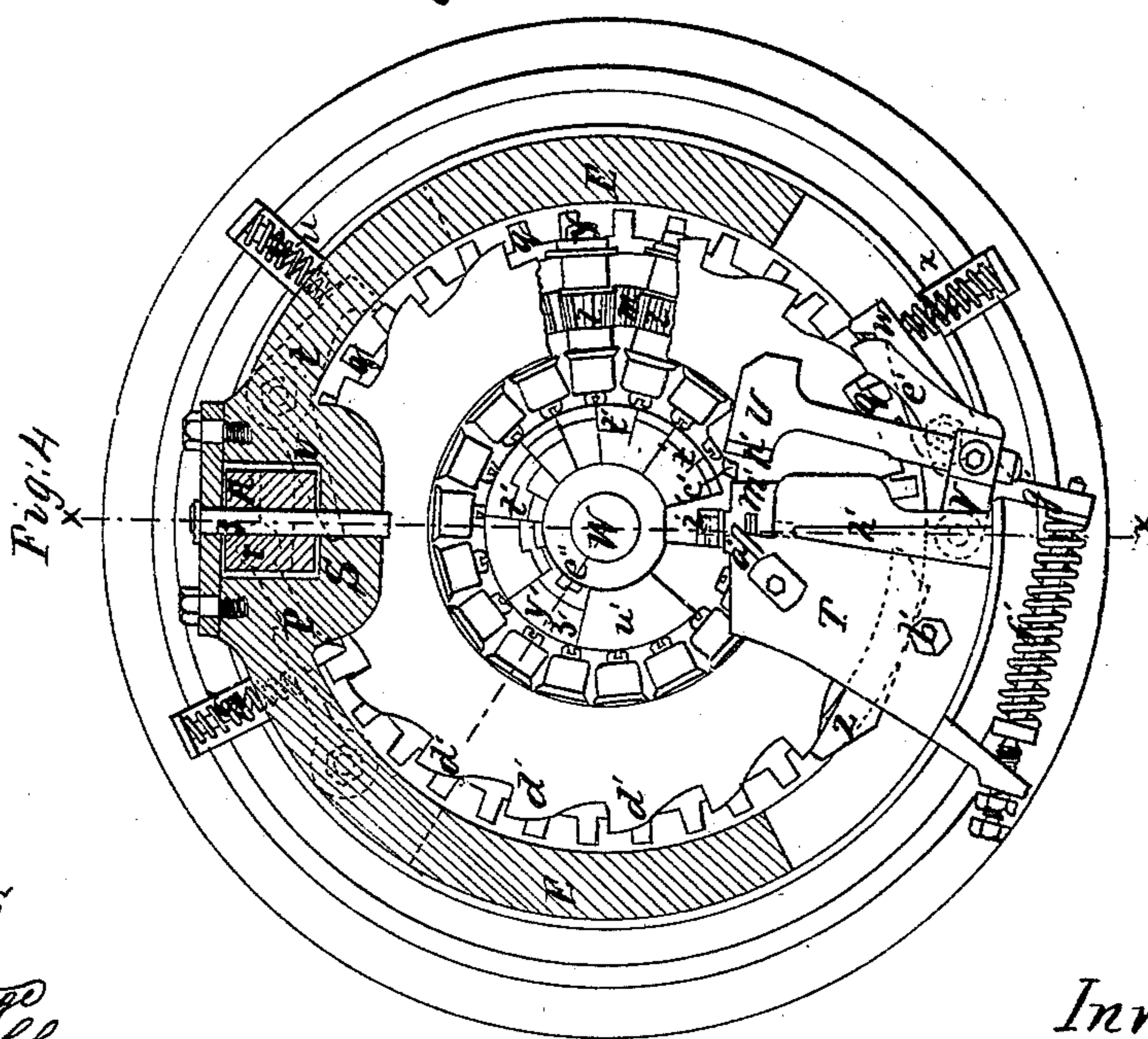
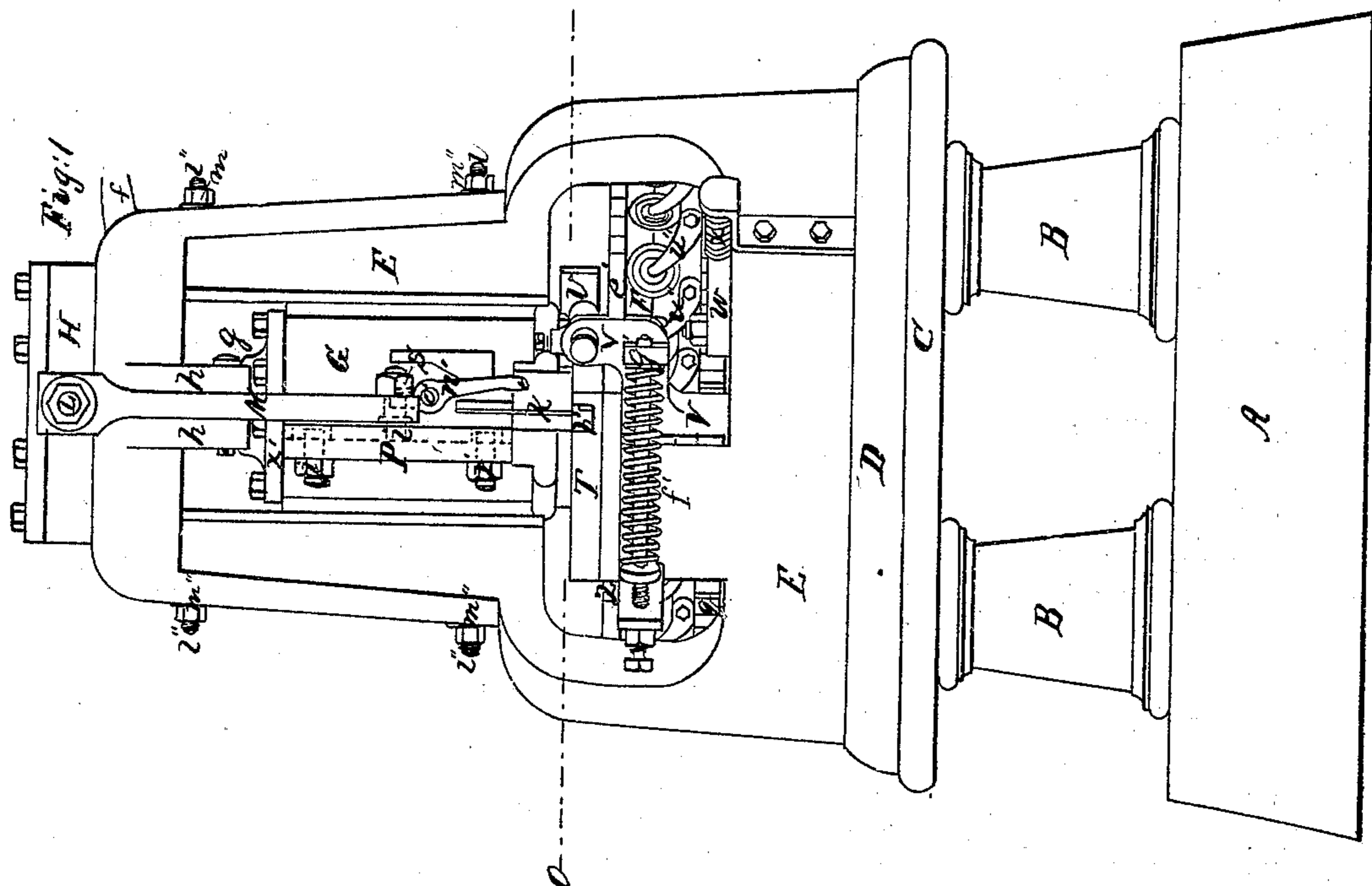


