5 Sheets—Sheet 1.

J. M. ALDEN.

WOOD SCREW MACHINE.

No. 110,532. Patented Dec. 27, 1870.

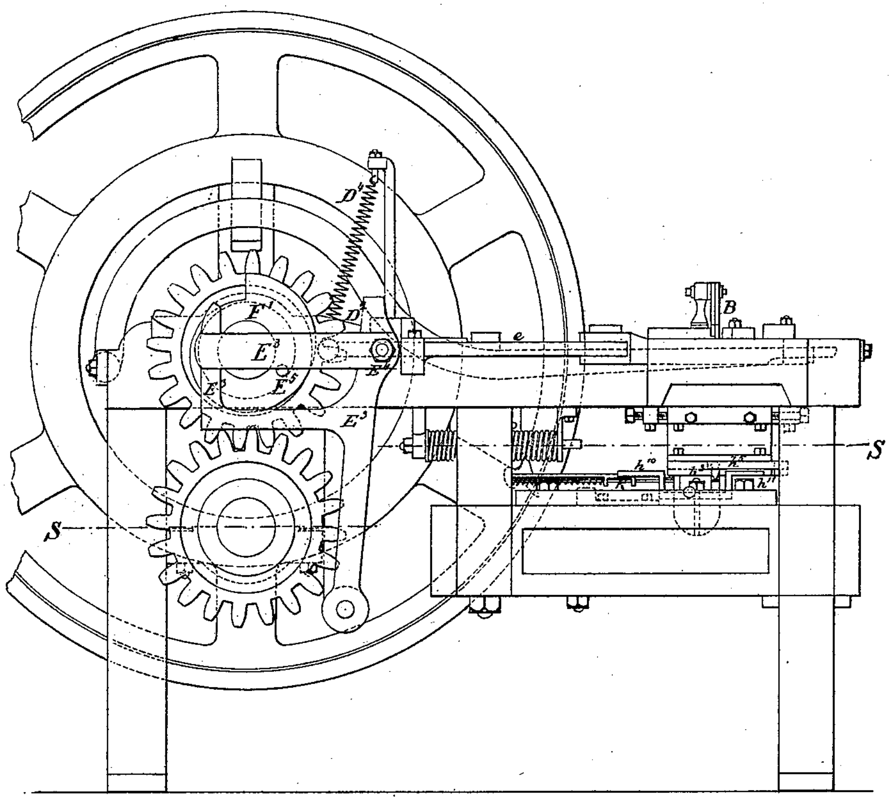
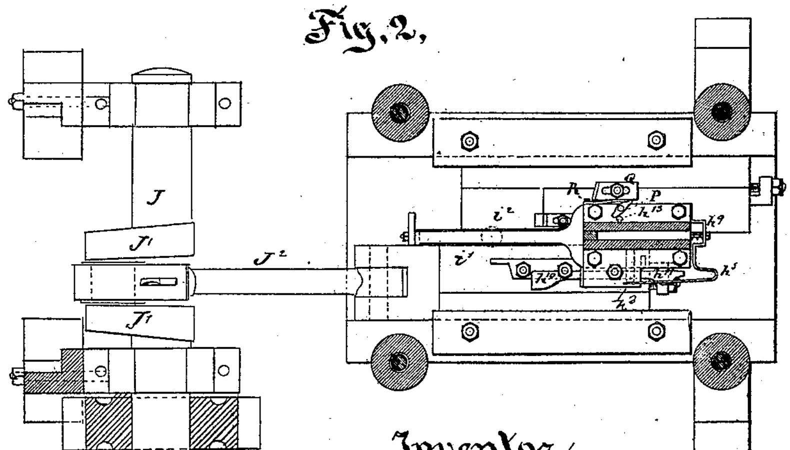


Fig. 2,



Witnesses, A. Hoermann
C. C. Livings

Inventor,
James M Alden
by his atty T. D. Stetson

5 Sheets—Sheet 2.

J. M. ALDEN.

WOOD SCREW MACHINE.

No. 110,532. Patented Dec. 27, 1870.

Fig. 3.

