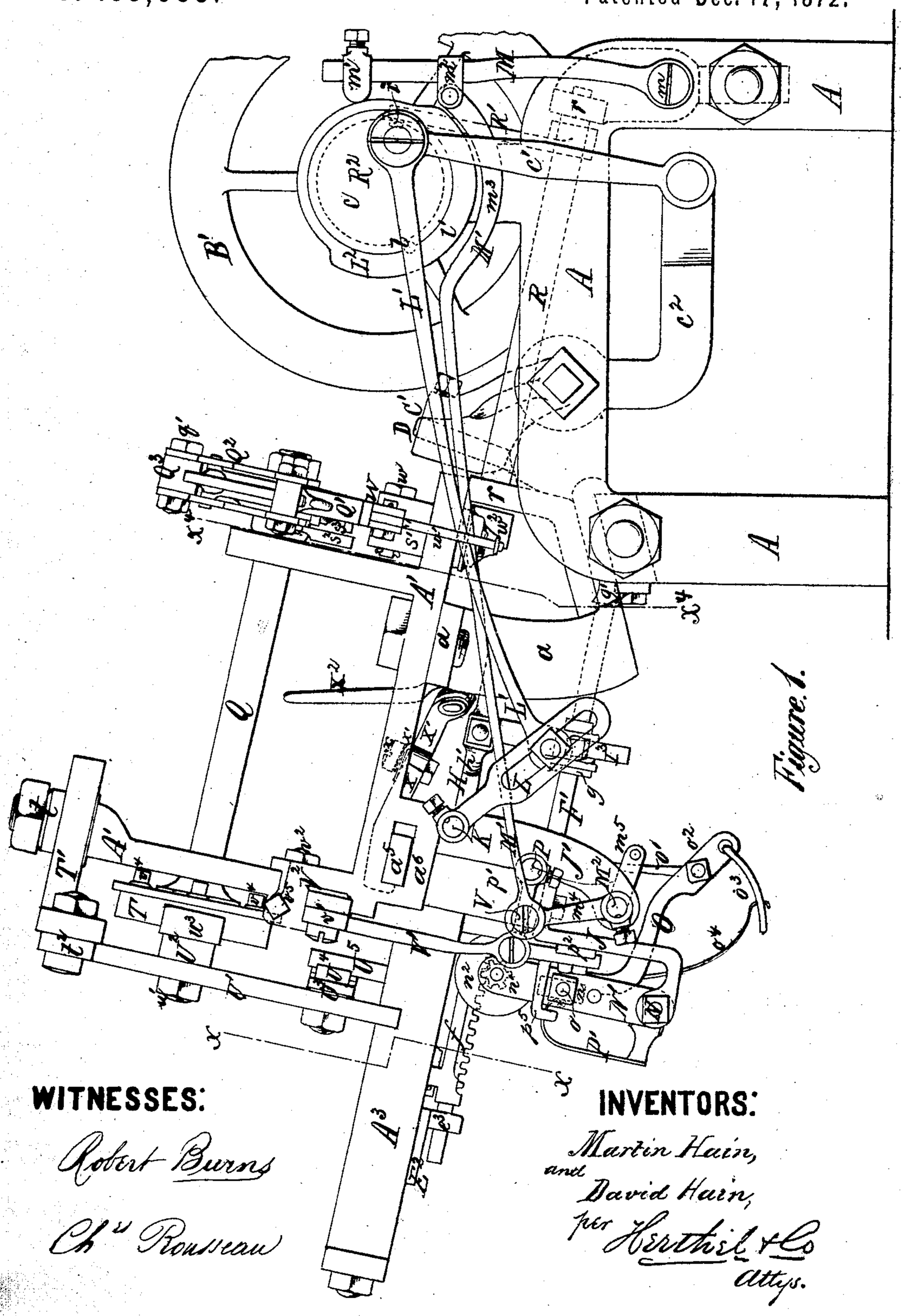

Figure 1.

WITNESSES:

Robert Burns

Ch.s Rousseau

INVENTORS:

Martin Hain,
and
David Hain,
per Herthel & Co
Attys.

5 Sheets--Sheet 2.

M. & D. HAIN.

Nail-Cutting Machines.

No. 133,935. Patented Dec. 17, 1872.

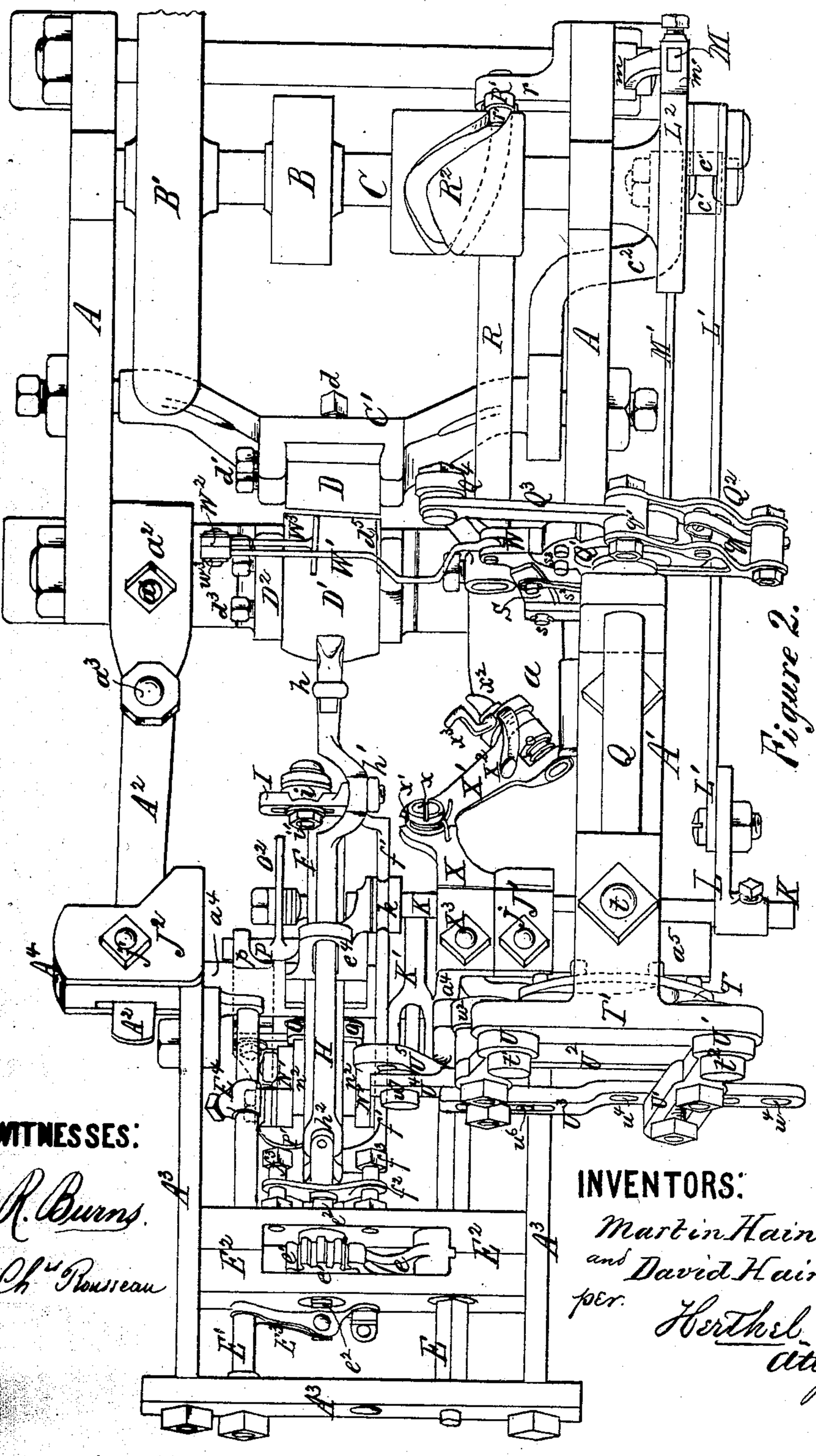

Figure 2.

