

(No Model.)

2 Sheets—Sheet 1.

H. W. FOWLER.
ROLL FOR MAKING SPIKES.

No. 317,330.

Patented May 5, 1885.

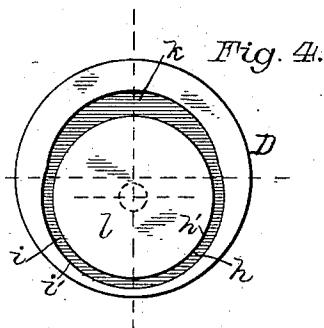
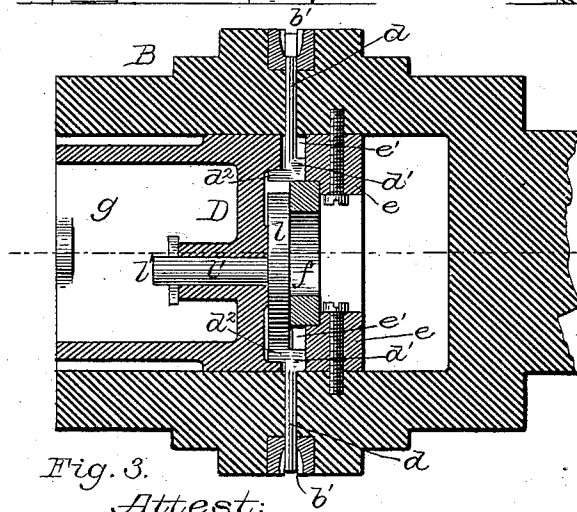
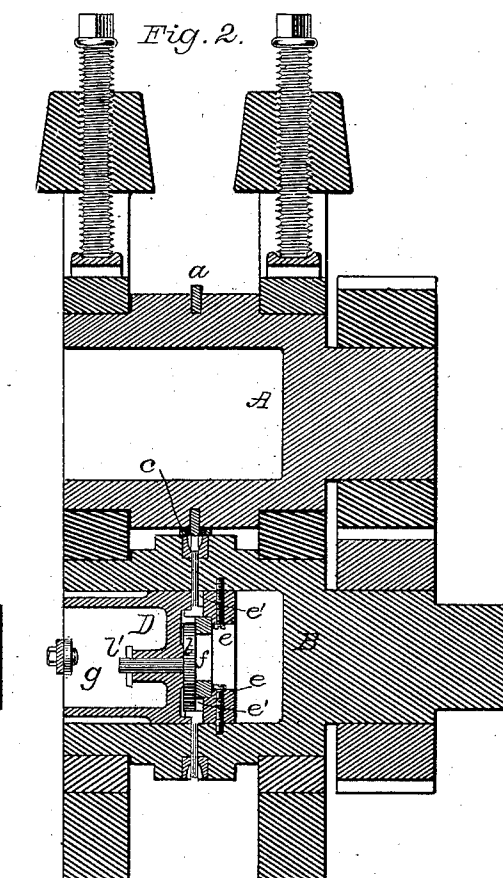
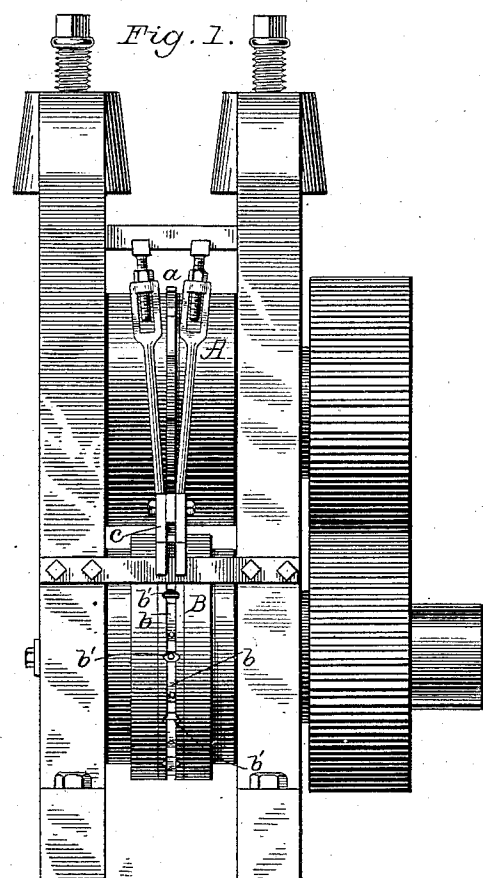


Fig. 3.