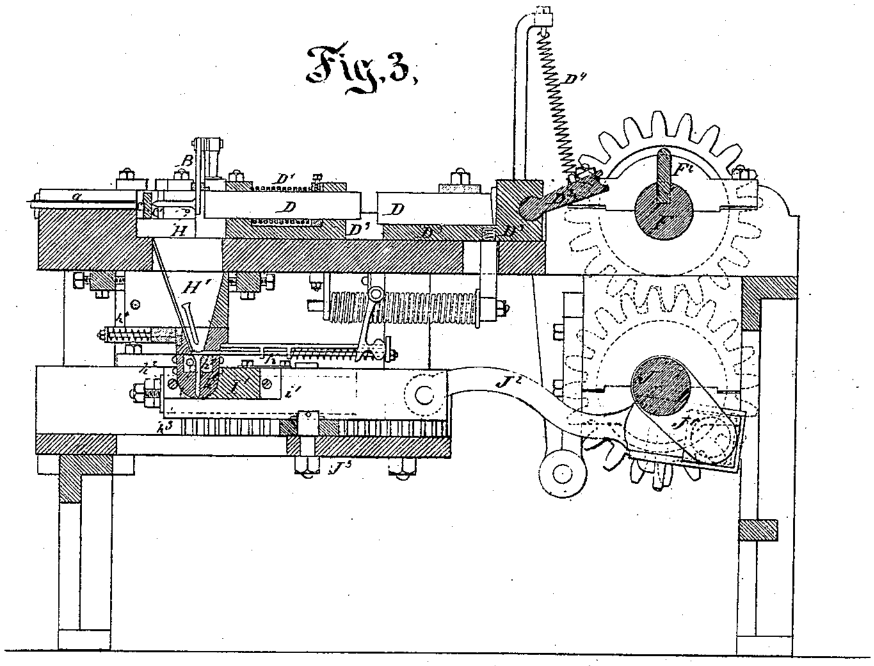
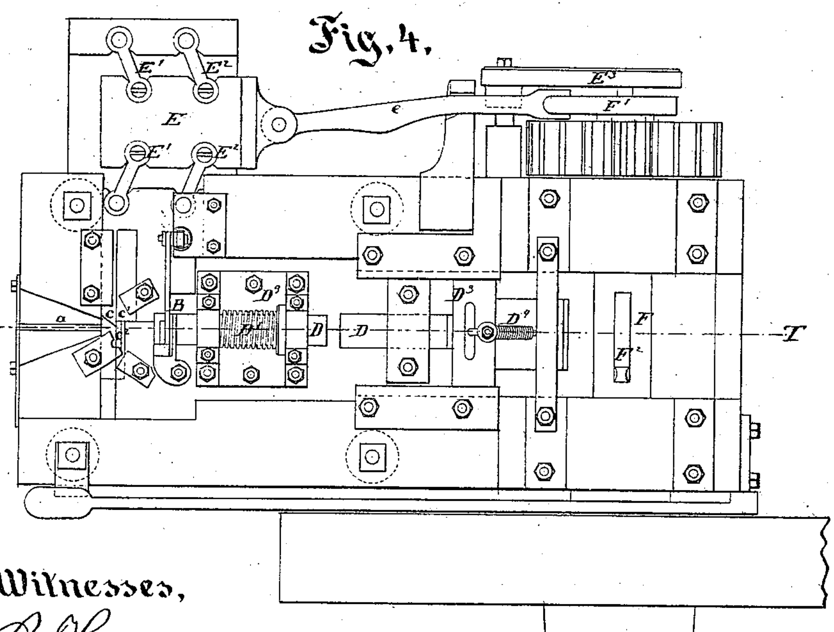


Fig. 4.



Witnesses,

A. Hoermann.

C. C. Livings

Inventor,

J. M. Alden
by his atty T. D. Stetson

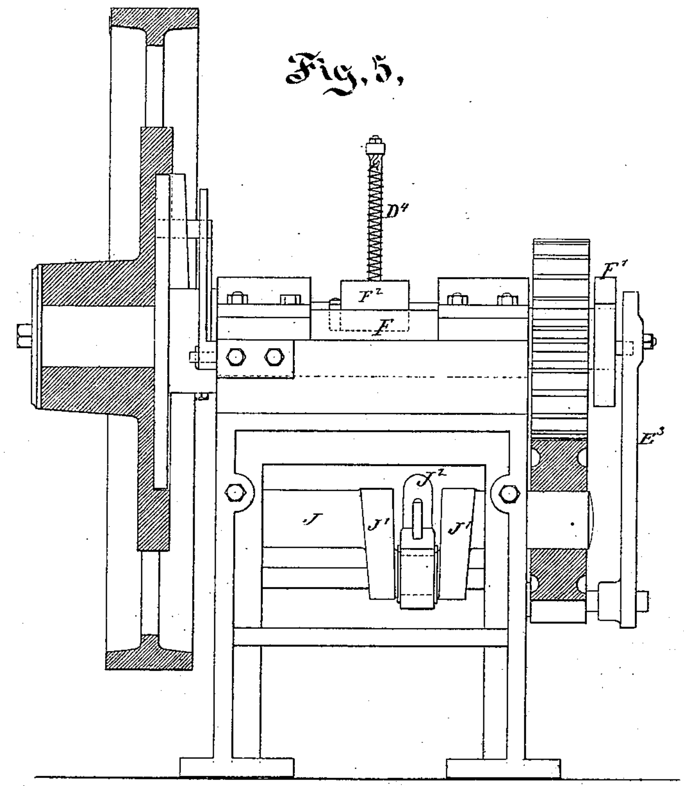
5 Sheets—Sheet 3.