WITNESSES:

R. Burns.

Ch.s Rousseau

INVENTORS:

Martin Hain
and David Hain
per: Herthel & Co
attys.

5 Sheets--Sheet 3.

M. & D. HAIN.

Nail-Cutting Machines.

No. 133,935. Patented Dec. 17, 1872.

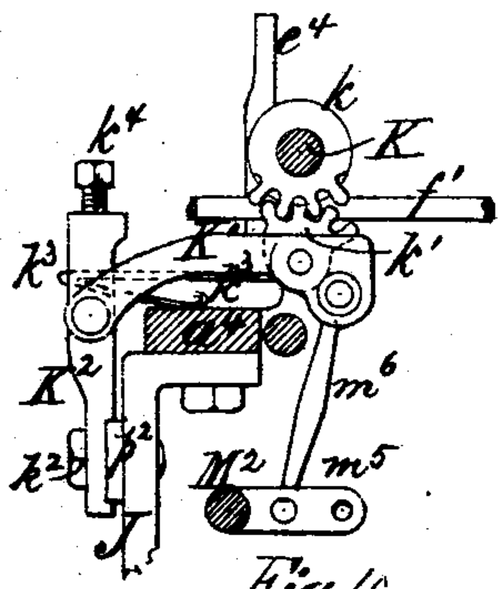

Fig. 4.

Figure 3.

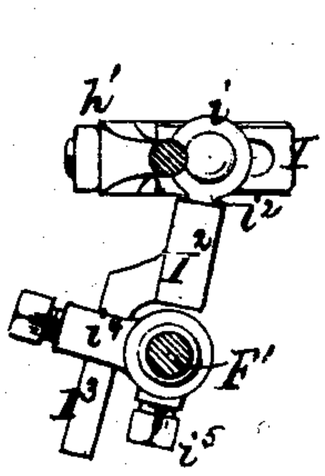

Fig. 6.

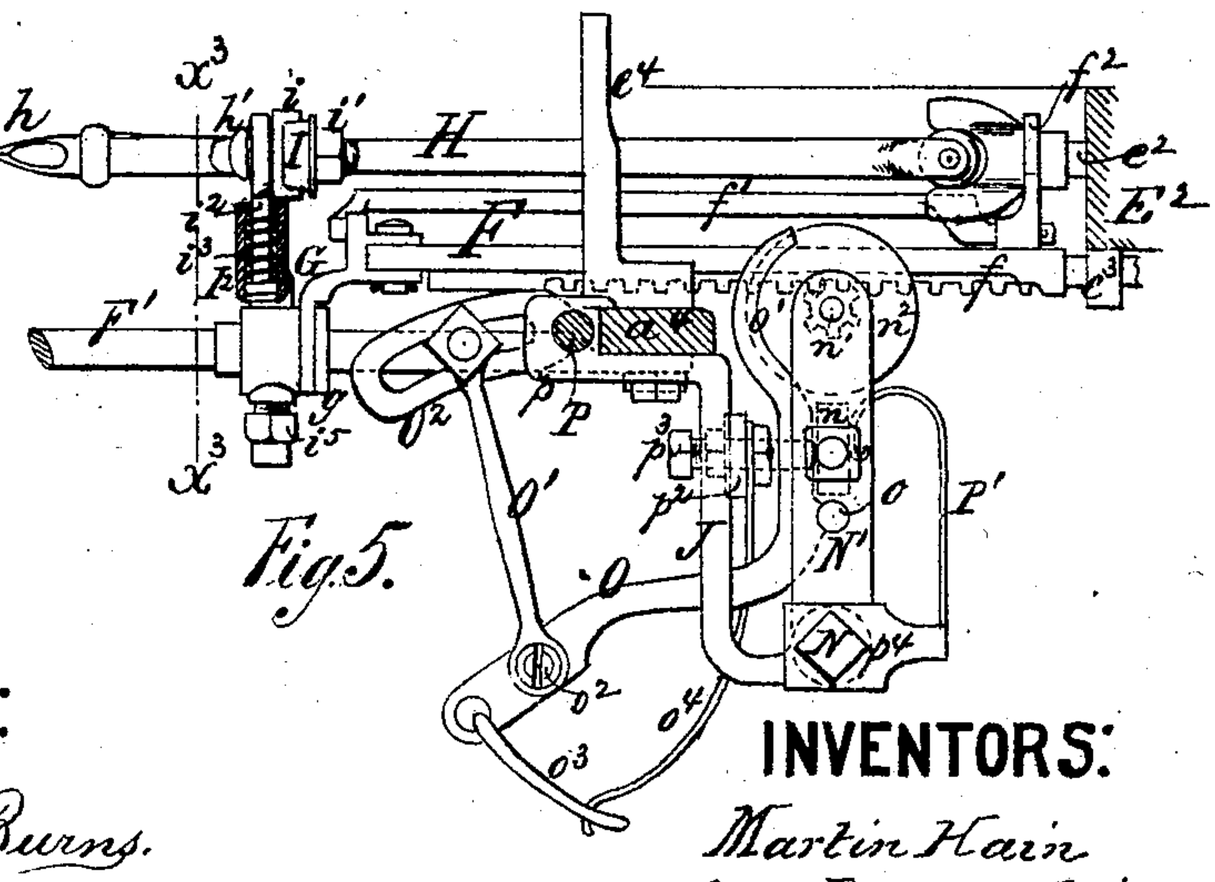

Fig. 5.

WITNESSES:

Robert Burns.

Ch" Rousseau

INVENTORS:

Martin Hain
and David Hain
per Herthel & Co attys

5 Sheets--Sheet 4.

M. & D. HAIN.

Nail-Cutting Machines.

No. 133,935. Patented Dec. 17, 1872.

