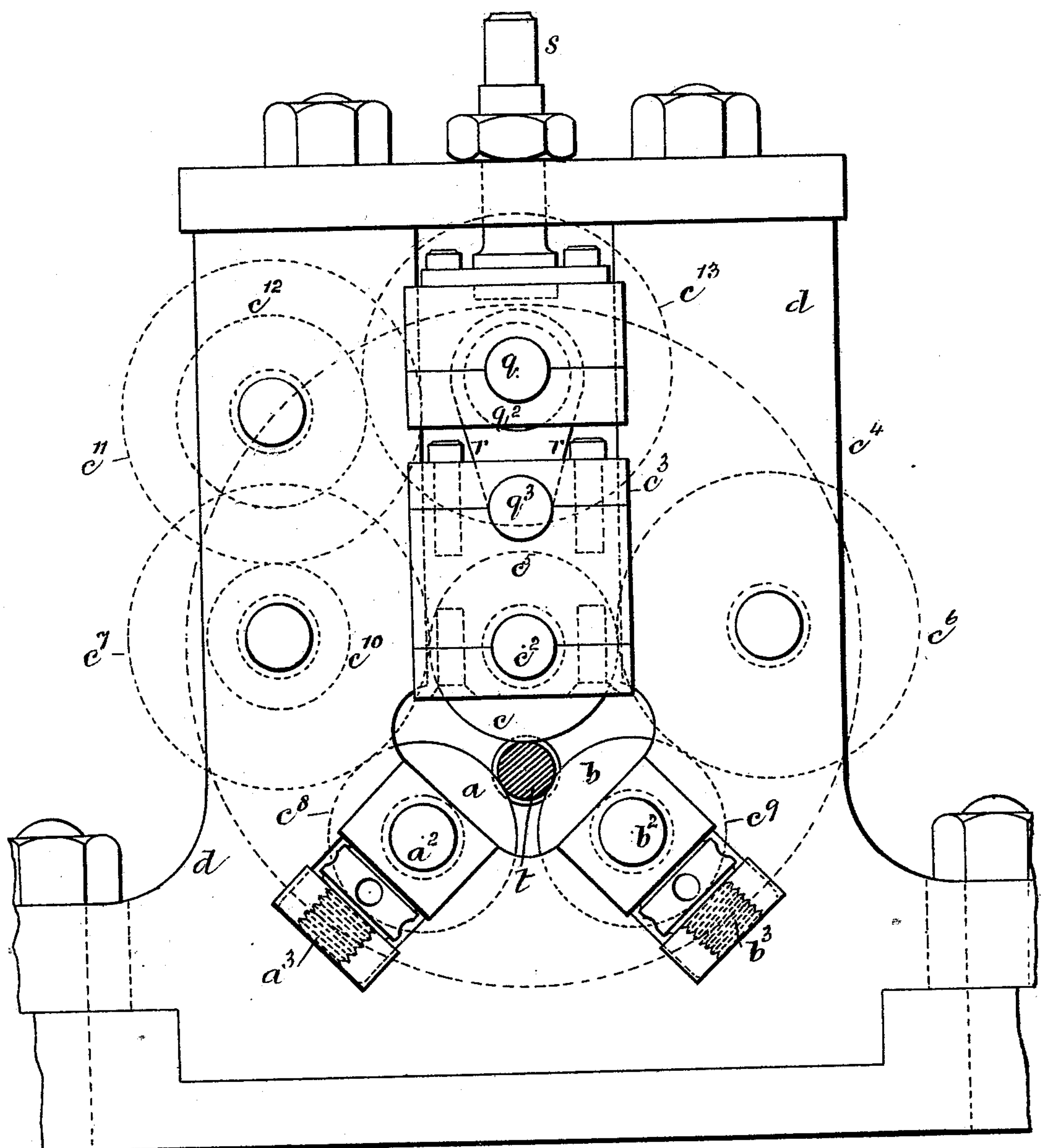
T. RICKETT.

MACHINES FOR THE MANUFACTURE OF SCREWS.

No. 188,949. Patented March 27, 1877.

FIG 1



Witnesses,
George Shaw
Richard Skerrett.