Attest:

Philip T. Larner,
Notary Public.

Inventor:
Hervey W. Fowler,
By *Wm. Wood*
Attorney.

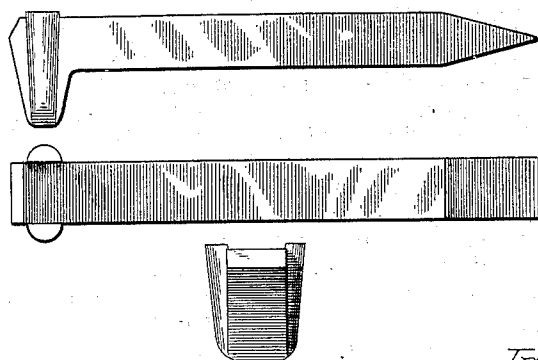
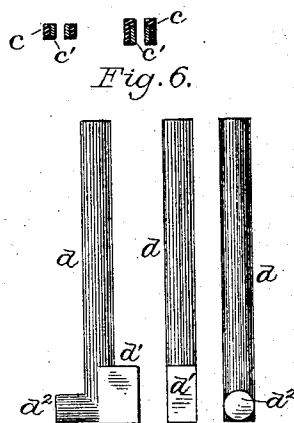
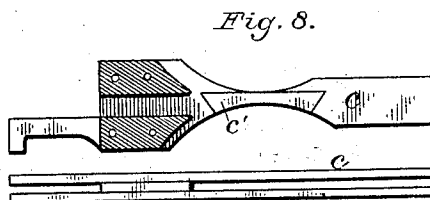
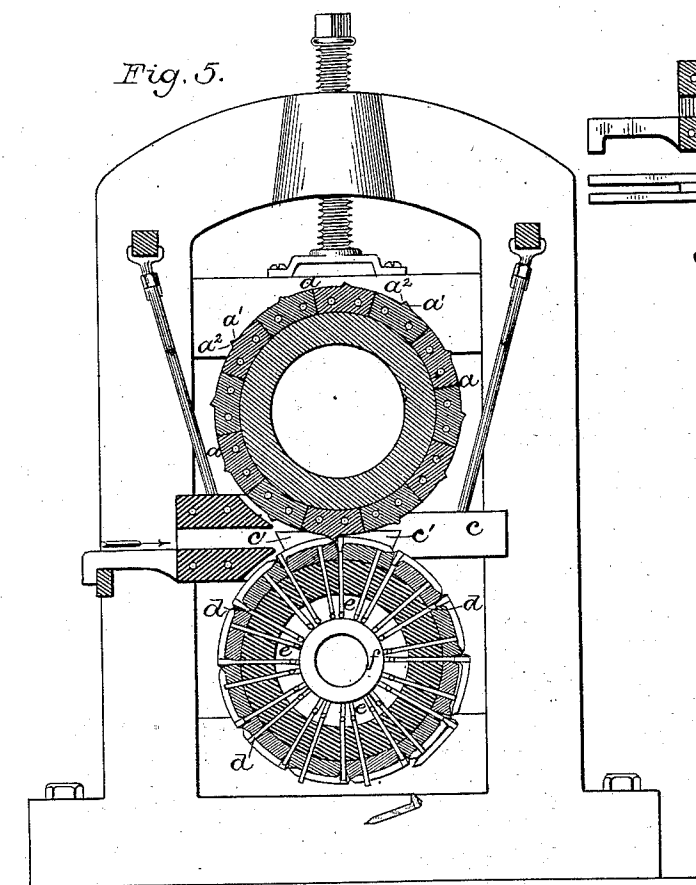
(No Model.)

2 Sheets—Sheet 2.

H. W. FOWLER.
ROLL FOR MAKING SPIKES.

No. 317,330.

Patented May 5, 1885.



