V. De. M. Upham, 2. Sheets. Sheet. 1.

Bolt Header

No. 110,515. Patented Dec. 27. 1870.

Fig. 1.

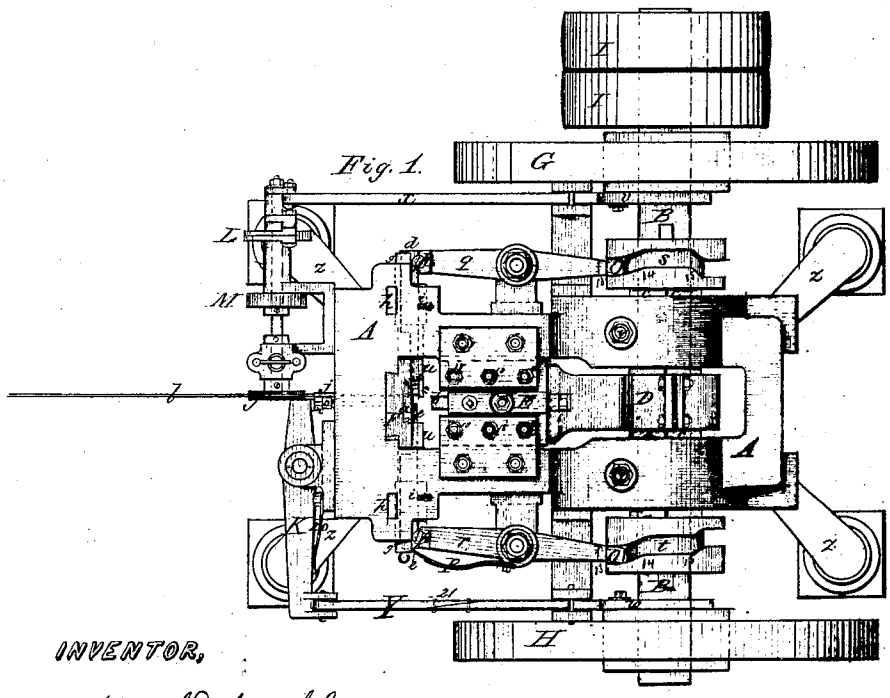

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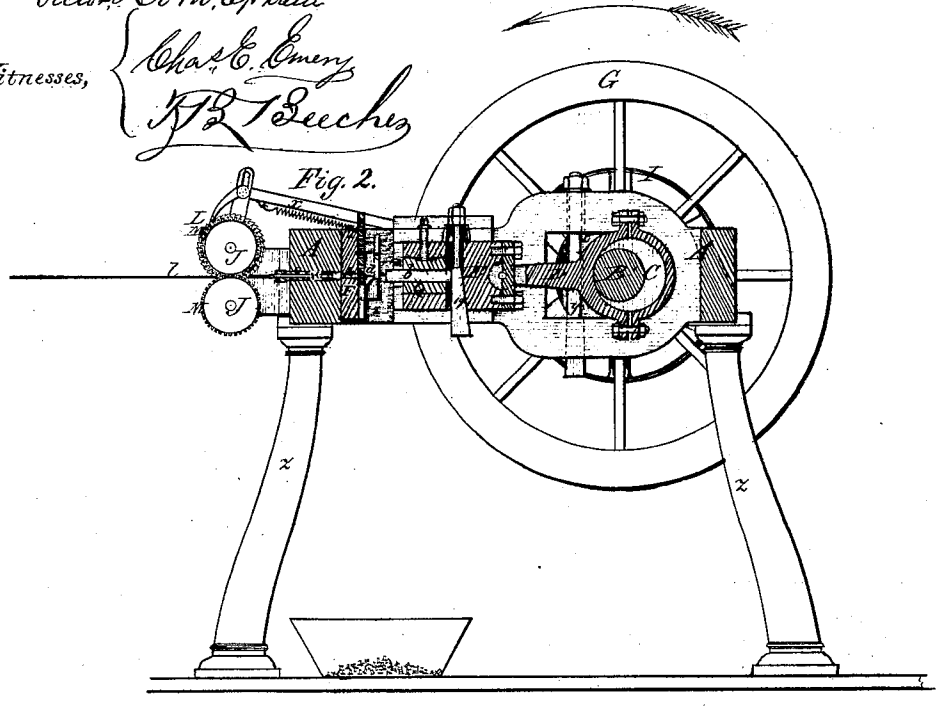
Fig. 2.