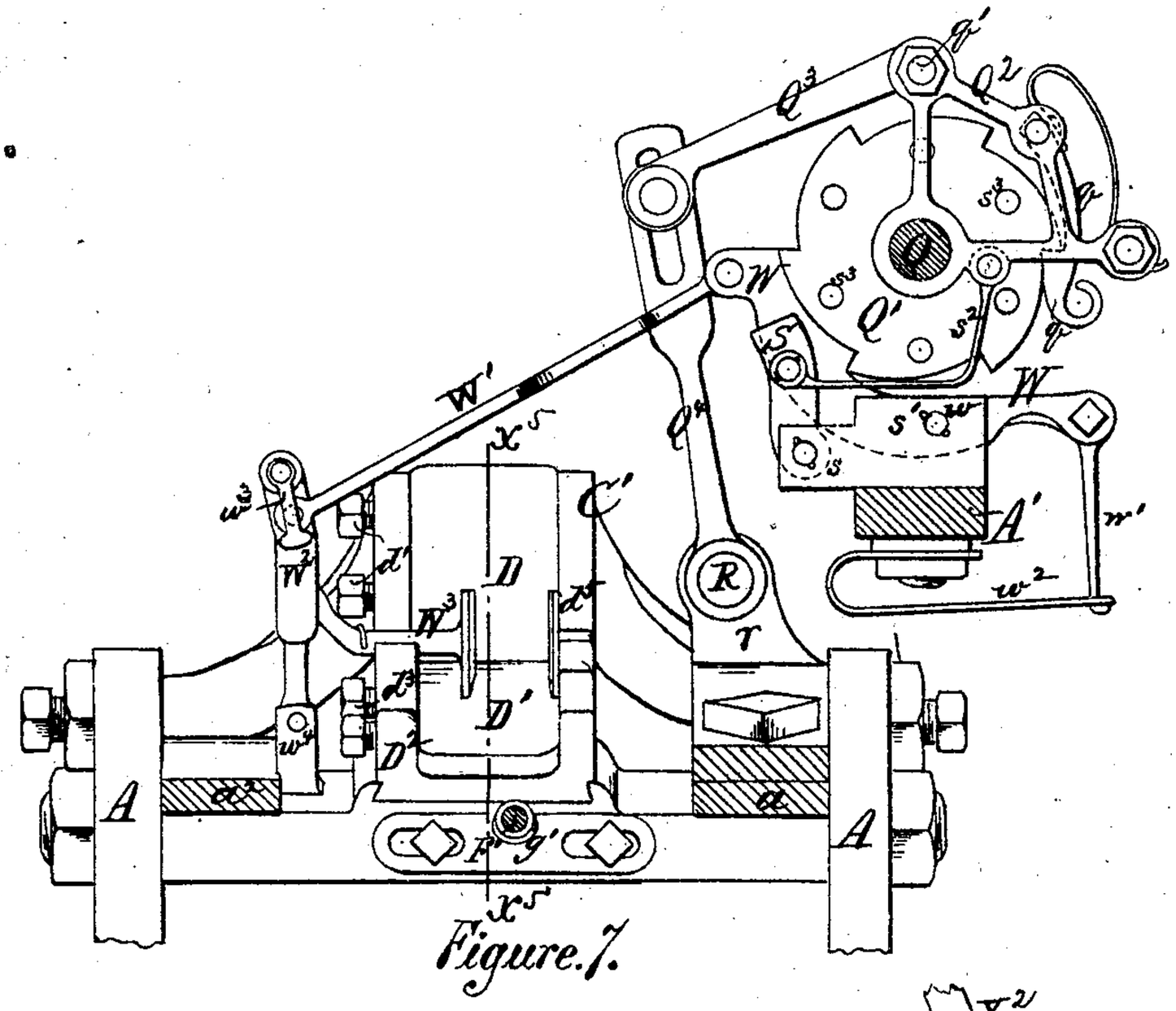

Figure 7.

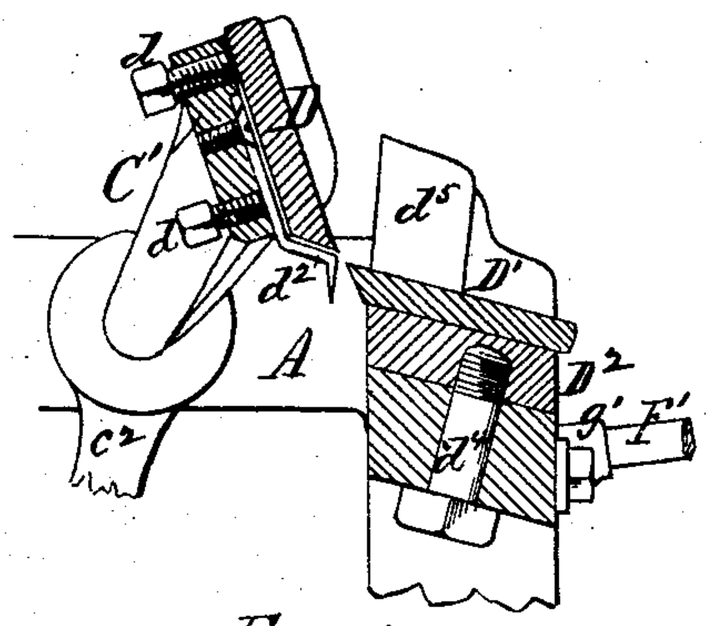

Fig. 8.

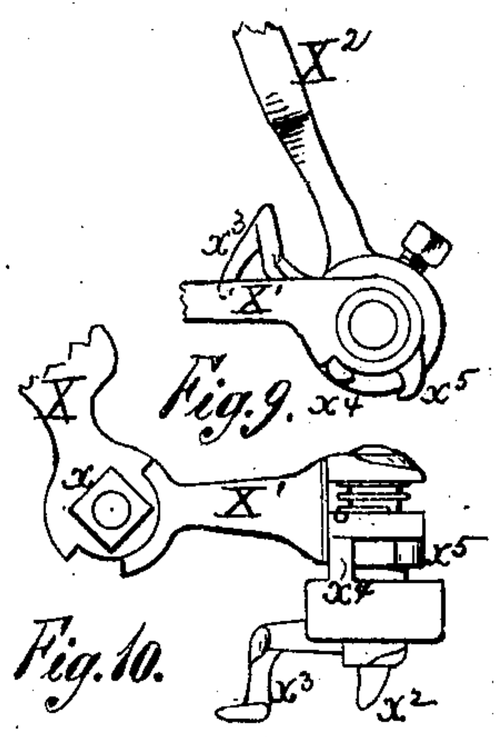

Fig. 9.

Fig. 10.

WITNESSES:

Robert Burns.

Ch.s Rousseau

INVENTORS:

Martin Hain
and
David Hain
per Herthel & Co
attys.

5 Sheets--Sheet 5.

M. & D. HAIN.

Nail-Cutting Machines.

No. 133,935. Patented Dec. 17, 1872.

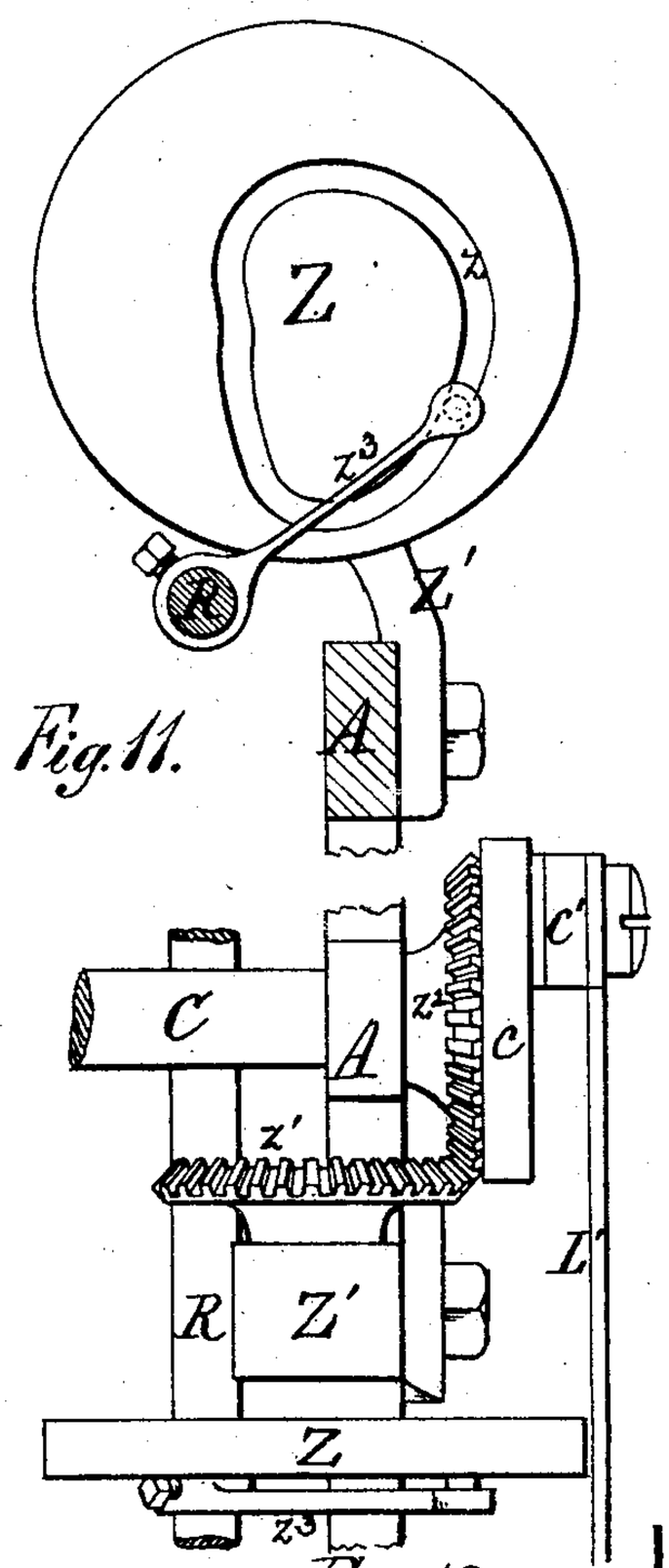

Fig. 11.