Attest:
Philip F. Larnier.
Lowell Battle

Inventor:
Hervey W. Fowler.
By *Wm. Wood*
Attorney.

UNITED STATES PATENT OFFICE.

HERVEY W. FOWLER, OF CHICAGO, ILLINOIS.

ROLL FOR MAKING SPIKES.

SPECIFICATION forming part of Letters Patent No. 317,330, dated May 5, 1895.

Application filed June 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, HERVEY W. FOWLER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Rolls for Making Spikes, Bolts, and other Similar Articles; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is
10 a clear, true, and complete description of the several features of my invention.

Although my present improvements are applicable to any metal-working service involving the use of rolls having matrix-dies and
15 clearing-plungers for discharging the contents of the dies, I have specially devised them for use in connection with such rolls for making spikes as constitute in part the subject of my Letters Patent dated May 17, 1881, No. 241,641.
20 In operation such rolls have their matrix-dies filled with metal under extraordinary pressure, and the clearing-plungers not only serve as means for discharging the spikes from the dies, but their ends also serve as portions of
25 the inner walls of the dies. The straining force on these plungers is so great that, as heretofore organized by me with their operative mechanism, they were liable to become bent or cramped and rendered incapable of properly discharging a spike from the
30 dies, with all the objectionable results obviously incident thereto; and one object of my present invention is to afford reliable guides for the inner ends of said plungers.

35 While a die is being filled with metal its one or more plungers are subjected to heavy endwise or thrusting pressure, and heretofore in my machines during that operation their inner ends were moved in contact with the surface of a stationary abutment for the plungers,
40 and hence the abrasive contact of these surfaces, exposed, as they must be, to the reception of abrasive matter, resulted in comparatively speedy wear of these parts. After the
45 dies have been filled with metal the plungers operate as clearers for ejecting the spike from the matrix-dies, and great power is sometimes required for performing this service. As heretofore organized by me these plungers, while
50 performing their clearing functions, moved

with their inner ends in contact with the surface of a stationary cam, during which movement the abrasive action is even greater than when said cam serves merely as an abutment for the plungers during the filling of the dies. 55

Another object of my present invention is to provide for said plungers abutments for their inner ends which move or are capable of moving with the plungers during their ejecting movements, and thus avoid not only the
60 destructive abrasion referred to, but also enable the clearing operation to be performed with much less power than when a stationary abutment is relied upon.

In my prior die-roll, as shown and described 65 in my said Letters Patent, a stationary cam served not only as a means for imparting to the plungers their ejecting movements, but also as their abutment while the dies were receiving metal; but I have now provided the plungers with a novel internal abutment, which is
70 attached to and rotates with the roll, and is wholly independent of the ejecting mechanism, and instead of relying as heretofore upon a stationary cam as a part of the ejecting
75 mechanism, I employ a novel rotating disk having its axis located in a stationary bearing at the one side of the axial line of the roll, so that as the roll revolves each plunger at its
80 inner end successively abuts upon and engages with the periphery of said disk, which by revolving on its axis moves with the plungers during their entire ejecting movements. The retraction of the plungers from
85 their projected positions is still performed by a stationary cam in a manner similar to that illustrated in my said Letters Patent; but as the force involved for retracting is very slight but little destructive abrasion occurs.

Another feature of my invention has for its
90 object an increased capacity in production incident to a more complete and effective delivery of the metal to the matrix-dies than was possible in the rolls as heretofore organized by me. As shown in my aforesaid Letters
95 Patent, the matrix-die roll and an upper roll are so constructed and organized that the working portions of the upper roll conformed to the outlines of the matrix-dies; but I now employ an upper roll having a tongue which 10

is at all points narrower than the head portion of the matrix-die, and employ, for the first time with said rolls, a stationary tongue-box, which is interposed between the rolls and serves as an extension of the side walls of each matrix-die when it arrives at the pass, and which, being in close contact with the sides of the tongue of the upper roll, overlies the two sides of the head of each matrix-die, and serves as portions of the upper wall of said die during the formation of the head of a spike.

Certain other minor improvements have been devised by me, which will be specified in detail in the claims hereunto annexed.