Inventor
Thomas Rickett

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FIG II

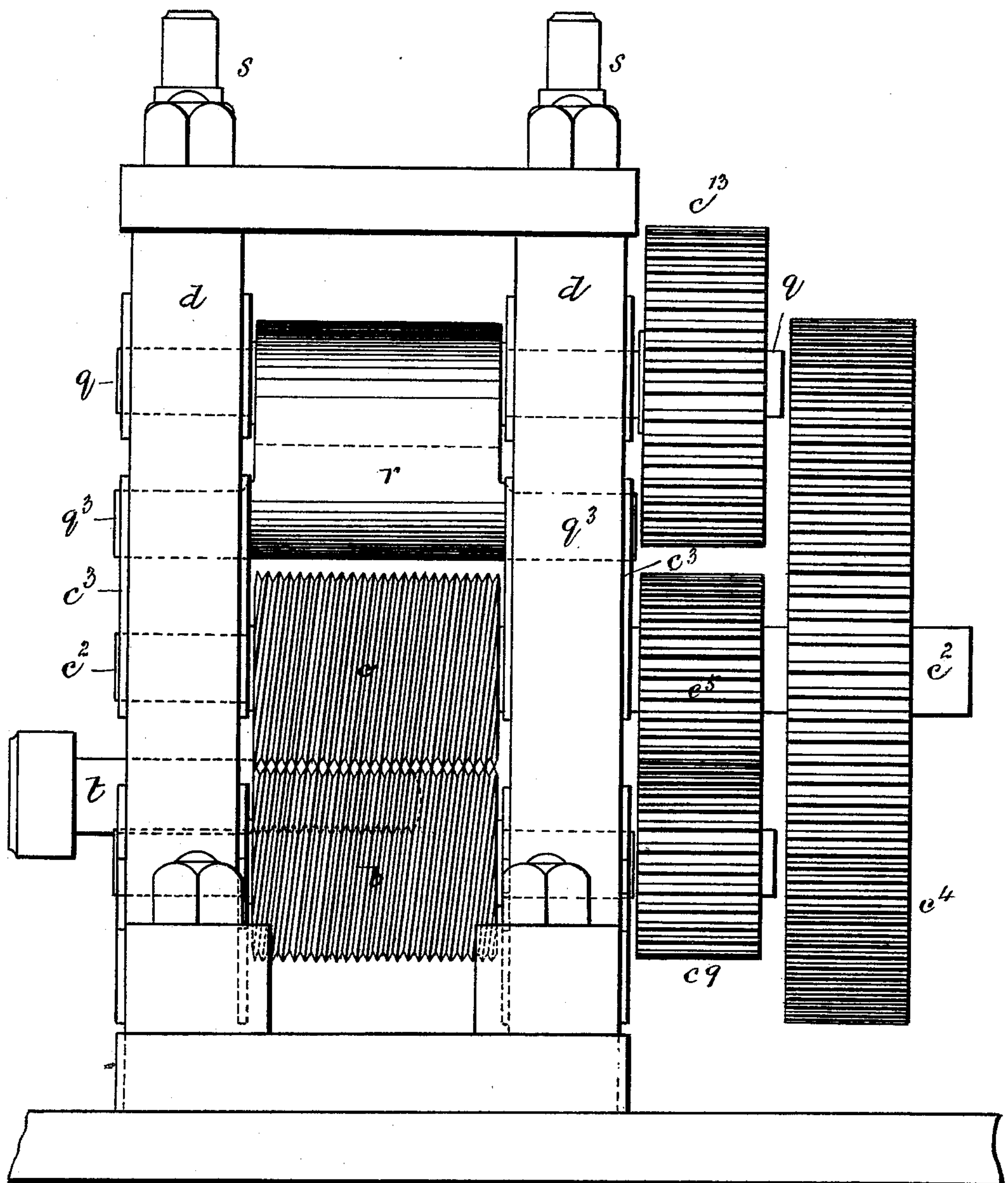

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FIG III

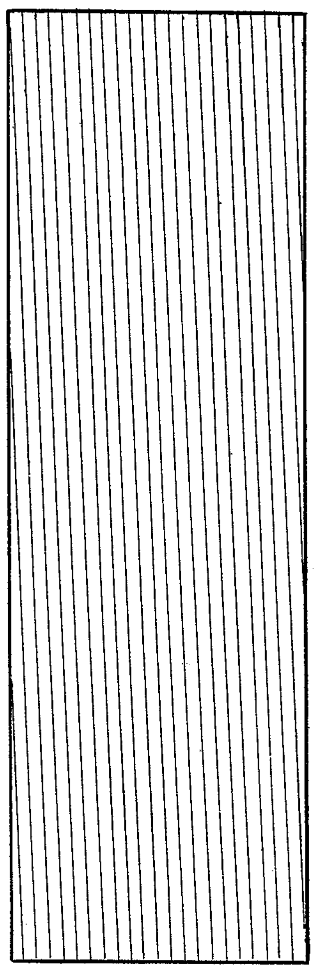
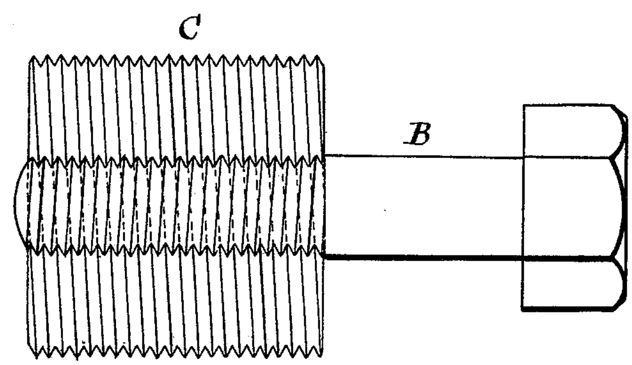


FIG IV



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UNITED STATES PATENT OFFICE.

THOMAS RICKETT, OF NORTHFIELD, NEAR BIRMINGHAM, ENGLAND.

IMPROVEMENT IN MACHINES FOR THE MANUFACTURE OF SCREWS.

Specification forming part of Letters Patent No. **188,949**, dated March 27, 1877; application filed February 27, 1877.

To all whom it may concern:

Be it known that I, THOMAS RICKETT, of Northfield, near Birmingham, in the county of Warwick, England, manager of works, have invented or discovered new or Improved Machinery for the Manufacture of Screws, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My invention consists of the new or improved machinery hereinafter described for the manufacture of screws, by the action of which said machinery on the rod or bolt to be made into a screw a screw-thread is impressed upon the said rod or bolt without the cutting away of any portion of the metal of the said rod or bolt.

The said machinery consists, essentially, of rolls having screw-threads cut upon them, by and between which rolls the rod or bolt to be made into a screw is operated upon. Pressure being applied to the rolls, their rotatory motion is communicated to the rod or bolt situated between them, with its axis parallel to their axes, and the screw-threads on the rolls are impressed on the rod or bolt, which is thus converted into a screw.

I use three rolls, with their axes parallel to each other. Two of the rolls are placed as close together as posible in the same plane, with the third roll above and midway between them. The rod or bolt to be screwed is placed between the three rolls, and the said rolls are made to rotate in the same direction. The upper roll is caused to approach the two lower rolls by mechanism, which preserves the parallelism of the three rolls. By the action of the parallel rolls the sharp edge of the threads of the said rolls are forced into the bolt, forming grooves therein, and raising the metal between