Sheet 1, 3 Sheets.

# E. L. Brundage Nail Mach.

No. 94,391.

Patented Aug. 31, 1869.



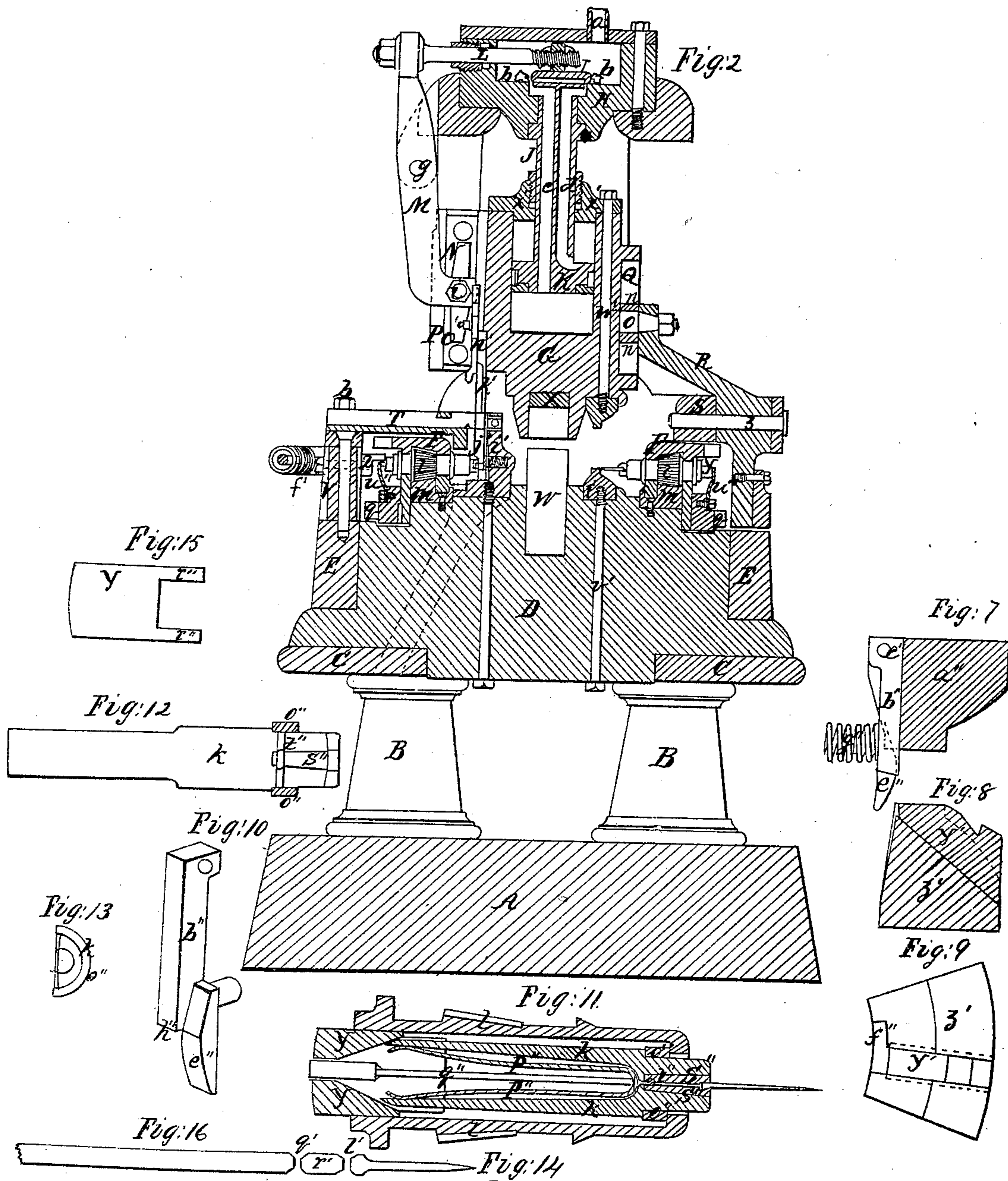
Witnesses  
H. C. Brundage  
Hugh Duffey