2. Sheets, Sheet 2

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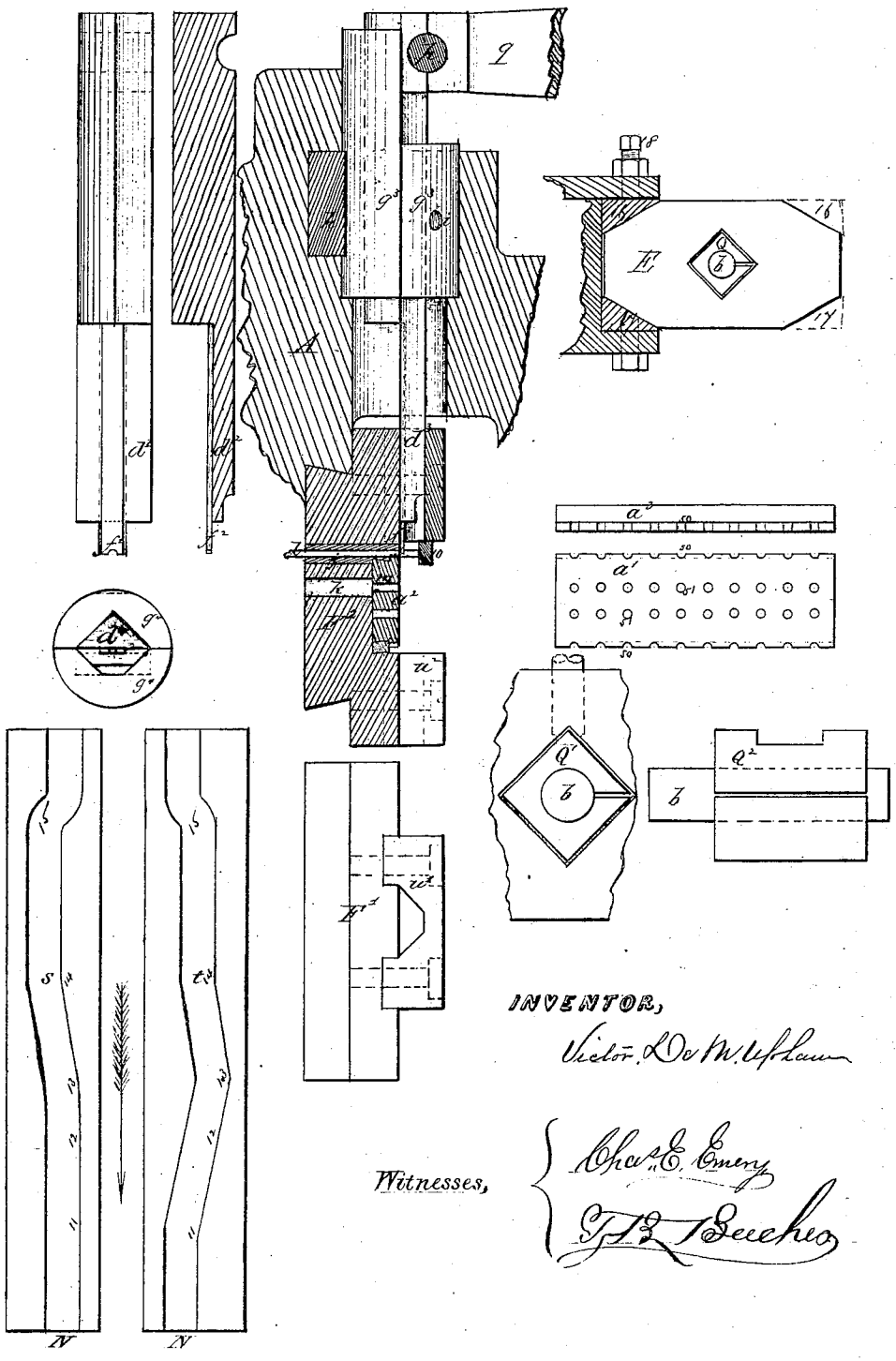

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VICTOR DE M. UPHAM, OF BROOKLYN, NEW YORK.

Letters Patent No. 110,515, dated December 27, 1870; antedated December 10, 1870.

IMPROVEMENT IN MACHINES FOR HEADING RIVET AND SCREW-BLANKS.

The Schedule referred to in these Letters Patent and making part of the same.

Be it known that I, VICTOR DE M. UPHAM, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Heading-Machine for Heading Rivets and Screw-Blanks; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing making part of this specification.