Referring to the two sheets of drawings, Figure 1, Sheet 1, is a front elevation of a set of spike-making rolls embodying all of my present improvements. Fig. 2 is a vertical central section of the same on a line with the axes of the rolls. Fig. 3 is an enlarged sectional view of the matrix-die roll. Fig. 4 is a side view of the plunger-controlling cams. Fig. 5, Sheet 2, is a sectional view of the two rolls in line with the pass. Fig. 6 illustrates the plunger detached in several views. Fig. 7 illustrates a spike as produced by me in its most approved form. Fig. 8, in several views, illustrates the tongue-box detached.

In the drawings, a pair of rolls, A and B, are shown to be mounted in a suitable housing, which may be varied in its character without departing from my invention.

The upper roll, A, has a tongue, *a*, which performs the function of a series of male dies, in so far as it co-operates with a series of matrix-dies in the lower roll, B, and also in that at intervals corresponding to the length of each matrix-die it has the pointing and cutting surfaces *a'* and *a''*, which respectively so enter the matrix-die as to form one side of the point of a spike and also one of the angular faces on top of its head, and at the same time to separate it from the metal which occupies the preceding matrix, in which the next succeeding spike is to be formed.

The matrix-die roll B has the consecutive series of matrix-dies *b*, which are similar to those shown in my aforesaid prior patent; but the head portion *b'* of each matrix-die is so shaped at its sides as to produce a more fully rounded web at each side of the head of a spike, as shown in Fig. 7, than in the spikes as heretofore produced by me.

As thus far described, these rolls also differ from those heretofore used by me, in that the tongue of the upper roll does not have any of its working-surface so formed as to enter the head *b'* of the matrix-die, and it is at no point wider than the main portion of said dies in which the shanks of spikes are formed, and instead of wholly entering said dies, as in my prior machine, only the cutting and pointing surfaces *a'* and *a''* of said tongue enter said dies, the remaining portion thereof serving to close said dies on top and to operate as an upper wall therefor throughout the length of the

shank of a spike, and also across its head, but leaving the two sides of the head *b'* of the matrix-die, in which the spike-head webs are formed, uncovered by said tongue. For affording an upper wall for the head of each matrix-die on each side of the tongue *a*, I have introduced an entirely novel feature, which in some respects resembles a guide-box, as ordinarily used, for guiding metal into a pass. This device I will term a "tongue-box," *c*, which is composed of two vertical steel or iron plates, concaved on their lower edges to closely fit the periphery of the lower roll, and they are also concaved on their upper edges, so as to be free from contact with the periphery of the upper roll; but they are each in close contact at their inner sides with the coincident side of the tongue *a* of the upper roll. The inner sides of the tongue-box are in line with the sides of the matrix-dies, and therefore the sides of said box serve, practically, as an upward extension of the side walls of each matrix-die during the time it is receiving metal at the pass of the rolls. The lower edges of said box, on each side thereof, serve as portions of the upper wall of each matrix-die at each side of the head portion *b'* thereof, because said box-edges overlie those portions of the matrix-die in which the side webs of the head of the spikes are formed. Approximately desirable results will accrue if the tongue-box be relied upon solely for serving as the top wall of portions of the matrix-die, as described; but for obtaining the best results said box should also serve as vertical extensions of the side walls of said dies. The use of this novel box enables the rolls to be successfully operated at great speed, because of the accurate and complete delivery of the metal to the matrix-dies, it being understood that, as provided for in my aforesaid Letters Patent, the bar or rod of metal employed is substantially equal to or greater in sectional area than the horizontal sectional area of the head of a finished spike. The wear on the sides of this box is so great that they must be frequently renewed; but the cost incident thereto is of little consequence in view of the advantages which accrue from its use, and for reducing this cost to a minimum I employ detachable steel cheek-pieces, *c'*, which can be readily inserted into and removed from recesses provided therefor in each side of said box. As shown in the drawings, Fig. 1, the ends of the tongue-box are braced by brace-bolts, each provided with adjusting-nuts by which the box can be forced downwardly upon the surface of the matrix-roll. The tongue *a* of the upper roll is composed of detachable sections, each of a length corresponding to the length of each matrix-die, so that said sections can be readily renewed should any of them become unduly worn or get broken.