Inventor  
E. L. Brundage

# F. L. Brundage Nail Mach

No 94,391.

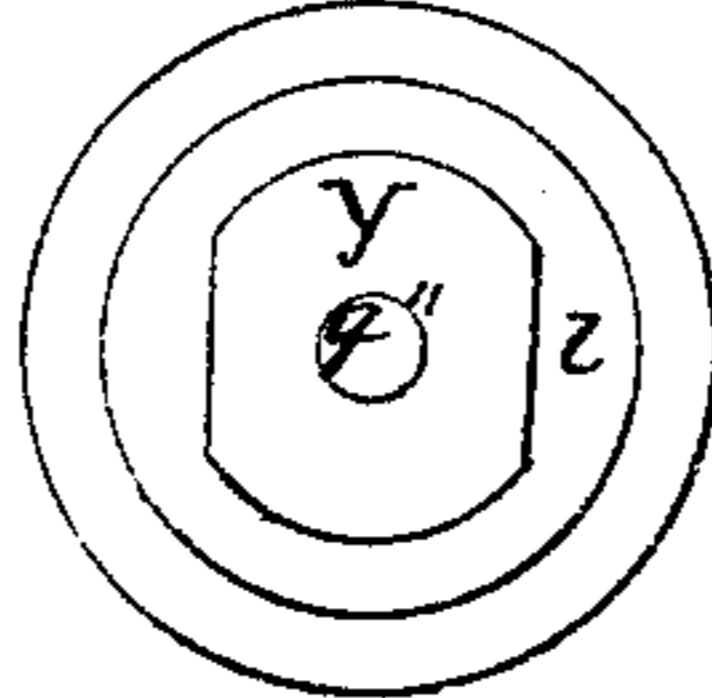
Patented Aug. 31, 1869



Witnesses.

H. C. Brundage

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E. I. Brundage.

Nail Mach.

No 94,391.

Patented Aug. 31, 1869.