J. M. ALDEN.

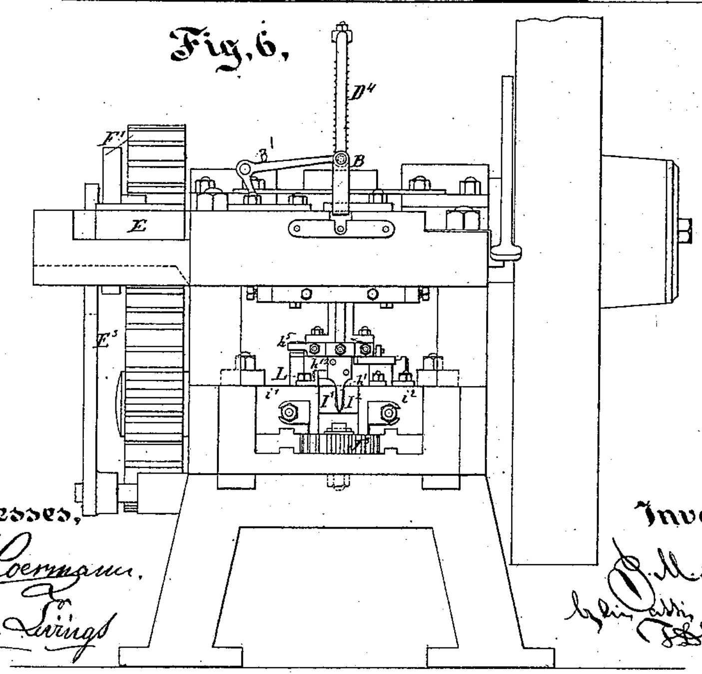
WOOD SCREW MACHINE.

No. 110,532. Patented Dec 27, 1870.

Fig, 5,



Fig, 6,



Witnesses,

A. Hoermann.

C. C. Livings

Inventor,

J. M. Alden

by his atty

T. D. Stetson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

J. M. ALDEN.

WOOD SCREW MACHINE.

No. 110,532. Patented Dec. 27, 1870.

Fig. 7.

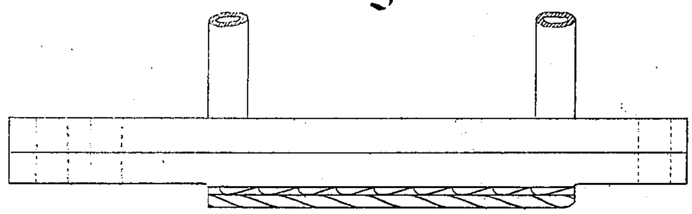


Fig. 8.

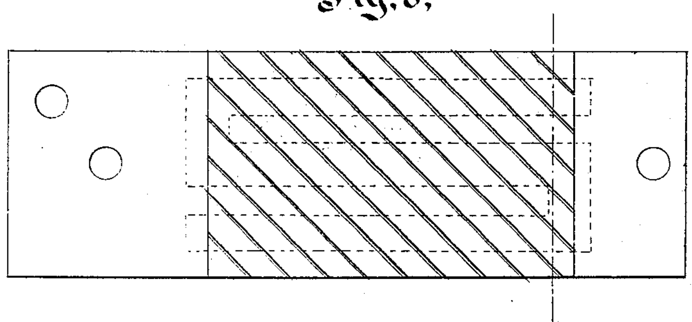


Fig. 9.

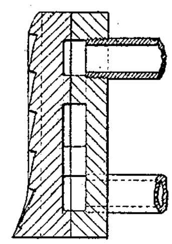


Fig. 10.

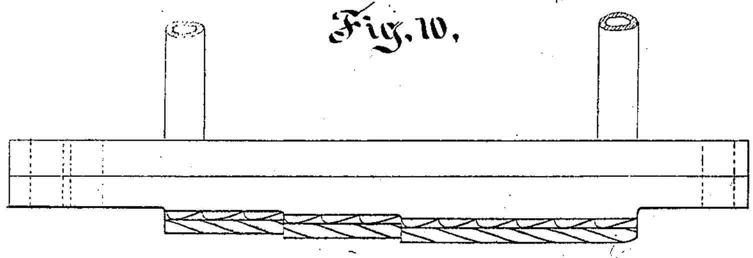


Fig. 11.

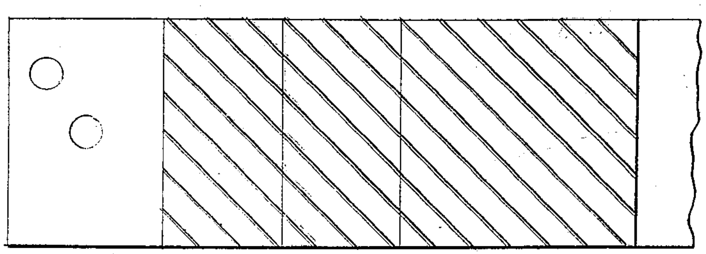
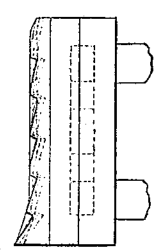


Fig. 12.



Witnesses,

A. Hoermann

C. C. Livings

Inventor,

J. M. Alden

by his atty J. B. Staton

J. M. ALDEN.

WOOD SCREW MACHINE.

No 110,532. Patented Dec. 27, 1870.

Fig. 13.

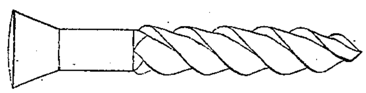


Fig. 14.