Fig. 12.

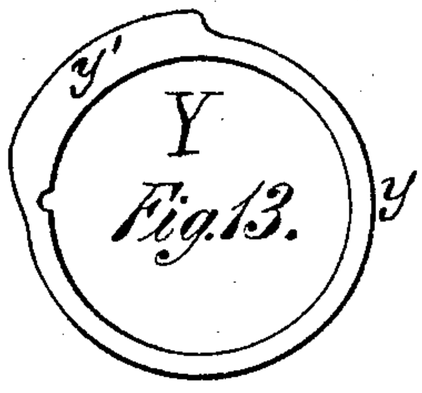

Fig. 13.

WITNESSES:

Robert Burns.

Ch.^s Rousseau

INVENTORS:

Martin Hain
and David Hain
per Herthel & Co
attys.

UNITED STATES PATENT OFFICE

MARTIN HAIN AND DAVID HAIN, OF HERMANN, MISSOURI.

IMPROVEMENT IN NAIL-CUTTING MACHINES.

Specification forming part of Letters Patent No. **133,935**, dated December 17, 1872.

To all whom it may concern:

Be it known that we, MARTIN HAIN and DAVID HAIN, of Hermann, in the county of Gasconade and State of Missouri, have made a certain new and useful Improvement in Nail-Cutting Machines; and we do hereby declare that the following is a full and true description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon.

It is well known that in cutting nail-blanks the same are held and fed by a plate carrier or holder to the shears of a nail-machine, and that, in order to form the head, point, and required taper of the nails, the relative position of the nail-plate must be changed with reference to the shears after every cut. To effect this, in the improved machine here presented, the nail-plate is first fed in a horizontal plane to offer metal to the shears constituting the forward feed, and after each cut is partly drawn back to clear the shears, constituting the back motion; next turned half round, and at the same time is slightly raised, (to allow the turning motion just described to be made without bending the plate;) and, lastly, lowered in position for repetition of the movements aforesaid. The general nature of this invention may therefore be stated to consist in the application of automatic-acting mechanical devices to produce the various motions above described; or, in other words, the nail-plate has the same motions imparted to it as those communicated by hand.

The detail nature of our invention can be stated as consisting: First, providing the main frame with a top-side frame and pivoted extension slide to support the rectangular feed-guide frame, so that said frame-carrying feeding devices can be laterally adjusted, as required; secondly, to the peculiar construction, arrangement, and connection of plate-holder by which the same is rendered adjustable to suit the nature or condition of nail-plate; thirdly, to the construction and arrangement of devices to produce "horizontal-feed" motion and impart same to plate-holder; fourthly, to the construction and arrangement of devices to produce "backing" motion and impart same to plate-holder, withdrawing same with plate from shears, so as to allow the turning of the plate to take place; fifthly, to the construction and arrangement of devices to produce a semi-rotary reciprocating motion and impart same to plate-holder; sixthly, to the manner of constructing, arranging, and connecting the feed mechanism in feed-guide frame and operating said devices from power source, so as to combinedly impart the several "feed," "backing," and "turning" motions to plate-holder; seventhly, the construction and use of an eccentric cam-ring of such varying throw that by means of said cam-ring and its operative connections a "forward feed" and "backing" motions are communicated to plate-holder; eighthly, to the arrangement and construction of a hand-pry for engaging the plate-holder to open its nippers, and to be automatic in its disengagement from same; ninthly, to the arrangement and construction of a spring-guard attachment and its manner of operating the nail-plate to be fed uniformly to the shears; lastly, to certain detail construction of parts—all of which will now more fully appear.

To enable those herein skilled to make and use our said improvements we will now more fully describe the same, referring to the annexed drawing, in which—

Sheet 1, Figure 1, is a side elevation; Sheet 2, Fig. 2, a top plan; Sheet 3, Fig. 3, a transverse or end section at line $x\ x$ with parts removed to show hidden detail parts; Fig. 4 is a detail section at line $x^1\ x^1$, showing adjustable attachment to regulate feed-tension of roller devices; Fig. 5 is a detail horizontal section at line $x^2\ x^2$, showing feed-guide carrying plate-holder, and part of connecting parts that operate feed-guide; Fig. 6 is a detail section at line $x^3\ x^3$, showing adjustable arrangements of parts connecting elbow of plate-holder; Sheet 4, Fig. 7, represents a sectional elevation at line $x^4\ x^4$ of devices that operate spring-guard attachment—Fig. 8 being a detail section at line $x^5\ x^5$ of cutter-head, base-block, and shears or cutter arrangements; Fig. 9, end view of hand-pry; Fig. 10, bottom plan of hand-pry; and Sheet 5, Fig. 11, face elevation of equivalent cam-groove wheel; Fig. 12 represents [illegible] manner of supporting and operating said cam-groove wheel; Fig. 13 is eccentric cam-ring [illegible] varying throw by way of modification.

Same letters of reference indicate same [illegible] in the various figures.