My invention has for its object to construct a rivet and screw heading-machine which will operate with greater rapidity, and which may be more readily adjusted and adapted to different work than any hitherto in use.

My invention consists in various improved devices and combinations designed to accomplish the above result, which are hereinafter fully enumerated and described.

On sheet 1 of the drawing—

Figure 1 represents a plan view of the heading-machine complete.

Figure 2 is a vertical longitudinal section of the same.

Sheet 2 of the drawing shows, on an enlarged scale, various details of the machine, which have been designated by the same letters that indicate corresponding parts on sheet 1.

The different views of the same part on sheet 2 are distinguished by attaching a numeral to the designating letter.

A represents the main frame of the machine. It consists of two thick, heavy sides, joined together at their ends in a single casting, and is supported by suitable legs, *z z z z*.

The sides of the framing near one end are thickened, and lateral openings provided to receive the boxes *c c c c* of the main shaft B.

These boxes are adjusted to the shaft by nuts on keys *y y*.

The shaft B, between its bearings, is enlarged on one side, so as to form an eccentric, C.

This eccentric, by means of a heavy connecting-rod, D, moves the hammer-block E back and forth in suitable guides formed inside the frame A.

The block E carries the hammer *b* which heads the rivet-blank.

a designates the die-plate.

A side of this plate is provided with a semicircular groove or recess, against the edge of which the wire is cut.

The blank thus cut is transferred over an adjoining opening in the plate, and is pushed into the same and headed by the hammer.

In practice I generally construct the die-plate *a* with a number of cutting-recesses and die-openings, as is shown on sheet 2, in which a^1 represents the face of the die-plate; a^2, a cross-section, and a^3 a side view of the same.

Usually, the upper-side edges of the die-plate are made to project slightly, in the manner shown, and through them are cut semicircular grooves 50, against the edges of which the wire is cut.

Opposite and near the grooves 50 are placed die-openings 51.

Only one of the grooves 50 and one of the die-openings 51 are in use at the same time, but the plate may be turned round and shifted vertically, to bring into use either of the openings desired.

The holes in the plate may be of the same size as shown, or of different sizes, so that rivets of different diameters can be made in the same plate.

Each die-opening 51 is located opposite the groove 50, used in connection with it, but the die-openings on the two sides of the plate need not be placed opposite each other, as shown, but may be "staggered" to increase the strength of the plate.

The die-plate, with its openings and recesses, is sometimes called, technically, the "die." It is secured in place in any suitable manner.

As shown, its sides at the rear are of dovetail form, and are secured by means of a key in a groove of corresponding shape in a die-block, marked F.

This die-block may, however, be omitted, and the die-plate *a* be secured directly in the bed A.

The back part of die-block F is made of dovetail shape and fits into a corresponding recess in the bed A, where it is secured by a key.

Near the center of this die-block F are two holes, in one of which is fitted tightly a bush, *j*, the interior of which is of sufficient size to permit the free passage of the wire from which the blanks are formed.

One side of this bush is cut away to fit it to the edge of the die, and the latter is so adjusted that the wire, in passing through the bush, enters one of the grooves in the edge of the die, as shown on sheet 2 at a^2.

When one of the grooves is placed opposite the bush *j* the adjoining hole in the die comes opposite a larger hole in the die-plate F.

In this hole is placed a steel pin *k*, fitting loosely, and of a length equal to the thickness of die-block F.

The hole in die *a*, opposite *k*, has also, fitted loosely into it, a steel pin, *m*, the length of which is equal to the thickness of the die, and the rear end of which is upset to fit a countersink surrounding the hole on the back of the die.

By reference to sheet 1, fig. 2, it will be seen that the pin *k* bears against the head of a bolt, *n*, which slides through a bush, *o*, that screws into frame A.

When the pin *m* is pushed in it pushes back *k* and bolt *n* until the head of the latter rests upon the end

of bush *o*. This bush may be turned in or out to form rivets of different lengths.

Across the face of the die-block F and die *a* slide the ends of the "cutter" *d* and "finger" *e*.

The office of *d* is to cut off the blank from the wire *l*, and, in connection with *e*, to transfer the same over the adjoining hole in the die-block, into which hole the blank is pushed by the hammer and headed.

On sheet 2, d^3 shows a top view of the cutter inclosed by its bearings.

d^2 is a horizontal longitudinal section of the cutter;

d^1, a side view; and

d^4, an end view of the same.

The cutter consists of a square bar with one corner removed and one-half cut away for part of its length on a diagonal longitudinal section.