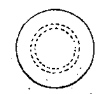


Fig. 15.

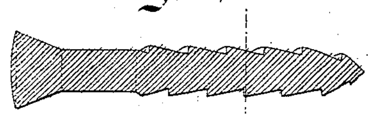


Fig. 16.

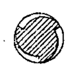


Fig. 17.

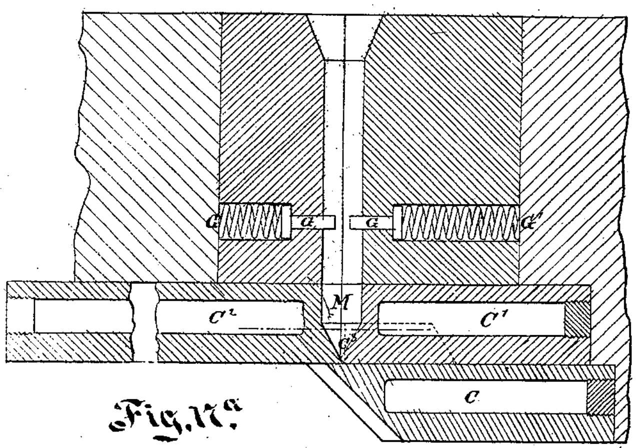


Fig. 18.

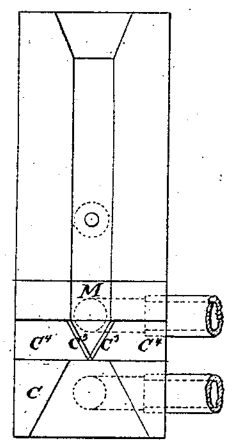


Fig. 17a.

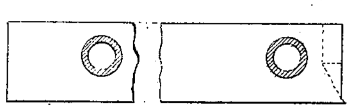


Fig. 17b.

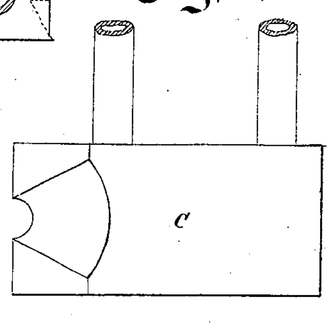


Fig. 18a.

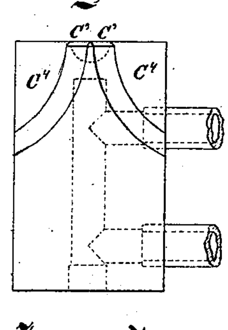


Fig. 19.

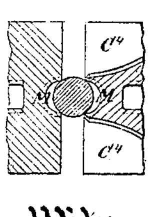
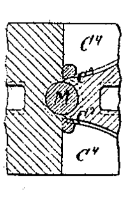


Fig. 20.



Witnesses,

A. Hoermann.

C. C. Livings

Inventor,

James M. Alden
by his atty
T. D. Stetson

United States Patent Office.

JAMES M. ALDEN, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL SCREW-NAIL COMPANY, OF SAME PLACE.

Letters Patent No. 110,532, dated December 27, 1870.

IMPROVEMENT IN WOOD-SCREW MACHINES.

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

To all whom it may concern:

Be it known that I, JAMES M. ALDEN, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Screw and Bolt-Machines; and I do hereby declare that the following is a full and exact description thereof.

This machine manufactures screws in a complete form at a single heat.

The threads are produced by indenting the grooves and forcing up the metal for the threads, by acting on the surface with suitable parts or dies having a corresponding shape.

The blank is rolled between two surfaces which are grooved obliquely to the path in which the surfaces travel.

The blank is without motion, except that of simply rotating on its axis during the period while the threads are being produced.

There are two dies traveling in opposite directions, and compressing the blank between them during this operation.

My machine will make screws of any ordinary kind with some success; but it is especially adapted for the manufacture of the screw-nails, screw-spikes, or screw-bolts, described in the patent issued to Samuel Pratt, dated October 25, 1853.

The threads are of a form giving a strong hold in the wood, and the pitch is much greater than in ordinary screws.

The favorite number of threads is three, but a greater or lesser number may be produced, if desired.

Screw-nails so shaped may be driven by the hammer, and will turn themselves as they enter into the wood.

They may, by means of a suitable header, having a chisel thereon, be provided with a score for operating, also with screw-drivers, if desired.

They may have any form of head which may be desired, for any particular purpose.

The machine receives the iron in the form of a round rod or bar. It is important that the size be accurately determined and uniform. To effect this, the bars or rods may be drawn through an accurate gauge in the same manner as wire is drawn after it is rolled down to very nearly the proper size. This leaves them perfectly round and true.

The iron is now heated again, and may then be fed in by hand into my machine, or by any power which will feed it intermittently as required. A weight or spring force, which will press it constantly forward, will answer the purpose.

I will first proceed to describe what I consider the best means of carrying out my invention, and will afterward designate the points which I believe to be new therein.

The accompanying drawing forms a part of this specification.

Figure 1 is a side elevation of the entire machine.

Figure 2 is a horizontal section through some of the principal parts on the crooked line S S in fig. 1.