A represents a suitable frame to carry the driving and cutting mechanism. B is driving-pulley hung on end of the main shaft C, which is situated transversely in the upper part of frame A. Said shaft by its pulley is operated from power source, as usual, to communicate motion to operating parts of the machine. B′ is the fly-wheel on shaft C, to counteract irregularities of motion. At its opposite end on main shaft C is arranged a crank-disk, *c*, which connects, by a rod, c^1, with the backward-extending arm c^2 of the cutter-head C^1. The cutter-head C^1 carries the shear D, which can be properly adjusted and firmly seated in its bevel seat by the several rear set-screws *d*, and side screws d^1. The spring d^2, secured behind shear D, serves to gage the feed or inward movement of the nail-plate. The frame A is also provided with shear D^1, which lies inclined in a base-block, D^2. Said shear is also properly adjusted and secured in its seat by side-screws d^3. The said base-block D^2, however, is formed independent of its supporting-frame part, being placed in same by a dovetailed joint, and firmly secured by a bolt-screw, d^4, as shown in Figs. 7 and 8. By this arrangement the base-block D^2 can be readily replaced in case its sides or shoulders become broken, or otherwise its parts become disabled, thus avoiding the expense, labor, and inconvenience ordinarily experienced in casting base-block to form part of its supporting-frame. Forming part of base-block D^2 is a beveled guard d^5, which, in conjunction with the spring-guard attachment, hereinafter described, guides the nail-plate at all times true to its required position for the formation of the head part of nail. Securely bolted to one side of frame A, by branch support *a*, is a top-side frame, A^1. (See Figs. 1 and 2.) Said frame carries the devices that operate the spring-guard, and also devices that communicate a semi-reverse rotary motion to plate-holder, hereinafter described. To opposite side of frame A is bolted, at a^1, the bracket a^2, to which is pivoted, at a^3, the extension slide A^2. The slide A^2, on one side and top-side frame A^1 on the other, support the rectangular extension frame A^3, which carries feed mechanism. In order that the frame A^3, with its operating parts, may be laterally adjusted, said frame is formed with a right-angle guide-base, A^4, which has a proper slot through which the tapering end of the slide A^2 passes. (See Figs. 2 and 3.) Further, to bottom of base A^4 one end of a cross-bar, a^4, is bolted, and, as the one side of the extension frame A^3 is supported by slide A^2, the opposite inner end of frame A^3 is fitted and bolted to the vertical part of said cross-bar a^4, which, further, by its top extension a^5, passes through a lug, a^6, which forms part of top frame A^1, as indicated in Figs. 1, 2, and 3. Thus is pivoted and supported the extension frame A^3, so that the same, with its mechanical operating feed devices, can readily be adjusted laterally, and secured in position by proper set-screws in order to feed nail-plates and cut nails with any required taper, and form large or small-headed nails. The feed mechanism in extension frame A^3 is constructed and arranged to operate as follows: Within frame A^3, to turn, is a square shaft, E, and parallel to this, but securely attached to said frame, is a sliding rod, E^1. On the shaft E and slide E^1 is a sliding dog, E^2, which has arranged to turn in its mortised part a tooth-arc, *e*, the hole through which is squared so as to freely slide with its sliding dog on shaft E. The tooth-arc *e* meshes with a pinion, e^1, which is similarly arranged to turn in dog E^2, and slide with same. E^3 is a feather or spring clasp with set-screw to regulate the sliding motion of dog E^2. E^4 is a stop which can be relatively set to limit slide motion of dog E^2. Further, in conjunction with sliding dog E^2, is arranged a feed-guide, F. (See Figs. 1, 2, and 5.) The said feed-guide consists of a rack-bar, *f*, extending along one side of which is a friction-rod, f^1. The rack-bar *f* is formed with a widened vertical plate, f^2, which connects, by extension screw-bolts f^3, to sliding dog E^2. The journal end of said rack-bar engages a lug-bearing, e^3, bottom of dog E^2. The rack-bar *f* is guided in its horizontal motion by the vertical slotted guide e^4, which is attached to form part of cross-head a^4. (See Figs. 2, 3, and 5.) The side or friction rod f^1 is properly connected at one end to widened bearing f^2, its inner end being secured to socket-bearing G. The inner end of rack-bar *f* also connects to bearing G, which engages a collar or sleeve, *g*, on the connecting-rod F^1, Figs. 1 and 5. One end of said rod F^1 is securely bolted to bottom of cross-bar a^4, the other end resting in a slotted socket-bearing, g^1, which is adjustably bolted to main frame A. (See Figs. 1, 5, and 7.) By means of said slotted bearing g^1 the adjustable motion and lateral setting of the feed-guide frame A^3 can be followed up, as required. To the sliding dog E^2 is further connected the plate-holder H, which holds and presents the nail-blank to the cutters. The said plate-holder is formed with nippers or jaws *h*, which, by the usual clamping-ring, hold the plate. The plate-holder is further formed with an elbow, h^1, while its arm, passing through the slotted guide e^4, connects, by square shaft e^2 of universal coupling h^2, to pinion e^1, so as to turn and follow the movements of the gearing in the sliding dog, as clearly shown in Figs. 2 and 5. The said coupling h^2 imparts an accommodating turning movement adapted to every distinct motion required of the plate-holder. To more perfectly adapt the motions of the plate-holder in accordance with the nature or condition of nail-blank its elbow h^1 is connected adjustably, as follows: To elbow h^1 is bolted a slotted arm, I, which is fitted to the clutch or mortised eye-bolt *i*, and to which said arm is adjustably secured by nut i^1. (See Figs. 2, 5, 6.) Thus the elbow-part of plate-holder can be set sufficiently to raise or lower the plate, as required. To allow the plate-holder free

vertical play, to eye-bolt i is attached the suspended rod i^2, which, with spring i^3, is fitted to engage the sleeve-bracket I^2, as illustrated in Fig. 5. The said sleeve-bracket I^2 is further formed with a shank, I^3, so as to be adjustably secured in the offset of a collar-bearing, i^4. (See Fig. 6.) By thus adjusting the shank of the sleeve-bracket I^2 the forward part of the plate-holder can be raised or lowered, as required. The collar i^4 is secured by bolt i^5 to the sleeve g, which with its parts turns and slides on the connecting-rod F^1, as shown in Figs. 1, 5, and 6. The adjustment of the elbow by the slotted arm I is to raise or lower, or rather enlarge or lessen, the circle described by the elbow part of plate-holder, in accordance with the width, size, and form of nail-plate, preventing any friction or jar of nail-plate upon the bed or face of the shear. By means of the sleeve-shank I^2 I^3 the operator can adjust the plate-holder in accordance with the raised or lowered edge of nail-plate, so that said curved or irregular form of plate shall be fed directly in line, as required, to the shears; also to avoid undue tension of the spring in the sleeve I^2. The automatic adjustment of plate-holder by spring regulates the plate-holder in its feed-action, and causes it to assume the varying positions that arise from the nature of the plate, and so as to present at all times the edge of the plate directly and true to the cutting-edges of the shears. Thus, it will be noticed that all the required adjustments and motions of the plate-holder are achieved to suit all varying conditions of nail-plates. By connecting to sliding dog E^2 the plate-holder, as described, the same has imparted to it from the power-source, by means of a cam-groove wheel and connecting operating devices that operate gearing in sliding dog, a semi-rotary reciprocating motion, hereinafter to be detailed; also, the plate-holder thus connected is operated by the devices producing the forward feed and back motions. To bottom of transverse or cross bar a^4 are bolted sub-frames J, to which is hinged the upright frame-carrying mechanism that produces back motion of plate-holder, (see Figs. 1, 3, and 5,) the devices that produce forward-feed motion, first to be described, being as follows: At j to top of cross-bar a^4 is bolted a hanger, J^1; a similar hanger, J^2, formed, however, to cap base-piece A^4, is bolted to same at j^1. (See Figs. 1, 2, and 3.) Through the hanger J^1 passes a top shaft, K. Said shaft at its inner end is formed with a grooved friction-roller, k, fitted by its groove to engage the friction-rod f^1 of feed-guide F, and turning in the collar-part of the vertical guide e^4. (See Figs. 2, 3, and 4.) Further, the friction-roller k is formed with a mutilated pinion, fitted to mesh with a similar-constructed pinion friction-roller, k^1, which engages the lower face of friction-rod, said roller k^1 being journaled to the side of an adjusting-bar, K^1. (See Figs. 2 and 4.) In order that the feed of the respective rollers k k^1 may be limited or otherwise regulated in tension and force, and be imparted to feed-guide F, the said adjusting-bar K^1 is hinged to a rear upright, K^2, which is bolted at k^2 to sub-frame J, as shown in Figs. 3 and 4. Further, arranged to act on the bottom face of the adjusting-bar K^1 is a V-spring, k^3, one end of which engages the slot of the upright K^2. A set-screw, k^4, engages top of spring, regulates the adjustment of the hinged bar, K^1, and, consequently, the frictional action of the rollers upon feed-guide F, as clearly shown in Fig. 4. The sliding or back adjustment of feed-guide F by the operator (when machine is not operated) is chiefly accomplished by the small roller k^5. (See Fig. 3.)