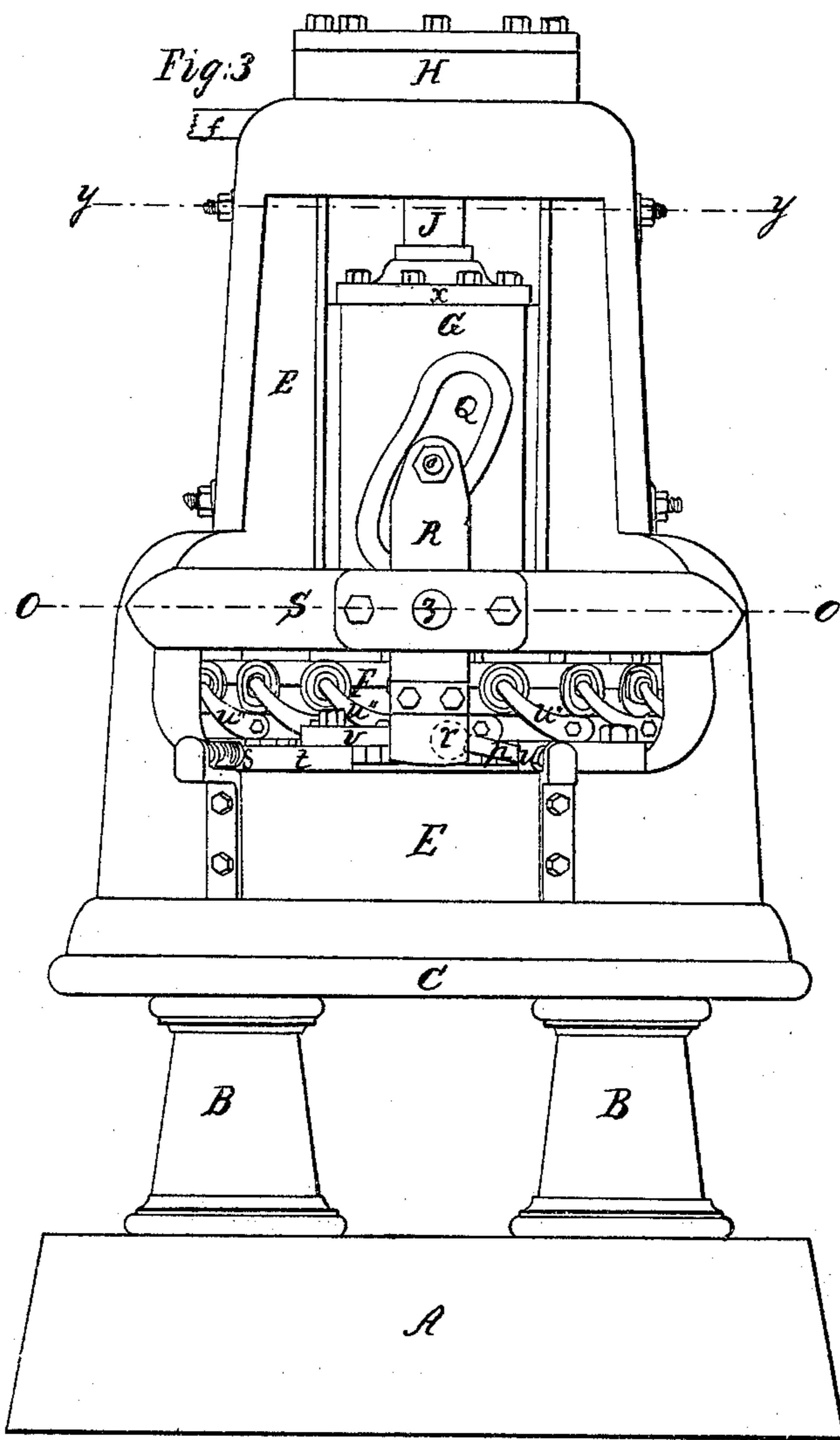


Fig. 5

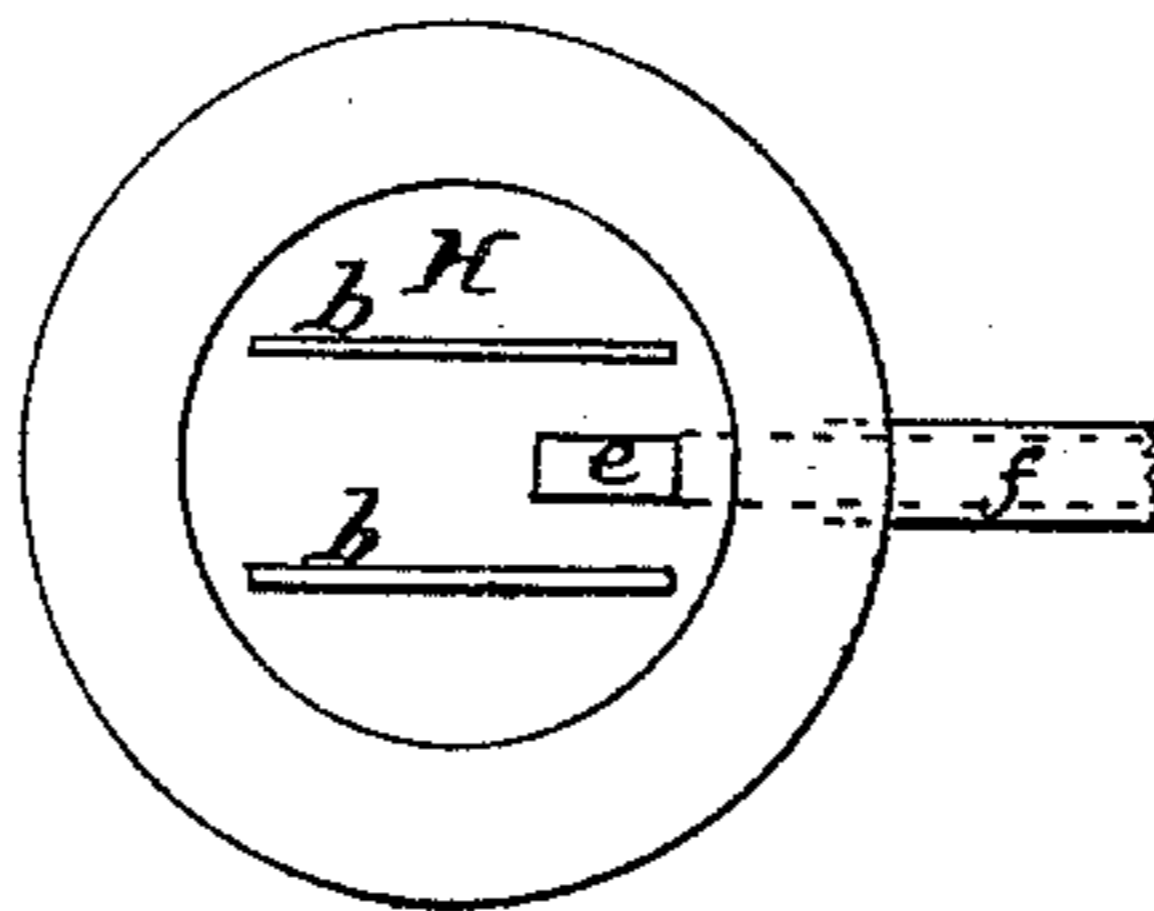
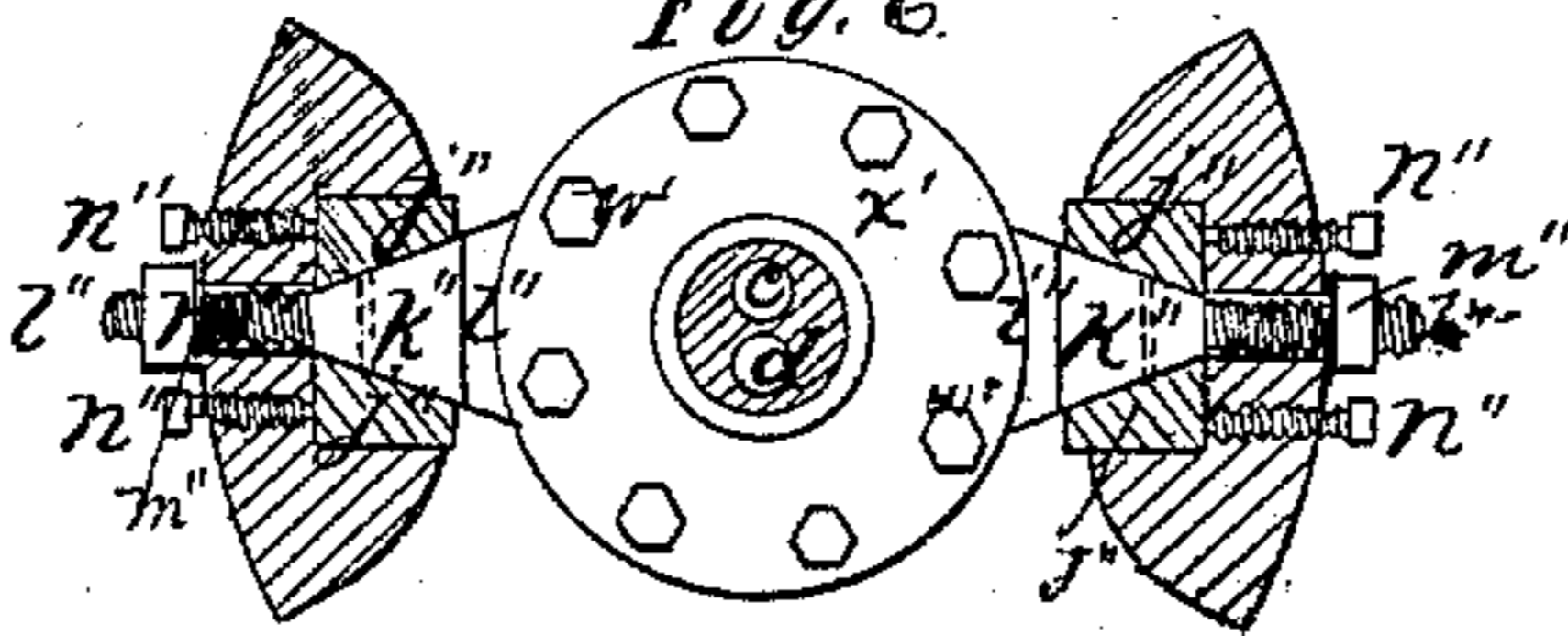