Figure 3 is a section on the line T T in fig. 4.

Figure 4 is a plan.

Figure 5 is a rear elevation.

Figure 6 is a front elevation.

The above figures are on a scale about one-fourth of the size of a machine which I constructed and tested with success.

The remaining figures show detached details on a larger scale.

Figure 7 is an edge view, and

Figure 8, a face view of one of my dies. Fig. 8 shows in dotted lines the passages therein for the circulation of cold water.

Figure 9 is a cross-section, showing the same, and also the connections of rubber-hose to convey the water.

Figure 10 is an edge view of a form of die which I prefer. It is made with steps or offsets. The die first impresses the threads by the lowest step, then sinks the next step deeper, thereby raising the threads higher by sudden increments, instead of gradually, and I find the effect is better.

Figure 11 is a face view, and

Figure 12, a section.

Figures 13 to 16, inclusive, show the form of thread which I prefer.

Figure 17 is a horizontal section through the knife and dies, which cut off and point the iron.

Figure 17^2 is a face view of the knife which divides the bar.

Figures 18 to 20, inclusive, show exactly the form and action of the dies in giving a pointed form to the bolt or screw.

Figure 19 shows the dies in the act of commencing, and

Figure 20 shows the same in the act of completing the pointing of a bolt. Fig. 20 shows at each side of the bolt a small quantity of metal cut or sheared off by the sharp form of the dies. The dies both swage and cut the metal in giving it the pointed form.

Similar letters of reference indicate like parts in all the figures.

The material of the whole of the rigid parts may be of iron and steel. The material of the flexible pipes may be soft vulcanized rubber.

The machine being complex, I have endeavored to represent it fully and correctly by the drawing. In describing these I will, to save repetitions, describe the operation simultaneously with the description of the parts.

The motions of the several parts of my machine are derived not from a single-rotating shaft, but from two rotating shafts, F and J, geared together. The uppermost shaft, F, is the main driving-shaft, and carries a driving-pulley, fly-wheel, &c. It operates those parts of the mechanism which produce the blank, that is to say, the parts which cut off the bar or rod, and those parts that firmly compress and point the blank, head the blank, operate the gauge, and open the dies and discharge the blank.

This shaft could also operate the feeding mechanism, if any such mechanism be employed.

The other shaft, J, I term the crank-shaft. It is mounted directly under the main driving-shaft, and is geared so as to turn in the same time. It carries a stout crank which operates the movable bars, and thus operates all those portions of the mechanism which detain the blank, hold it, support it, thread it, and discharge it in the form of a complete screw or screw-nail.

It follows that by disconnecting the gearing which connects the crank-shaft to the driving-shaft, I can produce blanks alone without operating any portion of the threading mechanism. I propose to do so when, under any circumstances, blanks are wanted without threads.

My machine may thus be used for the production of rivets and plain bolts of various kinds, with or without provision for pointing.

It may be remarked that the knives or the parts which cut off and shape the points of the blank may be removed and exchanged without difficulty.

The end of a hot rod of iron, on being fed forward into the machine through the tube a, strikes the gauge B, which may be adjusted at will by any approved means not represented to determine the length of the blank, and the quantity allowed for the head.

While the hot bar rests against this gauge B, it is cut off by a transversely-moving knife, C, attached to the moving die C^1, or carried with it. The blank is now inclosed and compressed firmly between two dies, C^1 and C^2, which take hold of the entire length which is to form the shank or body. They leave a portion projecting to form a head.

While attaining this condition gauge B rises out of the way by the agency of the bent lever B^1, actuated by the moving die-carrier, as indicated in figs. 4 and 6. Next, a strong header or heading-die (hollowed, if it be desired, to produce swelled heads,) advances and compresses the projecting part of the metal endwise against the dies C^1 C^2, which hold the body of the blank. This forms the head. If the head is to be round, square, or of any other exact form, the main dies C^1 C^2 must be correspondingly formed to shape it.

Most screw-nails require to be reduced or pointed at the end furthest from the head. I give such a form to the dies C^1 C^2, which inclose and hold the body, as shall impart a proper form to the point. I do this successively by making the upper part of each die, at the point, with a knife-edge, so as, partly by swaging, and partly by cutting off the surplus metal, to reduce and taper the point of the nail with tolerable symmetry.

This form is important, and is shown in figs. 17 to 20. It will be seen, on examining these figures, that the form of the dies toward the head is as usual, and that the form of the dies toward the point is such as corresponds to the pointed form of the screw desired.

For the entire space beyond the recess, the faces of both dies are plane, except—and this is the main point—at that part of the dies which is to form the point of the nail. There the metal on the upper side of each of the recesses is formed knifewise, the metal forming a sharp ridge or edge close to the recess, and being sunk or removed behind.

By "the recess" in the above I mean the cavity in the die which receives the screw-blank. Calling this recess M, and so marking it in all the figs. 17 to 20, it will be observed that while its main body is semi-cylindrical in each die, its point is semi-conical in each.

It will be obvious that the force required to operate the dies described is very great. I obtain it by means of two double toggles, E^1 E^2, arranged to be operated by a sliding carriage, E, which is moved forward by the connection e in a direction parallel to the axis of the bolt.