To operate the friction-rollers k k^1 to produce feed motion for feed-guide F the outer end of shaft K connects with a slotted arm, L, which is adjustably secured to a pitman-rod, L^1, which, in turn, connects with crank-rod c^1, as clearly shown in Figs. 1, 2, and 3. By means, therefore, of the pitman connection to crank of driving-shaft, and in the conjoint operation of the friction-rollers k k^1, a reciprocating rectilinear motion is imparted to feed-guide F carrying plate-holder. To convert the motion just described into an intermittent forward feed motion and communicate the same to the plate-holder an eccentric cam-ring, L^2, is placed on crank-disk c, being secured thereto by pin l. The construction of said cam-ring is of such a form as to have a raised concentric surface, l^1, clearly shown in Fig. 1. In line with cam-ring L^2 is arranged an upright cam-lever, M, pivoted at m to frame of the machine. Said cam-lever M carries an adjustable pallet, m^1, which impinges against cam-surface of the cam-ring L^2. (See Figs. 1 and 2.) Further, a connecting-rod, M^1, connects, by socket m^2, to cam-lever M, said rod being curved at m^3, and connecting at its forward end, by arm m^4, to a treadle-shaft, M^2, Figs. 1 and 3. The treadle-shaft M^2 is arranged transversely to turn in hangers J^1 J^2, and, by its socket-joint m^5, connects with arm m^6 that operates the adjustable bar K^1 carrying friction-roller. (See Figs. 1 and 4.) The pallet of cam-lever, engaging the surface of the cam-ring L^2, imparts, conjointly with pitman and its connecting feed devices, a forward feed motion to plate-holder. Further, as soon as the required feed motion has been accomplished and the pallet of cam-lever engages the raised surface of the cam-ring, by means of the connecting-rod M^1 and its connections with the friction-rollers, the same are operated to reverse the action to allow the backing devices, now to be described, to perform and impart back motion to plate-holder.

The arrangement of the devices to produce back motion, or retraction of the plate-holder after each cut, to allow the turning of the plate in connection with feed devices described, are therefore as follows: The sub-frames J have their curved ends united by a connecting-rod, N. Hinged to said rod is arranged a frame attachment, N′, united by cross-piece n. Jour-

naled near top of said frame N′ is a pinion, n^1, formed with enlarged side disks n^2, and fitted to gear with rack of feed-guide. (See Figs. 1, 3, and 5.) The said pinion-wheel is allowed to freely rotate during forward feed-motion produced by friction-rolls k k^1, and stopped or clutched to perform the backing motion or retraction of the plate-holder. This is performed by a clutch-lever, O, fulcrumed at o in the upright frame N′, and further formed with forks o^1 fitted to clutch the side disks of the pinion-wheel n^1, and at the same time swing or vibrate the frame attachment N′ backward to perform the backing motion of plate-holder, as indicated in Figs. 1, 2, 3, and 5. Further, the elbow part of said clutch-lever at o^2 connects to connecting-arm O^1, which is adjustably attached to a slotted arm, O^2, which forms part of the vibrating-shaft P. (See Figs. 1, 2, and 5.) The shaft P is arranged transversely to turn in a bearing, p, Fig. 2, which forms projecting part of sub-frame J. The outer end of said shaft turns in a vertical journal, p^1, which is bolted to side of cross-head a^4. (See Figs. 1 and 3.) The further connection of shaft P to operate the forked clutch-lever O, will be, as hereinafter detailed, to act in combination with devices that produce a semi-rotary motion.

In order to adjust the swing or vibration of the frame attachment N′ and allow a free rotary motion of pinion-wheel n^1 during feed-motion a cross-bar, p^2, is bolted to sub-frames J. In said cross-bar a set-bolt, p^3, is arranged to pass through slot of clutch-lever O and engage against the cross-piece n of the upright frame N′, when the same is adjusted after every back motion. Further, the adjustment of the upright frame N′ in operative position is effected by a spring, P′, one end of which is attached at p^4, the other end pressing against the cross-piece n of frame N′, as clearly shown in Figs. 1, 3, and 5. A stay, p^5, stops properly the adjustments of the frame N′. The lower end of clutch-lever has a sub-link, o^3, to which is attached a spring, o^4, which connects to cross-bar p^2, said spring being to facilitate return motions of its connecting parts.

Having thus described the arrangement and construction of connecting mechanism to produce forward-feed motion — also described devices which, when operated, produce back motion—the further operating parts to produce the reverse semi-rotary motions and communicate same to plate-holder are as follows: In top or side frame A^1 is arranged a horizontal shaft, Q, at the inner end of which is a ratchet-wheel, Q^1. In connection with ratchet-wheel Q^1 and journaled on shaft Q is a working-beam, Q^2, of the constructive form shown. Said working-beam is provided with a spring-pawl, q, fitted to engage and impel said ratchet-wheel. (See Fig. 7.) Said ratchet-wheel, acting upon impulse of spring-pawl q, in turn revolves the shaft Q. For this purpose, at q^1, to working-beam is journaled an extension arm, Q^3, which connects adjustably to a slotted rocker-bar, Q^4. The lower end of Q^4 is further attached to inner end of a horizontal shaft, R, which has its journals resting in bearings r bolted to main frame. (See Figs. 1, 2, and 7.) At the outer end of shaft R is properly secured a tension-lever arm, R^1, which has a pin, r^1, fitted to engage a cam-groove wheel, R^2, Figs. 1 and 2. The said cam-groove wheel is of the constructive form indicated and relatively secured to main shaft C, as shown in Fig. 2. The cam-groove wheel thus connected, when operated, imparts an intermittent rotary motion to ratchet-wheel Q^1 and its shaft Q. Further, the part rotary motion thus achieved is estopped by a stop, S, pivoted in a socket-bearing, s, (which forms part of the side bracket s^1 bolted to frame A^1,) see Figs. 1 and 7. To said stop is connected a suitable spring-bar, s^2, which also connects to frame part of working-beam Q^2, said spring-bar operating the stop S to engage the studs s^3 cast on the inner face of the ratchet-wheel Q^1, clearly shown in Fig. 7. Thus the cam-groove wheel R^2 imparts a part rotary motion to working-beam Q^2, which, by its spring-pawl q, actuates the ratchet-wheel Q^1 to communicate at correct periods (being estopped by stop device S) the required intermittent rotary motion to shaft Q. To utilize the motion just described of shaft Q, at its outer end is keyed a triangulated cam, T, Fig. 3, having equidistant studs projecting from its inner disk, said studs being to impart, at required intervals, a reciprocating motion to devices producing back motion, hereinafter detailed, while the cam proper imparts a semi-rotary reciprocating motion to the following devices: On top the vertical part of frame A^2 is bolted adjustably at t a T-shaped support, T′, to which is journaled respectively at t^1 t^2 the oscillating lever-arm U U^1, Figs. 1, 2, and 3. To said lever-arms are joined a cross-arm, U^2, the connecting-bolts u u^1 carrying anti-friction roller u^2 u^3, fitted to engage the curved surface of the cam T, as indicated in Figs. 1, 2, and 3. The lever-arm U^1 is extended so that by its elongated slot it can be adjustably bolted in the series of holes u^4 of the transverse lever-arm U^3, (see Figs. 1, 2, and 3.) Further, the arm U^3 is pivoted at u^5 to a sub-arm, U^4, the pin u^6 of which engages the slot of arm U^3, Fig. 3. The sub-arm U^4 is further pivoted at u^7 to a vertical joint, U^5, which properly connects near inner end of square shaft E of frame A^3, as shown in Fig. 3; the adjustability of the system of lever-arms here shown being chiefly to allow and accommodate the lateral adjustments of the frame A^3, heretofore described. By this manner of connection, it will be noticed that a semi-rotary reciprocating motion is imparted to the gearing in the sliding dog, and communicated to plate-holder in conjunction with the forward-feed motion, heretofore described.