Fig. 6



Witnesses.

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# UNITED STATES PATENT OFFICE.

E. L. BRUNDAGE, OF MIDDLETOWN, NEW YORK.

## IMPROVED MACHINE FOR MAKING HORSESHOE-NAILS.

*Specification forming part of Letters Patent No. 94,391, dated August 31, 1869.*

*To all whom it may concern:*

Be it known that I, EDWIN L. BRUNDAGE, of the village of Middletown, Orange county, State of New York, have invented new and useful Improvements in a Machine for Forging Horseshoe-Nails.

My invention consists of improvements upon a machine for which Letters Patent were granted to Daniel Dodge, June 22, 1852, the nails being forged and formed and the blank being carried nearly in the same manner as described in said Dodge's specification.

My improvements consist in the adoption and use of a steam-hammer, together with devices for imparting motions, and with parts such as make a complete working machine.

The prominent feature in this character of machine is that it insures perfect work by an active elastic blow, as is obtained by a direct-acting steam-hammer.

And I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the machine, reference being had to the annexed drawings, making a part of this specification, like letters of reference being made to like parts in the several figures.

Figure 1 is a front elevation of the machine; Fig. 2, a vertical cross-section through the center of the machine in the line *x x*, as shown in Fig. 4; Fig. 3, rear elevation of the machine; Fig. 4, horizontal top view in section through the line *o o*, as shown in Figs. 1 and 3; Fig. 5, top view of the steam-chest; Fig. 6, horizontal section of the machine through the line *y y*, as shown in Fig. 3; Fig. 7, hammer-die in section, to which is attached point-cutter, Fig. 10; Fig. 8, section of anvil-die, in which point-cutter *y'* is inserted, as shown at Fig. 9; Fig. 9, top view of anvil-die, in which point-cutter *y'* is inserted; Fig. 10, perspective view of that portion of the point-cutter which is attached to the hammer, as shown at Fig. 7; Fig. 11, longitudinal section of pinion and griper, in which is shown the griper *k k*, the griper-spring *p'' p''*, the follower *q''*, the opener *Y*, the pinion *l*, the ring *o*, the griper-jaws *s'' s''*, and the pin *t''*; Fig. 12, inside view of one-half the griper; Fig. 17, end view of one-half the griper; Fig. 14, end view of the pinion and griper-opener.

A, main base-block of the machine; B B, columns standing upon the base-block and supporting the frame and anvil; C, plate on which the anvil is placed; D, heavy block of metal, called the anvil, circular in form, with a recess or chamber in which dies *u' u' u'* and *u'* are placed, by which, together with dies placed in the hammer, an exact reverse, the blanks are forged, drawn out, and made into the finished nails; E, frame of the machine; F, griper-carriage, which carries the pinions and gripers; G, cylinder or steam hammer; H, steam-chest, set in a recess in the upper end of the frame, in which *b b* are the steam-ports and *e* is the exhaust-port; I, steam-valve, by which the steam is let into the steam-hammer; J, piston-rod, which is stationary, being firmly fastened to the steam-chest; K, piston; L, valve-rod, secured at one end to the valve, and at the other to the valve-lever; M, valve-lever, by which the valve is moved to admit steam to the cylinder; N, upper wedge cam or valve-shifter; O, lower wedge cam or valve-shifter.