The carriage E is returned by a simple contact of the yoke E^3 with a pin connected thereto. The force required for this purpose is slight.

The yoke E^3, it will be observed, is attached by the pin E^4 to the connection e, which carries the slide E. When the connection e has been moved forward by the cam F^1, and has ceased its motion in this direction, the pin E^5 on the end of the shaft F, acting like a crank-pin or cam against the inside of the back arm of the yoke E^3, pushes the yoke back, and thus pulls the slide E back by its connection e to its original position.

The header D is drawn back by a spring, D^1, coiled around it. It is brought forward with force to compress the metal by a knuckle-motion.

A short arm, F^2, on the revolving shaft F makes a connection, at each revolution, with the end of a strong link or half-toggle, D^2, which acts directly against the heading-carriage D^3, in the line, or nearly in the line, of the axis of the bolt. It acts always very nearly in that line, so that the carriage, which is strongly guided, traverses forward in a correct line and gives a true motion to the strong heading-die.

A spring, D^4, carries up the hinged part, which I have termed the link, so as to be in position to again receive the revolving-arm F^2 in time for the next forward motion.

I obtain a more sudden movement of the heading-die D by allowing it to move back only to a sufficient distance to entirely clear the head and to allow the metal for the next head to come forward into position, and to allow the gauge B to stand in the proper place. The carriage D^3, which carries the stout hinged arm or link D^2, is allowed to move backward further. It therefore acquires a considerable velocity before it strikes and imparts motion to the header D.

Immediately on the retreating or backward movement of the header D, the dies C^1 C^2, before described, commence to open and liberate the blank.

To avoid the chance that the bolt or nail may stick in one of the dies, I provide a spring, G^1, acting to force inward a pin, G, through a small hole in each die, at right angles to the axis of the screw or nail. This spring G^1 is so gentle as not to indent the small pin into the soft iron, but is, at the same time, sufficiently stiff to insure a dislodgement of the blank so soon as the dies commence to open. The dies open so far that the slight projection of the clearers G into the cavity for the screw does not interfere with the feeding.

When the dies have opened sufficiently the blank falls by gravity, and it moves by gravity into the lower position, where it is subjected to further treatment, which produces the threads. The transfer of the blank from the dies C^1 C^2, above described, to the threading-dies to be described below, is a very important part of the operation. The threading-dies do not extend the whole length of the traverse; they act on the bolt while it stands in a vertical position, the bolt being held, by means to be described below, to receive the action of the threading-dies.

The tilting of the blank is effected by the aid of a pin or trip, H, which extends across under the blank, and receives it as it drops in such a manner that the point end, being longest, its gravity preponderates, and always throws the point down. The form of this pin or trip H may be varied within wide limits. It may be better, in most instances, to make it flat and inclined, but various other sections may serve. Its office is to arrest the head end of the blank and compel the blank to descend point foremost.

Thus tilted, the bolt or nail drops into a tapering hopper or partially funnel-shaped space, H^1.

The lower end or nose h^1 h^2 of this funnel or hopper is sufficiently opened at the proper times to allow the point and part of the body of the blank to pass through.

Here it is suspended by its head, while the dies I^1 I^2 act on the body below and produce the threads.

Screw-nails, ordinarily, have a portion of the shank or body left plain. In other words, the threads, considered as beginning at the point, extend upward only about two-thirds of the length to the head, about one-third being left plain or cylindrical. The lower end or nose of my hopper H^1 is shaped to fit very accurately, but loosely, around that portion of the body of the screw which is to be left plain. It also fits very accurately around the head when the head has been previously exactly finished. The greater the portion of the surface of the blank which can be thus inclosed in the lower portion of the hopper H^1, during the operation of threading, the better. In the socket thus provided the hot blank is held and allowed to turn.

The threading-dies I^1 I^2 are carried on stout slides, i^1 i^2, which I term movable bars, which are strongly guided in rectilinear guides, and which I term the "carriage-way," and are reciprocated with equal motions in opposite directions.

The dies are formed and adjusted in a proper position, according to the size of the blank and the number and obliquity of the threads desired. The dies may be made of chilled iron or case-hardened iron. I have operated dies of chilled iron, having the chill about one-fourth of an inch thick, very successfully. I have also used, with some success, case-hardened wrought-iron.

It is important that the motion of the two threading-dies which move in opposite directions shall be exactly equal at all times. I effect this by reciprocating one die, I^1, with its carriage or movable bar, by means of a crank motion, direct from the crank-shaft J, by means of a connecting-rod, J^2, as will be obvious.

The proper motion in the opposite direction is communicated from this carriage or movable bar i^1 to the other i^2 by means of an intermediate pinion, J^3, which acts in a rack in each movable bar, as represented. The pinion J^3 is mounted at a lower level than the threading-dies.

I give an ample motion to these threading dies by a crank, J^1, having a radius of one foot in the experimental machine now in operation, and a single movement or half reciprocation of the two dies is sufficient to impress the threads. The dies act on the upper or sharp angular side of the thread with most force, and they force up the metal to form the thread with an efficiency which depends on the correctness of their form and adjustment, and on the softness or plasticity of the hot iron.