the grooves until the threads of the rolls are exactly reproduced in the bolt. The roll-threads groove the bolt to about half their depth, and the remainder of the thread is raised or forced up by the metal displaced in the embedding of the roll-threads. By this method bolts of any length less than that of the rolls can be made by a few rotations of the rolls.

The bolts may be operated upon either hot or cold; but I prefer to operate on the bolt while cold, the density and strength of the metal being greatly increased by the rolling action when the metal is operated upon in the cold state.

I make the rolls of steel, hardened and tempered, the threads being cut upon them to the depth required on the screws to be made. When the rolls have the same diameter as the screws to be made, only one continuous screw-thread is made on each roll; but when the rolls are of larger diameter than the screw to be made, more than one thread is made on each roll, the number of threads on the rolls increasing as their diameters increase. Thus, if the rolls have double the diameter of the screws, they have two continuous screw-threads each—that is, the threads formed are those of a double-threaded screw. If of treble the diameter, they have three screw-threads, and so on. When rolls of small diameter are employed, I support or back them up by larger rolls.

Screws of steel, iron, brass, copper, or other metals and alloys can be readily made by the use of the said machinery.

I will now proceed to describe, with reference to the accompanying drawings, the manner in which my invention may be carried into effect.

Figure 1 represents, in front elevation, and Fig. 2 in side elevation, machinery constructed according to my invention for the manufacture of screws by impressing a screw-thread upon a plain rod or screw or bolt blank.

The said machinery consists essentially of three rolls, *a b c*, having screw-threads cut upon their peripheries, the axes or shafts a^2 b^2 c^2 of the said rolls being parallel to each other, and working in bearings in the uprights *d d*. The peripheries of the said rolls *a b c* are concentric to their axes or shafts, and the construction of the said rolls is hereinafter particularly described.