The above cams N and O are secured to a plate or arm, P, projecting from the hammer by the bolts *j j*, and as the hammer is moved up or down it communicates an oscillating motion to the lever M, thereby giving the proper motion to the valve. The cams are adjustable; N is moved up or down as required to cut off the steam in the downward stroke of the hammer at the exact point desired to admit steam above the piston to raise the hammer and break the force of its descent and govern the blow to the required force to forge the nails when each of the gripers carries a blank. O is raised or lowered to admit steam below the piston, and as the hammer raises it exactly governs and breaks the upward stroke of the hammer and forces it down.

P, wedge-cam or valve-shifter plate, to which the valve-shifters are secured by bolts *j j*; Q, cam-slot, made in the hammer, in which a roller projecting from the lever R works, which lever and the driving-pawl *p* communicate rotary motion to the griper-carriage; R, griper-carriage driving-lever; S, arm or brace, permanently secured to and forming a part of the frame of the machine, to which the lever R is attached at the fulcrum *z*; T, stationary-cutter stock, which holds the stationary cutter *a'*;

U, moving-cutter stock; it holds the cutter  $c'$ , which moves with the stock, and, working in connection with the cutter  $a'$ , the edges form a cutter similar to a shears, and cut the nail-blank from the rod; V, rock-shaft, to which the moving-cutter stock is secured; W, stop, permanently fixed or driven in the anvil, and in connection with stop X limits the hammer as to its length of stroke; X, hammer-stop, permanently fixed or driven in the hammer, and, working against the anvil-stop W, limits the hammer in length of stroke, as above; Y, griper-opener, inserted in the outer end of the griper-pinion, and bears against the ends of the griper-blades shown at Fig. 11, and when forced into the pinion, as it comes in contact with the stationary cam Z, opens the griper for the discharge of the finished nail, and the griper remains open until it receives another nail-blank; Z, stationary cam, which forces the griper-opener into the griper-pinion, and as the carriage revolves the opener comes in contact with the cam, the griper is opened as above for the discharge of the finished nail and the reception of another nail-blank;  $a$ , steam-pipe, through which steam is conveyed from the steam-boiler to the steam-chest of the machine;  $b b$ , steam-ports, for admitting steam to the cylinder or steam-hammer;  $c, d$ , steam-passages constructed in the piston-rod J, to convey the steam from the steam-ports to the cylinder. The passage  $c$  discharges in the cylinder below the piston, thereby forcing the hammer or cylinder down. The passage  $d$  discharges in the cylinder above the piston, which raises the cylinder or steam-hammer, as will be seen by reference to Fig. 2;  $e$ , exhaust-steam port, Fig. 5;  $f$ , exhaust-pipe;  $g$ , valve-lever fulcrum, at which point the valve-lever M is secured;  $h h$ , lugs projecting from the upper part of the frame, and to which the valve-lever is secured by the stud  $i$ ;  $i$ , valve-lever stud;  $j j$ , valve-shifter bolts and nuts, by which the valve-shifters or wedge cams N and O are secured and adjusted in order to regulate the length of stroke and strength of blow of the steam-hammer;  $k k$ , griper, for receiving the nail-blank and holding it while being forged;  $l l$ , pinions, in which are incased the grippers, having teeth which work into the teeth in the stationary rack  $m$ , and as the pinions are carried forward by the rotary motion of the griper-carriage F, in which they are secured, a revolving motion is communicated to them which is equal to one-quarter of a revolution to each upward stroke of the hammer;  $m$ , stationary rack, in which the teeth of the griper-pinions work in order to give the grippers a revolving motion;  $n$ , friction-roller, which, upon the stud  $o$ , projects from the upper end of the lever R, and works in the cam-slot Q, thereby giving motion to the lever as the hammer is raised or lowered;  $o$ , friction-stud in the upper end of the lever R, on which the friction-roller  $n$  works;  $p$ , driving-pawl, (shown at Fig. 3 and in dotted lines in Fig.

4,) which is attached to the lower end of the lever R by a ball-and-socket joint. The advanced end of the pawl is so constructed that it fits against the carriage-teeth  $q q$ , and as the steam-hammer is forced upward motion is communicated to the driving-pawl by means of the slot Q and the lever R, and as the pawl is moved forward, the end being held against the teeth  $q$  by the spring  $s$ , the carriage is propelled ahead equal to one tooth and one space between the teeth at each upward motion of the steam-hammer G;  $q q$ , carriage-teeth, against which the driving-pawl works and gives the griper-carriage rotary motion;  $r$ , pawl-ball, which fits in the socket at the lower end of the lever R, and forms a ball-and-socket joint;  $s$ , spring for holding the driving-pawl up to the teeth of the griper-carriage;  $t$ , stop-pawl, for preventing the griper-carriage traveling farther than the exact required distance, in order that the blanks being forged will receive the blow from the hammer while standing in the proper position;  $u$ , stop-pawl spring, for pressing the pawl to the carriage and holding it in its place between the carriage-teeth;  $v$ , stop-pawl arm, which, being operated upon by the lever R when the hammer descends, forces the pawl away from the carriage-teeth and allows the carriage to go ahead one motion;  $w$ , backlash-pawl, for holding the carriage from any backlash motion or recoil as the carriage is brought with force against the stop-pawl  $t$ , and, operating in a contrary direction from it, holds the carriage firmly in the exact position for the blanks being forged to receive the blow from the hammer;  $z$ , lever-fulcrum, at which point the lever R is secured to and works upon the brace S;  $a'$ , stationary cutter, which, working in connection with the moving cutter  $c'$ , cuts the blank from the nail-rod;  $b'$ , bolt, by which the stationary-cutter stock T is secured to the frame of the machine;  $c'$  moving cutter, which works in connection with the stationary cutter  $a'$ , and cuts the blank from the nail-rod;  $d' d' d'$ , moving-cutter cams, on which arm  $e'$  of the rock-shaft V works and gives motion to the moving cutter at every second upward stroke of the hammer;  $e'$ , arm of rock-shaft, which works upon the cams  $d' d' d'$ , and gives motion to the moving cutter;  $f'$ , moving-cutter spring, which, as it is forced back by the arm  $e'$  and the cams  $d' d' d'$ , power is gathered upon the spring, and, as the arm slips from the abrupt end of the cams, gives motion to the moving cutter with sufficient force to cut the blank from the nail-rod;  $g'$ , arm, to which the moving-cutter spring is secured;  $h'$ , feeder, through which the nail-rods are fed into the machine;  $i'$ , gage, against which the nail-rod is fed when fed into the machine, and which regulates the length of blank;  $j'$ , groove in feeder, through which the nail-rod passes when fed into the machine;  $k'$ , punch, fastened firmly to the hammer, which, after the nail-blank is cut from the rod, punches or forces it into the grippers as they stand open and ready to re-