The hold on the upper portion of the material, which may now be called a complete screw or screw-nail, may be made loose, as above described, so as to allow the screw to turn freely therein, or that part of the hopper H^1 which holds the screw may turn with the screw. I have not tested the latter arrangement, and, as I fear that it may involve considerable difficulty, I prefer to let the screw-blank turn loosely within it.

After the threading-dies I^1 I^2 have passed, and the threads have been swaged properly on the screw by the rolling process above described, they continue their motion still further, leaving the screw entirely free before the dies return. During this time the nose or point of the hopper H^1 opens and drops the screw, the nose being formed in two pieces, h^1 h^2, and provided with proper connections, hereinafter described, for the purpose.

After the screw has been finished it is necessary to open the nose sufficiently wide to allow the passage of the head of the screw; to effect this both halves h^1 h^2 of the nose may move in opposite directions, but I have found it sufficient, with all ordinary forms of the screw-nail, to open the hopper by moving one half, h^1, alone toward the front of the machine. It receives its motion from the movable bar i^1, through parts attached thereto. The means whereby this is effected are indicated in the drawing, fig. 6. The extent of the motion need be only sufficient to allow the head of the screw to descend freely.

The tension of the spring h^4 (see figs. 2 and 3) being gentle, it requires only a moderate force to overcome it, as also the friction of the parts.

This force is received from the slide i^1, at the proper time, through the medium of the projection L carried on the said slide, which strikes against the projection h^{11} on the part h^1 of the nose. It strikes when the slide i^1 has approached within an inch or less of the end of its forward motion, and carries the movable half h^1 of the nose forward with it to the end of its motion; then, on returning, the movable half returns by the force of the spring h^4 to its closed position.

I provide a movable stop or rest, K, in the hopper H^1, which extends across, directly over the head of the bolt, while it is being threaded, and arrests the descent of the succeeding bolt, until the one previously threaded is discharged. This movable rest is operated by a stub on the slide or movable bar i^2, and is drawn out for a very brief period. The drawing out of the movable rest K allows the blank previously resting on it to descend into the nose of the hopper.

In order to allow it to thus descend more freely, the nose is opened at this juncture a very little. This movement I term "limbering the nose." I effect it by two stubs or cams attached to the slide or bar i^2, one of which pulls out a locking pin, h^3, which, when the die i^1 moves forward, locks the halves h^1 h^2 of the nose together, and the other opens the halves a little.

This operation need require only a small fraction of a second, after which the halves h^1 h^2 of the nose again close together by the force of a spring, h^4, and the locking-pin h^3 is again forced in by the spring h^5 which acts on it.

It will be readily understood that the locking-pin gives a firmness to the grip of the nose h^1 h^2 around the shank and head of the screw which would not be otherwise attainable. The force of the spring h^4 is sufficiently great to urge the parts of the nose together properly while the screw is not being acted on by the dies I^1 I^2, but the action of the latter in rotating and impressing threads upon the heated screw-blank is liable to tend to bend it in various directions; and it is important that, while the nose does not gripe the blank so as to prevent its rotation, its support should be firm and unyielding. This is attained by the aid of the devices here described, with great certainty and with little complexity or difficulty.

The locking-pin h^3, by holding the two halves of the nose firmly together, gives it a very substantial character when it is performing its functions of holding the shank and head of the screw steady while it is turning in being threaded.

The motion of the locking-pin h^3 is effected by the spring h^5, (which constantly tends to force it inward to effect the locking;) and the incline h^{10} stands in such position on the forward end of the slide i^1 that it acts at the proper moment on the inner face of a bend or head of the locking-pin, and draws it out to liberate or open the nose, so that the stub Q on the slide i^2 can act simultaneously therewith against the lever P to open the nose a little way to let the screw-blank fall into the nose from the hopper H^1.

The corresponding incline h^{11}, carried on the opposite end of the slide i^1 in the position represented, acts similarly under the head of the locking-pin to draw it out.

When the screw is completed, and when the slide i^1 is nearly at the forward extremity of its motion, the projection I, simultaneously therewith, strikes the stub h^{11} and opens the nose to allow the finished screw to drop from the machine.

The slight opening of the nose, which I term "the limbering," is effected, after being thus unlocked, by means of the small lever P, shown in fig. 2, and the adjustable piece Q carried on the slide i^2 which strikes it. The spring R tends to keep this lever P in the position in which it is represented in this figure. When the slide i^2 moves forward the lever P and its connections are not affected; but as it commences to move backward the piece Q strikes the lever P and turns it in opposition to the spring R.

This momentary turning of the lever P acts on the projection h^{13}, which is fixed on the movable part h^1 of the nose, and moves the said part a little forward, enough to aid the blank in dropping into its place.

So soon as the piece Q has moved backward past the lever P the latter returns to its original position, as represented, and the locking-pin h^3 being at this time free, it is pressed into its place by the spring h^5, as before, and the nose is now firmly locked around the blank, touching it slightly but firmly to support it while being threaded.