The outer cam T further operates the connecting devices described to perform back motion, as follows: To the vibrating shaft P is

bolted an arm, V, to which is pivoted a connecting-rod, V^1, which further connects with an adjusting-arm, *v*, Figs. 1 and 3. The arm *v* is pivoted at v^1 to a shoulder-bracket, V^2, which partly incloses the vertical part of frame A^1, and to which said bracket is adjustably bolted at v^2, (see Figs. 1 and 3.) The inner end of adjusting-arm *v* is guided in its vertical movement in a slot formed in the shoulder-bracket. To said arm *v* is pivoted a spring-pawl, v^3, which is operated by the studs v^4 of the cam T. Further to the side, shoulders of the bracket V^2 are provided with extension set-screws v^5, each side and all which is clearly shown in Fig. 3. By this arrangement of parts, it will be seen that, after being acted upon or escaping the passing stud of the cam T in its rotary movement, the spring-pawl v^3 is caused to abut against an adjustable guide, v^6, on end of the screw-bolt v^5, in operative position for the arrest of the following stud of the cam. Further, it will be observed that after every feed-motion of plate-holder is accomplished the action of the cam T, operating, by its studs, the pawl device v^3, imparts a vertical reciprocating motion to vibrating shaft P, which, in turn, operates the clutch-lever to close or estop the rotation of pinion-wheel and at same time swing or vibrate the frame attachment N′ backward to perform the back motion of the plate-holder. The set-screws v^5 also serve to gage or precisely regulate the amount of back motion to be imparted to the frictional feed devices.

The combined action and operation of the mechanical parts described can therefore be stated, in effect, to consist, first, by means of the cam-ring and pitman connections a forward feed-motion is imparted to plate-holder to offer metal to the shears, at the same time the cam-groove wheel operates the working-beam in operative position to engage the ratchet-wheel to impart a part rotary motion to outer or triangular cam; secondly, after each cut of nail-plate the pallet engaging outer surface of cam-ring opens the friction-rolls *k* k^1, and holds same open during their entire reverse-turning movement, and at the same time the part rotary motion of outer or triangular cam taking place, this, by its studs, acting on connecting parts of frictional gear, consisting of clutch-lever O, pinion n^1, rack-bar F, vibrating frame N′, and sub-frames J, produces back motion of plate-holder, withdrawing same sufficiently for the plate to clear the shears; thirdly, this done, the rotary action of triangular cam still occurring, operates the system of lever-arms to impart a semi-rotary reciprocating motion to gearing in sliding dog, which, being communicated to plate-holder, turns same half round, thus presenting reversed tapering edge of nail-plate ready for repetition of the movements aforesaid, and as stated to be in the nature of our invention.

The several operations of feeding, backing, turning half round, together with adjustable movements of plate-holder, are all performed with precision, at correct intervals, in a better manner, and in less time required in their performance by hand, or in ordinary machines of this class; and the result is nails are formed and produced of a superior quality,

It is essential that the nail-plate be guided to its true position in the shear-block. This to insure, as the nail-blank is inwardly fed, (and as heretofore referred to,) we have arranged in combination, and to be operated by the ratchet-wheel, a spring-guard attachment, constructed as follows: A pawl-lever, W, of the curved construction, (shown in Fig. 7,) so as to be acted upon by the ratchet-wheel Q^1, is pivoted, at *w*, to the side bracket s^1 of the frame part A^1. To the outer end of said pawl-lever is pivoted a rod or arm, w^1, to which one end of the spring w^2 is attached, the other end of spring being secured to the bolt that connects brackets s^1 to frame A^1. (See Figs. 1 and 7.) To the inner end of the pawl-lever W is pivoted a transverse connecting-bar, W^1. Said bar connects detachably, by a pivot-catch, w^3, to an upright, W^2, which is pivoted in a socket-bearing, w^4, which forms part of main frame A, as indicated in Figs. 1, 2, and 7. Further, in opposite side of upright W^2 a pivot-catch is pivoted to the arm of the spring-guard W^3, which is guided and operates on the "flat" of the shear in base-block. A suitable spring is connected with arm of said guard, so as to retain its beveled edge on the face of the shear, and as indicated in Figs. 2 and 7. The spring-pawl lever W, acting from impulse of ratchet-wheel, therefore, imparts an oscillating or lateral movement to spring-guard W^3 of such a nature that, as soon as said guard is properly withdrawn to one side, (to allow for the turning motion of the plate-holder with plate,) said spring-guard, in its automatic return movement, guides and regulates the plate to abut against the beveled shoulder of base-block, and said plate is thus held in its true position until sheared off by the joint action of the two cutters. The spring-guard here shown especially overcomes the irregularities in cut-nails resulting when the plate is not directly, but crookedly and improperly, inserted in holder, and in this condition inwardly fed.

As an improved manner of inserting nail-plates, we have arranged and attached, in combination to our improved nail-feeder, a hand nipper-pry, of the following description: We connect two arm-joints, X X^1, by a rule-joint. The connecting-bolt of said joint *x* is provided with a suitable spring, x^1, which, by its tension, closes said joint whenever opened. In the socket end of the arm X^1 turns the nipper-shaft, which terminates in the nipper-point x^2 and griper or hook x^3, as indicated in Figs. 2, 9, and 10. Further, the nipper-shaft has its journal provided with a spring, to auto-

matically return in original position when turned by hand-lever X^2. The turning action with lever is limited by a projecting pin, x^4, of the lever abutting against the end projection x^5 of the socket-journal of arm X^1, all of which is shown in Figs. 2, 9, and 10. The hand-pry thus formed is simply bolted, at X^3, to one side of the machine, Fig. 2.

The operator therefore, by means of the hand-lever, turns the pry inward, so that its nipper-point x^2 engages the jaws of the plate-holder with hook x^3 on top; this done, the hand-lever is depressed, the jaws of plate-holder are opened, and can be thus held until the insertion of the nail-plate has been properly effected. This done, by releasing the lever the pry automatically disengages itself from plate-holder and returns in operative position. The nail-plate can thus be inserted faster, truer, with less inconvenience, and especially all lateral play of plate-holder ordinarily experienced is obviated, as the same is kept true in line during process of inserting nail-plates.

Our said improved machine can be simplified by way of a modification of eccentric cam-ring on disk of driving-shaft, and the substitution of an equivalent face cam-groove wheel, as follows: Y represents the modified cam-ring. This is formed of the varying throw consisting of the lower surface y and raised concentric surface y', as indicated in Fig. 13. Said cam-ring Y is simply placed and attached on the disk of driving-shaft in place of former cam-ring. In its action, when part of the lower surface y is being traversed, a forward feed is imparted by friction-rollers $k\ k^1$; also the backing motion occurs by the traversing of the remaining part of said surface y, which allows the friction-rollers $k\ k^1$ to remain closed to perform the backing motion, until the raised concentric surface y' being reached, and which, on being traversed, unlocks the friction-rollers, and thus an extra feed-throw is gained. Therefore it may be stated that a two-fourths throw of cam-surface y is feed-motion, one-fourth throw being for reverse, and the extra one-fourth, by means of raised surface y', is gained as a forward feed. It will, therefore, be noticed that by the substitution of the cam-ring Y all the devices described, and their connections as producing back motion, can be dispensed with, thus obviating the necessity of the frictional-gear, consisting of studs v^4, (on outer cam T,) shoulder-bracket V^2, side screws v^5, spring-pawl v^3, adjusting-arm v and its rod connection to treadle-shaft, (see Fig. 3;) further, sub-arm O^2, connecting-rod O^1, clutch-lever O, sub-frames J, hinged frame N′ and its attachments, set-bolt p^3, shaft P, and springs O^4 P′, can all be dispensed with, rendering the machine more simplified, yet retaining its essential principle of construction. As an equivalent to circular cam-groove wheel the face cam-groove wheel Z can be substituted. Said cam-wheel is formed with the irregular groove z, (see Fig. 11,) and has its shaft journaled in a supporting-arm, Z′, which is bolted to side of main frame A. To the end of its shaft said face cam-wheel has keyed a bevel-gear, z^1, arranged to gear with side gear z^2 forming part of the crank-disk c of driving-shaft. (See Fig. 12.) Fitted by its pin to engage in the groove z of cam-wheel is a tension-lever arm, z^3, which is properly connected to horizontal shaft R. The said parts being thus properly set and attached, the same action of semi-reverse rotary motion is communicated to plate-holder, as formerly described, and as being achieved by the action of the circular cam-groove wheel.