ceive it;  $l'$ , bevel head, as formed by the die  $m'$ , placed in the feeder, and the header  $n'$ , which is secured to the hammer;  $m'$ , header-die, placed in the feeder, in line with and under the nail-rod, as it passes through the groove  $j'$ , and against the gage  $l'$ , and forms one edge of the bevel shape to the nail-head;  $n'$ , header, hung to and carried with the hammer, and as the hammer descends, the header strikes the nail-rod on the upper edge, forces it against the die  $m'$ , and produces the indentation on both edges of the nail-rod and forms the beveled head;  $o'$ , header-pin, which holds the header to the hammer;  $p'$ , bevel of moving cutter, by means of which direction is given to the header  $n'$ . As it descends it forces the header side-wise, in order that it may strike the nail-rod exactly over the die  $m'$ , and by this process is formed the nick  $q'$ , Fig. 16;  $q'$ , nick in nail-rod, made by the header  $n'$  and the die  $m'$ , as described;  $r'$ , nail-blank cut from the nail-rod, from which the nail is made;  $s'$ , header-spring, for the purpose of keeping the header in a position so that it passes to one side of the nail-rod at every alternate blow of the hammer;  $t' t' t'$ , drawing-dies, over and between which the blank passes as it is being forged and drawn out;  $u'$ , finishing-dies, over and between which the blank passes after it has passed the drawing-dies, and by which it is made into the finished nail;  $v'$ , die-bolts, by which the dies are secured in the anvil;  $w'$ , die-bolts, by which the dies are secured to the hammer;  $x'$ , cylinder-head;  $y'$ , anvil point-cutter, inserted in anvil-die  $z'$ , Fig. 8;  $z'$ , anvil-die, in which point-cutter  $y'$  is inserted;  $a''$ , hammer point-cutter die, to which point-cutter  $b''$  is secured or hung by the pin  $c''$ ;  $b''$ , hammer point-cutter, hung to point-cutter die  $a''$  by the pin  $c''$ ;  $c''$ , pin, by which point-cutter is hung to point-cutter hammer-die;  $e''$ , point-cutter guide, by which the edge  $h''$  is guided to the edge of the anvil point-cutter  $y'$ , which guide  $e''$  comes in contact with the bevel of the anvil-die  $f''$ , in order that the edges of the hammer-cutter  $e''$  and the anvil-cutter  $y'$  are gaged and brought together similar to a shears, and cut the ends of the unfinished nails after they have passed the drawing-dies  $t' t' t'$ , before they come to the finishing-die  $u'$ , and has the effect to make all the nails precisely the same length when finished;  $f''$ , bevel on point-cutter die, against which the hammer-cutter guide works, in order to bring the anvil and hammer-cutters together in the exact required position;  $g''$ , hammer point-cutter spring, for the purpose of holding the point-cutter guide  $e''$  against the bevel  $f''$  in anvil-die  $z'$ , and compensates for any lateral motion of the hammer caused by the wearing of the guides or  $V$ s;  $h''$ , edge of hammer point-cutter;  $i'' i''$ , hammer  $V$ s, projections made on the hammer for the purpose of guides to the hammer; they work or slide on the guides  $j'' j''$ , and keep the hammer in line and its proper position;  $j'' j''$ , guides or ways, secured in recesses of the frame in which the  $V$ s  $i'' i''$  slide;