As shown in my said Letters Patent, this matrix-die roll B is provided with reciprocating plungers *d*; but instead of relying upon one plunger to each matrix-die, as can be done

in the use of dies especially organized therefor, and in the production of certain sizes and forms of spikes, I now employ two plungers d for each matrix-die, one of which enters the die at its head portion b' and the other at its shank portion, as clearly indicated. It is to be understood that any number of plungers can be employed in connection with each matrix-die without departure from my invention, although seldom, if ever, will more than two be required.

As described in my aforesaid Letters Patent, these plungers, when retracted, serve as portions of the bottom of each matrix-die, and they are therefore of necessity subjected to powerful thrusting-strains while said dies are being filled with metal. While thus under strain the inner ends of the plungers of my prior machine were moving in contact with a stationary abutment afforded by a portion of the surface of a stationary cam, and said inner ends of the plungers were also guided only by their housings in the roll itself. I have now provided the matrix-roll with an internal annular guide or ring, e , having a rectangular radial slot, e' , for each plunger d , and each of the latter has a rectangular guiding tail-piece, d' , which occupies and slides in its slot e' , by which it is accurately guided in its longitudinal movements and well braced against deflection. Within said guide-ring e is an abutment-collar, f , which occupies an annular rabbeted recess in said guide-ring, but projects therefrom at its outer side, as clearly indicated, so as to afford for the inner end of each plunger an abutment extending from near its axial line or center to the end of its tail-piece d' . As this abutment-ring revolves with the die-roll B, it will be seen that no abrasive contact can occur between it and the plungers, and that it effectually enables them to resist the thrusting strains to which they are subjected while the matrix-dies are being filled with metal. This guide-ring and also the abutment-collar can be employed separately, or combined, in connection with plunger-operating mechanism other than that hereinafter described—as, for instance, with the stationary cam organized as in my said Letters Patent. While it is preferable that each plunger have a guiding tail-piece, as shown, good guiding and bracing results will accrue if the slots of the guide-ring be only capable of receiving, say, one-half or even more of the diameter of the plungers, the latter in that case having no guiding tail-piece d' .

The mechanism by which the plungers are projected includes what I believe to be an entirely novel feature, which, although hereinafter claimed in certain specific combinations in connection with a matrix-die roll and plungers, will be in itself made the subject of a separate application of Letters Patent. As organized by me in this machine said novel feature consists of a stationary cam having a movable working-surface, so that when the plungers have their actual work to do in ejecting spikes from the dies they

are forced outwardly by being abutted by an eccentric surface, which moves with them, as distinguished from a stationary eccentric surface, over which the rear ends of the plungers are moved for forcing them outwardly, as shown and described in my said prior Letters Patent. The plunger-cam D is at the inner end of a hollow sleeve, g , which is located within the die-roll B, and it is prevented from rotation therewith by bolts and a cross-bar secured to the vertical housing or frame of the machine, and is shown in side view in Fig. 4. As here shown in Fig. 4, the cam has a groove, which is laid out as a part of two circles, one of which is eccentric to the axis of the cam-sleeve, and consequently to the axis of the matrix-die roll. Each plunger has a second tail-piece, d'' , which occupies said cam-groove, and the plunger is projected outwardly while said tail-piece occupies the portion h of the cam-groove, is retracted while it occupies the portion i , and is at rest when said tail-piece occupies the portion k of said groove, which is of such width as enables the plunger tail-pieces d'' to then freely bear upon the abutment-collar f , as before described. The working-surface of the cam while projecting the plungers is the inner surface, h' , of the portion h of the cam-groove, and the working-surface of said cam while retracting the plungers is the outer surface, i' , of the portion i of said groove. Instead of having the working cam-surface h' stationary, as heretofore, it is movable, so that when abutted by a plunger it is moved thereby and moves therewith until the plunger is fully projected, whereupon said tail-piece d'' then takes bearing against the stationary working-surface i' , by which the retracting service is performed. This movable surface, for abutment with the plungers and for forcing them outwardly, can be variously provided for without departure from my invention; but, considering the large number of plungers required in a spike-roll, and the desirable high speed at which it should be operated, it is best afforded by a rotative steel disk, l , which has a strong heavy axis, l' , housed in a suitable bearing in the body of the cam and at one side of the axis thereof. As will be clearly seen in Fig. 3, said disk has an abutting bearing for each plunger, which not only includes the entire outer or end surface of the tail-piece d'' , but also extends to the axial line of the plunger; and, also, that as the plungers are carried with the roll, they successively engage with the surface of the disk, and that instead of sliding thereon, as with a stationary cam of ordinary construction, the disk is rotated by and with said plungers, the latter being thereby projected because the surface of said disk is eccentric to the common axis of the cam and the roll. Although this disk constitutes a movable working-face in a stationary cam, and it is essential that its axis should be located at one side of the axis of the stationary cam, it is not essential that the axis of said disk should have its bearing in the body of