In the flat position thus exposed is fitted in a dovetail groove, a thin piece of steel, *f*, with a semicircular groove across it to grasp the blank.

The cutter *d* is operated by lever *q* through a pin, *p*, which enters a half hole in the side of the outer end of *d*, and a corresponding half hole in the end of the lever.

The finger *e* is constructed exactly like *d*, but lies on the opposite side of the machine.

The cutter and finger have each two bearings, one on the die-block F and the other in brasses *g g* in the frame.

One side of the first-named bearing is formed by F and the other by the caps *u u*, which keep the moving parts up to their places.

Each pair of brasses, *g* and *g*, fits into a circular hole in the frame, the front brasses of each pair being tightened and adjusted by keys, *h h*, and the back ones by screws *i i*, and also by two others in the bottom of the frame not shown.

The front brasses extend out further than the inner ones, so as to furnish support opposite the pins *p p*.

The cutter *d* and finger *e* may be made triangular, or have any number of sides, or may be round, and provided with a feather, so long as the general construction and arrangement relative to the bearings of said cutter and finger and to the die-plate remain substantially the same.

The levers *q* and *r*, which operate respectively the cutter and finger, are pivoted at their centers to brackets on the frame, and carry on their rear ends rollers O O, which enter and receive motion from grooves in cams *s* and *t*, the operations of which are more particularly described hereafter.

G and H are fly-wheels, to steady the motion of the machine, and I and I are the driving and loose pulleys.

On the inner hubs of the driving-wheels are placed cams *v* and *w*.

The cam *v*, by means of connection *x*, operates a lever, carrying a number of pawls of different lengths, which engage with the teeth of a ratchet-wheel, L, and give motion to the gear-wheels M M and the feed-wheels J J, which propel the wire into the machine.

The connection *x* and the pawl-lever are operated in one direction only by the cam, and are returned to place by a spring.

K is a strong lever, pivoted to the frame. One end of the lever presses against the bolt *n*, the other by means of a connection, Y, receives motion from the cam *w*.

The connections *x* and Y are supported, near the cams which operate them, by suitable brackets attached to the frame.

The operation of the machine is as follows:

The wire *l* is taken from a coil on a reel in the usual manner. The wheels revolve in the direction of the arrow.

Supposing the machine to have been in regular operation, as the hammer *b* is drawn back by E, D, and C, to the position shown, the cam *w*, by means of rod Y, lever K, bolt *n*, and pins *k* and *m*, pushes out of the die a rivet, headed at the previous stroke, and the cam *v*, in the manner described, moves the feed-wheels J J and advances the wire into the machine the length of one rivet-blank, or until the end of the wire strikes a small adjustable stop, 10.

By this time the cams *s* and *t* have, in manner described, moved the cutter *d* and finger *e* so that their steel ends grasp the wire on each side. All the parts are then in the position shown in the drawing.

The cutter and finger are then moved together toward the right of the machine, toward rod Y, in fig. 1; the steel end *f* of the cutter cuts off the wire against the edge of the die; and the blank thus formed being held between the thin steel ends of the cutter and finger is transferred partly across the die, until it comes opposite the hole then in use. Here the blank is held until the hammer *b* comes up and pushes it into the hole, when the cutter and finger are suddenly pulled back out of the way.

The entrance of the blank into the die pushes in the pins *m* and *k*, and bolt *n*, and moves *k* until the forward end of bolt *n* rests on the end of *o*, when the hammer upsets the end of the blank and forms on it a head, corresponding to the shape of the hammer-face.

The hammer is now withdrawn, the belt *n* is pushed back, as before, to force out the headed blank or rivet, the feed-gear pushes in the wire for another blank, which is cut off, carried to the part of the die in use, pushed in, the cutter and finger withdrawn, the head made, and the operation continuously repeated, a rivet being formed at every revolution of the machine.

On sheet 2, *s* and *t* represent the development of the cylindrical surface of the cams *s* and *t*, fig. 1, on a larger scale, and show the shape of the grooves on the cams at all points in the circumference.

At or about the time that the hammer has formed the rivet-head, and has commenced to return, the cams *s* and *t* would be in such a position that the rollers would lie in that part of the groove corresponding to N N in the surface, as seen on sheet 2. At this point the rollers are nearest the interior edges of the cams, so, since the levers *q* and *r* reverse the motion of the cams, the cutter and finger are pulled to their fullest extent from the center of the machine.