they are constructed separately, one side from the other, and held in their places by set-bolts  $l'' l''$ , with wedge-form heads  $k'' k''$  and set-bolts  $n'' n''$ , and are so constructed that the hammer may be adjusted as it wears out of line by the strain of the several motions given by it to the other parts of the machine;  $k'' k''$ , wedges, which press against and hold the guides in their places;  $l'' l''$ , wedges or bolts with wedge-form heads, for the purpose of holding the guides or ways in their places in the frame;  $m'' m''$ , nuts on ends of wedge-bolts;  $n'' n''$ , set-bolts, for setting the guides, by which operation, in connection with the wedges  $k'' k''$ , the hammer is adjusted and brought into proper line whenever it becomes necessary;  $o''$ , griper-ring, which ring, when the two blades of the griper are put together, is slipped over the ends and holds them together;  $p''$ , griper-spring, pressing upon the inside of the griper-blades with sufficient power, so that the gripers hold the nail-blank while being forged;  $q''$ , follower, which is pressed upon by the spring  $u''$ , and keeps the griper in its place in the pinion  $l$ ;  $r'' r''$ , projections on griper-openers, which span the ends of the griper-blades and prevent the gripers from turning in the pinions;  $s'' s''$ , griper-jaws inserted in the ends of the griper-blade; they are adjustable, and when one pair is worn out another pair is inserted, and by their use the gripers are repaired and kept in order;  $t''$ , pin for holding jaws  $s'' s''$  in their places, and also acts as a fulcrum for the gripers, in order that they may open and shut;  $u''$ , outside griper-spring, the point of which bears upon the outer end of the follower  $q''$ , and holds the griper in its proper place in the pinion, and allows it to recede equal to the elongation of the blank in receiving the blow.

Having given the names and described all the parts of my machine or invention and the purposes for which they are used, I now proceed to describe the operation of the machine and the process by which the horseshoe-nails are made, which is as follows:

The steam is let into the steam-chest by an ordinary throttle-valve through the pipe  $a$ ; from there into the cylinder or hammer  $G$ . At the time the hammer is performing its upward stroke or motion the nail-rod, being heated to a bright red heat, is fed into the machine through the groove  $h'$ ; the end of the rod is forced against the gage  $i'$ , and stops. At this precise time the moving cutter  $c'$  strikes and forces it against the stationary cutter  $a'$ , by which the blank  $r'$  is cut from the end of the rod. It is forced forward over the groove  $j'$ , and at the next downward motion of the hammer the blank is forced by the punch  $k'$  downward through the feeder to the point where the griper  $k$  stands ready open to receive it. The blank is received between the griper-jaws  $s'' s''$ , and the next upward motion of the hammer gives horizontal and rotary motion to the griper-carriage  $F$  by means of the slot  $Q$ , the

lever R, and the driving-pawl *p*, and as the carriage starts the griper-opener Y is carried past and off the end of the stationary opener Z, against which it rests at the time the blank is received in the griper-jaws. The opener Y is forced back by the spring *p''*, the griper-jaws close upon and hold the blank also by the force of the spring *p''*, and by this upward motion of the hammer the carriage is moved ahead one thirty-sixth part of a revolution. The griper-pinions traveling with it make one-quarter of a revolution in the same time, and while the hammer makes its downward stroke the carriage and gripers are at rest, the nail-blank is in the proper position, and receives the blow from the hammer; then, as the hammer makes its third upward stroke, the nail-rod is again fed into the machine and another blank is cut off, received by the griper, and progresses the same as the first, and so on, until all the gripers have received a blank. The gripers are carried forward with the carriage, and at every upward motion of the hammer all the griper-pinions make one-quarter of a revolution and stop until the hammer descends and gives the blow on all the blanks or nails. The blanks, in their various stages of being forged and made into finished nails, pass over and between the hammer and anvil dies *t' t' t'*, and as there is an unevenness in the length as they are drawn out by the drawing-dies, they come around to the point-cutter dies *a''* and *z'*, the points are cut off, so that they are all made precisely the same length, and after leaving the point-cutter dies they pass to the finishing-die *w'* and are finished, the griper-opener Y comes in contact with the stationary opener Z, by which the gripers are opened and the finished nails are discharged; the griper again passes to the proper place and receives another blank.

Having thus described my invention, I do not claim the arrangement of dies for forging the nails, nor do I claim revolving and progressive gripers; but, what I do claim, and desire to secure by Letters Patent, is—

1. The arrangement of the moving cylinder G, steam-chest H, steam-ports *b b*, exhaust-port *e*, steam-passages *c* and *d* through the

stationary piston rod J, and valve I, the whole being constructed and operating as described.

2. The combination of the steam-hammer G with the anvil D, the graduated dies, the point-cutters, and the revolving and progressive gripers, to manufacture horseshoe-nails, the whole constructed and operating in the manner and for the purpose substantially the same as described.

3. The arrangement of the cams N and O, lever M, and valve-rod L, all constructed and operating together as and for the purpose substantially the same as described.

4. The arrangement of the cam-slot Q in the hammer, the lever R, and pawls *p* and *t*, all operating to give motion and stop to the carriage F, as and for the purpose described.

5. The combination of the series of cams *d' d'*, cutter-holder *u*, rock-shaft *v*, and the adjustable spring *f'*, all constructed and operating as and for the purpose substantially the same as described.

6. The arrangement of the hammer point-cutter *b''*, spring *g''*, guide *e''*, and anvil-cutter *y'*, the same being constructed and operating in the manner and for the purpose substantially the same as described.

7. The combination of the griper *k k*, fulcrum-pin *t''*, ring *o'*, spring *p''*, and opener Y, constructed, arranged, and operating in the manner and for the purpose set forth.

8. The arrangement of spring *w''*, follower *q''*, the spring *p''*, or an equivalent bearing, and the gripers *k k*, as and for the purpose set forth.

9. The combination of the stationary cam Z, opener Y, pinion-socket *l*, and spring-grippers *k k*, with the griper-carriage F, and rack *m*, in the manner and for the purpose described.

10. The combination of the dies *m' n'* and cutters *a' c'*, all arranged and operating to nick the rod and sever the blank in the manner and for the purpose substantially the same as described.

E. L. BRUNDAGE.

Witnesses:

H. C. BRUNDAGE,  
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