the stationary cam, it being obvious that said disk-axis might be located on the side opposite to that shown, and supported by a bearing of a similar character confined in the same manner at the opposite end of the roll-journal, which in that case would be cylindrically chambered like the end here shown; but this would require that power be applied to the upper instead of the lower roll, as shown in the drawings. The construction suggested would obviously involve unnecessary complication and expense without any attendant advantages.

The operation of these rolls will be readily understood from the foregoing description.

The preferred form of spike illustrated in three views in Fig. 7 embodies certain novel features devised by me, and which constitute the subject of Letters Patent No. 279,736, dated June 19, A. D. 1883.

It is to be understood that while I prefer to embody all of the novel features herein described in one machine, I am well aware that any one or more of them can be profitably employed regardless of the character of the other mechanism with which they may be organized.

I am well aware that rolls have heretofore been proposed for rolling wide and also narrow bars of connected wedge-shaped blanks, as shown and described—for instance, in English Letters Patent No. 5,589, of 1827, and 2,631, of 1859, and wherein one of the rolls of each set operates as a die-roll. It is to be understood in this connection that a matrix-die roll differs from said prior die-rolls in that matrix-dies have sides and ends, and on being filled with compressed metal they impart contour thereto at top, bottom, both sides, and both ends, whereas said prior die-rolls, having no matrix-dies, simply affect the contour of the top and bottom of the bar. With said prior die-rolls guide-boxes were organized which either served to merely guide the metal to the space between the rolls, or to also serve as side walls to the space between the working-faces of said rolls; but in no instance known to me has a roll containing matrix-dies been so provided with guides prior to my invention that, in operating with a tongue-roll, said guides would or could successively serve as a top wall for each matrix-die at such portions thereof as were not closed by the face of the tongue-roll.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, substantially as hereinbefore described, of the die-roll having a series of matrix-dies, the tongue-roll, and the stationary tongue-box extending between said rolls and serving as a top wall for portions of the matrix-dies.

2. The combination, substantially as hereinbefore described, of the die-roll having a series of matrix-dies, the tongue-roll, and the stationary tongue-box extending between said rolls and serving as a top wall for portions of the matrix-dies, and also as a vertical extension of their side walls.

3. The combination, substantially as hereinbefore described, of the tongue-roll, the matrix-die roll, its one or more plungers to each die, and a stationary cam provided with a movable surface for abutment with said plungers during their ejecting movements.

4. The combination, substantially as hereinbefore described, of the matrix-die roll and plungers, the stationary cam, and the disk mounted on an axis located at one side of the axis of said cam and serving as a movable abutment for the plungers during their ejecting movements.

5. The combination of the matrix-die roll, one or more reciprocating plungers in each die, and a radially-slotted annular guide or ring for the reception of the inner ends of said plungers, substantially as described.

6. The combination of the matrix-die roll, one or more reciprocating plungers in each die, and an abutment-collar fixed to and revolving with the roll for supporting said plungers while the dies are being filled with metal, substantially as described.

7. The combination of the matrix-die roll, one or more reciprocating plungers in each die, a radially-slotted guide-ring, and an abutment collar, substantially as hereinbefore described.

8. The combination of the matrix-die roll, reciprocating plunger, the guide-ring, the abutting collar, and the stationary cam having a movable surface for contact with the plungers during their ejecting movements, substantially as described.

HERVEY W. FOWLER.

Witnesses:

PHILIP F. LARNER,
HOWELL BARTLE.