The motion of the circumference of the cams is in the direction of the arrow, (see sheet 2.)

At or about the time the circumferences and their grooves have moved until the points 11 11 have reached the rollers O O, the hammer has been pulled partly back, and the rivet has been nearly or quite ejected from the die.

As the cam continues revolving, the groove in cam *t* moves the roller outward and the finger *e* inward over the die.

The cam *s* commences moving its roller slowly outward as the point 12, and the adjustment is such that at the point 13 both cutter and finger have grasped the wire, and the parts are in the position shown in fig. 1.

The grooves in both cams now turn to the left with the same angle, thus moving the cutter and finger to the right, cutting off the blank and moving it over the die to the particular hole in use, which is reached at 14.

The hammer now pushes the blank into the die, and before the hammer reaches the cutter and finger, the cam has moved so that the rollers are at 15, and become suddenly drawn in, pulling the cutter and finger away from the blank, and back to the same position as when the rollers were at N N.

It will observed that the cams give to the levers *q*

and *r* and the cutter and finger *d* and *e* a positive movement at all times.

Other machines give these parts a positive movement in but one direction.

The levers *q* and *r* also transmit the motion in the most direct manner, and are, from their shape, not as liable to spring as in the other machines where bell-cranks and rock-shafts are employed.

I prefer, in some instances, to dispense with a lever on the cutter side at least, and put a cam similar to that described near, and directly connected to the outer end of the cutter, and operate said cam by gear from the main shaft.

These improvements enable this machine to be run faster than others.

In order that the finger may press the blank tightly against the cutter when the cams have worn differently, the hole in *r* and *e* is made slightly oblong, so that the pin *p* fits loosely, and a spring, P, attached to lever *r*, presses upon the end of finger *e*, and keeps the slack all one way till the wire is grasped, when the blank is held by the elasticity of the spring within the limits of the slack; but the motion is positive beyond those limits.

By turning aside the spring P, and withdrawing pin *p*, the finger *e* may be pulled entirely out of the machine, as also may the cutter *d*, by simply removing its connecting-pin *p*. When the cutter and finger are removed, the die-block F can be taken out of the machine, and if it be necessary to change the die, or the steel points *f* of the cutter or finger, since the inner bearings of the latter are on the die-block, they may be adjusted to the die before being put in the machine.

An end view of the hammer-block E is represented on sheet 2. As shown, the shape is that of a rectangle with the corners removed, leaving four inclined surfaces, which receive the whole bearing and slide on triangular pieces 16 16, 17 17. By setting down the screws 18 18, &c., on the pieces 16 16, the wear of the sliding-block in all directions may be compensated by adjustments in one direction.

The great width of E gives it stability, and furnishes room for a long bearing where it connects to D. To form this bearing the end of D is widened and forked so that the whole rounded end bears in the working direction in a corresponding groove in E. A small cap on E takes hold of a small central pin so as to pull D back with E.

The hammer *b* is preferably made of circular section, and is secured in the center of a bush, Q, made from a square bar of steel or other metal. This bush lies in a larger square hole in hammer-block E, with a corner downward.

A longitudinal vertical section of the bush is shown in fig. 2.

On sheet 2, Q^1 shows an end view of the bush, and Q^2 a side view of the same. As shown, the bush is split along one of its side edges, and is secured by a set-screw acting upon a flat place in the top edge.

To adjust the hammer, the bush is packed underneath with slips, on one or both sides, which slips may be of the same or unequal thickness, so as to raise and move sidewise the hammer to the point desired; the set-screw or equivalent is then tightened, which presses the bush tightly upon the packing, and at the same time compresses the bush and holds the hammer firmly.

The rear end of the hammer abuts against the key 19, fig. 1, which key may be raised or lowered to adjust the thickness of the rivet-head.

The bush may be made of triangular, hexagonal, or octagonal section, or any equivalent shape, which will admit of the insertion of packing-pieces and the tightening of the bush and hammer, substantially as described.

In some cases difficulty has been experienced from the breaking or crushing of the small pin *m*, sheet 2, which pushes the rivet out of the die. In such instances the lever K or its supporting bucket is broken, to prevent which the operating rod Y is split diagonally, as shown at 21, and the parts are joined by small rivets of sufficient strength to operate the lever K under ordinary circumstances; but, in case of obstruction, the extra strain shears off the rivets and prevents more serious damage. This weak point 21 may be made in various equivalent ways to accomplish the same purpose.