To form the heads of nails, the ordinary header attachment for that purpose can be attached to our machine, the improvements here claimed having no reference to this part of the manufacture.

Having thus fully described our said improvements, what we claim and desire to secure by Letters Patent, is—

1. The top-side frame A^1 when connected and secured to main frame A by branch support a, as and for the purpose set forth.

2. The extension slide A^2, pivoted to main frame A by bracket a^2, as and for the purpose set forth.

3. The arrangement of extension frame A^3, base A^4, extension slide A^2, cross-bar a^4 having top-extension part a^5, in combination with lug a^6 forming part of top-side frame A^1, as and for the purpose set forth.

4. The sliding dog E^2, carrying toothed arc e and pinion e^1, in combination with the square shaft E and sliding rod E^1, as and for the purpose set forth.

5. The spring-clasp E^3, provided with adjusting-screw, in combination with sliding dog E^2 and sliding rod E^1, as and for the purpose set forth.

6. The adjustable stop E^4, provided with set-screw, in combination with sliding rod E^1 and sliding dog E^2, as and for the purpose set forth.

7. The rack-bar f, formed with vertical plate f^2, in combination with extension bolts f^3, sliding dog E^2, lug-bearing e^3, plate-holder H, and universal coupling h^2, as and for the purpose set forth.

8. The rack-bar f, in combination with slotted guide e^4 secured to cross-bar a^4 of frame A^3, as and for the purpose set forth.

9. The combination and arrangement of rack-bar f, widened bearing f^2, friction-rod f^1, socket-bearing G, and connecting-rod F^1, as and for the purpose set forth.

10. The connecting-rod F^1, adjustably bolted to main frame A by socket-bearing g^1, as and for the purpose set forth.

11. The plate-holder H, connected to sliding dog E^2 by universal coupling h^2 having square shaft e^2 passing through shaft of pinion e^1, as and for the purpose set forth.

12. The plate-holder H, having elbow part h^1, slotted arm I, eye-bolt i, and nut i^1, in combination with the sliding rod F^1, as and for the purpose set forth.

13. The combination and arrangement of plate-holder H, elbow part h^1, slotted arm I, eye-bolt i, nut i^1, suspended rod i^2, spring i^3, and sleeve-bracket I^2 secured to connecting-rod F^1, as and for the purpose set forth.

14. The sleeve-bracket I^2 having shank I^3, in combination with offset of collar-bearing i^4 arranged on connecting-shaft F^1, as and for the purpose set forth.

15. The collar-bearing i^4, secured to sleeve g by bolt i^5, in combination with connecting-rod F^1, as and for the purpose set forth.

16. The plate-holder H, universal coupling h^2, slotted guide e^4, slotted arm I, eye-bolt i, nut i^1, suspended rod i^2, spring i^3, sleeve-bracket I^2, its shank I^3, collar-bearing i^4, bolt i^5, sleeve g, in combination with sliding dog E^2, feed-guide F, connecting-rod F^1, and socket-bearing G, as and for the purpose set forth.

17. The friction-rollers k k^1, formed with mutilated pinions and roller k^5, in combination with friction-rod f^1, as and for the purpose set forth.

18. The friction-rollers $k\,k^1$, shaft K, hanger J^1, slotted arm L, pitman-rod L^1, crank-rod c^1, in combination with friction-rod f^1, as and for the purpose set forth.

19. The adjusting-bar K^1, upright K^2, sub-frames J, spring k^3, and set-screw k^4, in combination with friction-rollers k k^1 and friction-rod f^1, as and for the purpose set forth.

20. In combination with the crank-disk c and its cam-ring, the cam-lever M, pallet m^1, connecting-rod M^1, treadle-shaft M^2, arm m^6, and adjusting-bar K^1, as and for the purpose set forth.

21. The pinion n^1, having enlarged side disks n^2, in combination with clutch-lever O and rack f of feed-guide, as and for the purpose set forth.

22. The combination and arrangement of clutch-lever O, connecting-rod O^1, slotted arm O^2, sub-link o^3, spring o^4, vibrating shaft P, arm V, connecting-rod V^1, adjusting-arm v, shoulder-bracket V^2, spring-pawl v^3, studs v^4 on cam T, and adjusting-screws v^5, as and for the purpose set forth.

23. The cross-bar p^2 and set-screw p^3, in combination with cross-piece n of upright frame N′, as and for the purpose set forth.

24. The sub-frames J, connecting-rod N, upright frame N′, cross-piece n, pinion n^1, cross-bar p^2, set-screw p^3, spring P^1, clutch-lever O, connecting-rod O^1, slotted arm O^2, sub-link o^3, spring o^4, vibrating shaft P, arm V, connecting-rod V^1, adjusting-arm v, shoulder-bracket V^2, spring-pawl v^3, studs v^4 on cam T, in combination with rack f of feed-guide F, as and for the purpose set forth.

25. The stay p^5 secured to upright K^2, in combination with upright frame N′, as and for the purpose set forth.

26. The combination and arrangement of shaft Q, ratchet-wheel Q^1, working beam Q^2, spring-pawl q, extension arm Q^3, rocker-bar Q^4, shaft R, tension-lever R^1, and cam-groove wheel R^2, as and for the purpose set forth.

27. The stop S, socket-bearing s, spring-bar s^2 connected to working-beam Q^2, in combination with studs s^3 on ratchet-wheel Q^1, as and for the purpose set forth.

28. The triangular cam T, T-shaped support T′, oscillating arms U U^1, cross-arm U^2, anti-friction rollers u^2 u^3, transverse lever-arm U^3, sub-arm U^4, vertical joint U^5, in combination with square shaft E, as and for the purpose set forth.

29. The oscillating arm U^1, having elongated slot, transverse lever-arm U^3, slots u^4, bolt u^5, pin u^6, sub-arm U^4, vertical joint U^5, in combination with square shaft E, as and for the purpose set forth.

30. The pawl-lever W, pivoted at w to side bracket s^1, arm w^1, and spring w^2, in combination with frame A^1 and ratchet-wheel Q^1, as and for the purpose set forth.

31. The pawl-lever W, bracket s^1, arm w^1, spring w^2, transverse connecting-bar W^1, upright W^2, socket-bearing w^4, and spring-guard W^3, in combination with shears D^1 of base-block, as and for the purpose set forth.

32. The hand-pry formed of joints X X^1, spring x^1, knife-point x^2, hook x^3, and handle X^2, in combination with jaw h of plate-holder, as and for the purpose set forth.

In testimony of said invention we have hereunto set our hands.

MARTIN HAIN.
DAVID HAIN.

Witnesses:
WILLIAM W. HERTHEL,
ROBERT BURNS.