At the same time that the nose closes together, after the limbering operation and the descent of the bolt, the movable rest K moves inward and again extends across the hopper H^1, ready to receive and arrest the descent of the next blank.

In this position the movable rest K performs two important functions:

First, the arresting the blank and holding it in position directly over and ready to be dropped into the nose $h^1 h^2$ when the proper period arrives; and

Second, the holding down the blank which is already in the nose and preventing it from working upward under any circumstances while the threading is being effected.

The lower edge of the movable rest K is chamfered a little to aid it in passing very closely across the top of the head of the blank without the liability of catching thereon.

The upper face of the movable rest K is hollowed, something after the fashion of a sugar-scoop, but not as deep. This aids in leading the pointed lower end of the blank into the proper central position, and retaining it there while the nose of the hopper opens, so that it shall be certain to descend in the right position.

The portion of the blank which projects below the nose of the hopper and receives the impression of the threads from the dies above described, is liable to be bent or distorted by any slight maladjustment or accidental derangement of the parts, or even by variations in the heat or in the hardness or density of the hot iron. The bending of this projecting end is always liable to result in a defective screw.

In order to secure an additional safeguard, as far as may be, against such bending, I provide two thin pieces, $h^6 h^7$, which I term guys. These guys are firmly attached to the lower face of the nose, one to the movable half h^1 and the other to the fixed half h^2. I make them of considerable widths so as to afford sufficient strength; but the thickness must be less than the diameter of the screw-nails to allow the dies which produce the threads on the screw-nails or screws to reciprocate on each side without contact with these guys.

The guys serve to prevent the bending of the blank in either direction as the threading-dies act on the blank. They are hollowed on their inner faces, and are adapted to match the form of the blank; but they are mounted at a little distance so as to avoid contact with the threads except in the cases when the blank tends to bend in either direction. In other words, they allow just room enough for the swaged-up threads to turn freely without coming in contact under ordinary circumstances.

In order to avoid undue length of specification, I leave much to be understood from the drawing, and to be supplied by the ordinary skill of mechanics.

Such, for example, is the making of the parts in two or more pieces to allow the working faces to be adjusted or exchanged where I have represented them as made in a single piece; the introduction of an active current of cold water through the dies and other heated parts to maintain as low a temperature as practicable; the introduction of friction-rollers, or more properly, anti-friction rollers, to reduce the resistance and wear wherever necessary, particularly at the contact of the part e with the cam F, and at the back of the slides or bars $i^1 i^2$; and the employment of a quick-acting clutch to connect and disconnect the mechanism at will.

I may remark here that, although I have used the term screw and screw-nail for the most part in this specification, I esteem the machine well adapted to the manufacture of bolts, by which I mean articles of greater length, and usually of greater diameter also, than any ordinary screw-nails.

The drawing represents very clearly the provisions which I have made for adjusting the position of the parts below $C^1 C^2$, by moving them horizontally in every direction by means of screws. I find it important to so adjust these parts, *i.e.*, the hopper H^1 and its connections, that the screw or bolt, when suspended in the nose $h^1 h^2$, shall be accurately centered so as to be acted on equally by the two dies $I^1 I^2$.

Having now fully described my invention,

What I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. The combination, as set forth, of the guage B with the bell-crank lever B^1 and the die C^1.

2. The tilt-pin H and flat hopper H^1, arranged relatively to the dies $C^1 C^2$ and to the threading mechanism below, substantially as and for the purposes herein set forth.

3. The combination of the nozzle $h^1 h^2$, hopper H^1 and means for opening and closing it, guys $h^6 h^7$, and the threading-dies $I^1 I^2$, operating as and for the purpose set forth.

4. The arrangement of the movable rest K between the hopper H^1 and the loosely-holding nozzle $h^1 h^2$, that it may be made to perform the double function of restraining the descent of a blank until the right period, and of holding down the blank which is being threaded, all as and for the purposes herein set forth.

5. The guys $h^6 h^7$, in combination with and arranged relatively to the compound nose $h^1 h^2$, reciprocating threading-dies $I^1 I^2$, and the hopper H^1, as and for the purposes herein set forth.

6. In combination, the several elements of the mechanism operated from the cam-shaft F, to wit: The cutting off, griping, and pointing means; the gauge, and the means of operating it; the heading means, and the means of clearing the shaped blank from the dies

and conducting it away, as and for the purposes herein set forth.

7. In combination, the several elements of mechanism operated from the crank-shaft J, to wit: The movable rest K or its equivalent, the opening and closing nose h^1 h^2, with means h^3 h^5 for locking it tightly while required, and the threading-dies I^1 I^2, all arranged to operate on blanks and to produce therefrom threaded screws or screw-bolts as herein specified.

8. In combination, the two complete trains or sets of mechanism herein described, to wit: The mechanism for producing the blanks, and the mechanism for threading the same, the latter mechanism receiving the blanks from the former in a uniform position through the hopper H^1 or its equivalent, operating successively to form a complete screw, as herein specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES M. ALDEN.

Witnesses:

C. C. LIVINGS,

W. C. DEY.