It has been found of advantage to put a spring, 20, against the lever K, in manner shown, to keep the opposite end of the lever pressed against bolt *n*. This pulls the connection Y a little distance away from cam *w*, and the protuberance on the latter strikes Y with a slight blow, which is transmitted directly to jar out the rivet instead of being lost in a succession of blows in the several joints.

This jar has been found to be practically advantageous when making either large or small rivets. The large rivets sometimes stick in the die, and can be loosened by a quick blow better than by a gradual application of pressure. It has been found also, that the small steel pin *m*, which fits in the die opening and pushes out the rivet, soon becomes a strong magnet, and not infrequently, when making short light rivets, one of them will be attracted to the end of the pin *m* with sufficient force to prevent such rivet from falling when pushed out of the die.

Sometimes the finger *e*, as it crosses the die-plate, will push the rivet to one side so that it will drop; but if the end of the rivet be not entirely clear of the die the finger and die form a rough pair of shears, which cut off or distort the rivet, and cause considerable annoyance. This can only be prevented by causing the end of pin *m* to move out flush with the edge of the die at every stroke, which requires too nice adjustment for satisfactory working.

The jar produced when the spring 20 is used loosens the rivet from the pin, and also presses the latter as far out as possible at every stroke, so that the finger can push off the rivet if the jar fails to loosen it.

I disclaim a spring when arranged to keep the connecting-rod at all times in contact with the cam; such an arrangement is old. It prevents the jar I seek, and the length of the connection must be rigorously exact in order to cause the pin to move exactly far enough to fully eject the rivet.

Dies have been made with a straight cutting-edge, in combination with an opening in which the heading was performed, but this plan flattened the end of the blank and caused an irregular-shaped head. So, also, it is common to employ a die with two openings, against the edge of one of which the blank is cut and then transferred and headed in the other.

The half hole, or semicircular groove, forming the cutting edge in my invention, is found practically to be a great improvement; for, as the surface wears away, it can be heated in the fire and hammered up to a bearing, or filed or ground the same as the edge of any cutting-tool.

Some important improvements have been made in the arrangement and shape of the bearings of the cutter and finger. It is essential that the latter be capable of exact adjustment in relation to the die. In other machines the means for doing this are insufficient, as their bearings consist simply of a hole in the frame, and adjustment is roughly effected by packing-pieces.

I have two pairs of bearings, one close to the die and others at the extreme ends, both arranged so that the cutter and finger may be adjusted in relation to

the die. The shanks of the cutter and finger are also so shaped that they will not turn, and compensation for wear may be made by adjustment in one direction. Also, the method of inserting and adjusting the brasses in the frame is simple and efficient.

In other heading-machines it is usual to elevate the pillow-blocks carrying the main shaft, and also the die-block above the center line of the main frame, and in many instances the main shaft is placed below the plane in which the hammer-block moves, and a cam on the shaft pushes up a toggle-joint, which moves the hammer. In such arrangements the indirect action causes the frame to spring.

In the present invention the greatest strength of metal is disposed directly in the line of the strains, which requires a novel arrangement of the parts. The frame is also cast in one heavy piece, insuring great strength and solidity.

I claim as new and desire to secure by Letters Patent—

1. The die-plate *a*, with one or more die-openings, 51, and one or more semicircular grooves or recesses, 50, in combination with the die-block F or frame A, and the moving cutter and finger *d* and *e*, substantially as and for the purposes specified.

2. The construction and arrangement relative to one another and to the die-plate of the finger and cutter *d* and *e*, the brasses or bearings *g*, and wedges *h*, or their equivalents, substantially as shown and described.

3. The combination of the split and adjustable bushing Q, with the adjustable hammer-block E, substantially as and for the purposes set forth.

4. In combination with the subject-matter of the last preceding clause, the connecting-rod D and the eccentric C, on shaft B, substantially as shown and described.

5. For the purposes herein described, and in its relations to the other parts of the machine, the improved connecting-rod Y, the improvement in said rod consisting in making it in two pieces, lapped one on the other, and fastened together by rivets, bolts, or screws, substantially as described.

6. The combination of the shaft B, eccentric C, connecting-rod D, and hammer-block E, with a solid iron frame, constructed substantially as described.

7. The spring 20, arranged and combined with lever K, bolt *n*, connection Y, and cam *w*, in such manner that the spring keeps the end of the connection Y out of contact with the cam during a portion of the revolution, substantially as and for the purposes described.

VICTOR DE M. UPHAM.

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T. B. BEECHER,
CHAS. E. EMERY.