The axes or shafts a^2 b^2 of the lower rolls *a b* are situated in the same horizontal plane, and the third roll *c* is situated above and midway between the said rolls *a b*. (See Fig. 1.) The upper screwed roll *c* has an automatic rising and falling motion given to it, so that it is made gradually to approach to and recede from the lower rolls *a b* during the action of the machine. The lower rolls *a b* are adjustable by the set-screws a^3 b^3. The axis c^2 of the rising and falling roll *c* is carried in the bearings c^3 c^3, which are capable of sliding upon the uprights *d d* of the machine. Above the shaft c^2 of the top roll *c* is a parallel shaft, *q*, formed with an eccentric, q^2, between the bearings of the shaft. Working on the eccentric q^2 is a metal strap, *r*, the joint ends or pivots q^3 q^3 of which engage in the sliding bearings c^3 c^3, in which the shaft c^2 of the upper roll *c* works so that by the rotation of the said shaft *q*, and the action of the eccentric q^2 and strap *r*, the upper roll *c* is made gradually to approach to and recede from the lower rolls *a b*. The bearings of the shaft *q* are adjusted by the screws and screw-nuts *s*. The shaft *q* makes one revolution only while the rolls *a b c* are making several revolutions. The rolls *a b c* and the eccentric shaft *q* are driven by the following arrangement of gearing: On the end of the shaft c^2 of the upper roll *c* is a large toothed wheel, c^4, receiving motion from any prime mover. Or the said shaft c^2 may be driven by a pulley and band. On the said shaft c^2 is a toothed wheel, c^5, which gives motion through the toothed wheels c^6 c^7, and pinions c^8 and c^9 to the bottom rolls *a b*.

In Fig. 2 the toothed wheel c^6 is omitted. The shaft *q* is driven from the shaft of the toothed wheel c^7 by the toothed gearing, partly indicated in dotted lines in Fig. 1—that is to say, on the shaft of the wheel c^7 is a pinion, c^{10}, which gears with the toothed wheel c^{11}. On the shaft of the wheel c^{11} is a pinion, c^{12}, which gears with the toothed wheel c^{13} on the shaft *q*. The rising and falling of the upper roll *c* is thus automatic, and may be varied by the use of the differential gear to suit different pitches of screws.

The action of the machine is as follows: The top screwed roll *c* being at its highest point, the plain rod or screw blank to be screwed is introduced between the rolls *a b c*. As the top roll *c* descends the rod or blank is seized between it and the bottom rolls *a b*. A rotatory motion is thereby communicated to the rod or blank by the rotation of the said rolls, and screw-threads are impressed upon it, and when the top roll has reached its lowest point a perfect screw-thread will have been impressed upon the rod or blank by the said roll *c* in conjunction with the bottom rolls *a b*. A bolt marked, *t*, is represented in the act of being screwed by the operation of the rolls *a b c*. On the rising of the roll *c* the screwed bolt is released, and may be removed from the machine, and another plain rod or blank introduced between the rolls, and screwed in the manner described.

The feeding of the blanks to the rolls may either be effected automatically or by hand.

I do not limit myself to any particular ratio between the diameter of the rolls, by which the screw is formed, and the diameter of the bolt to be operated upon; nor do I limit myself to any particular rate of descent of the upper roll *c* relative to the velocity of rotation of the rolls; but I have found the proportions represented in the drawings between the rolls and the bolt to be screwed to answer well in practice—that is to say, the rolls *a b c* have a diameter three times as great as that of the bolt *t* to be operated upon. I have also found the rate of descent of the upper roll *c* compared with the velocity of the rolls *a b c*, which rate is produced by the arrangement of gearing represented in the drawing, to answer well in practice—that is, the roll *c* descends from its highest to its lowest position during the time occupied by the rolls *a b c* in making three rotations.

In forming the screw-threads on the rolls *a b c* I give to the said threads on the rolls a pitch, which is to the pitch of the thread to be produced on the bolt as the diameter of the rolls is to the diameter of the bolt to be screwed. Thus, the rolls represented in the drawing have a diameter three times as great as that of the bolt to be screwed, and the rise of the threads on the rolls is three times as great as the pitch of thread to be produced on the bolt. By the pitch of the thread I mean the distance between the summit or crest of one thread and the summit or crest of the next thread, and by the rise I mean the distance traversed along the roll by one convolution, the distance referred to being measured in a line parallel with the axis of the roll.

From this method of construction it follows that there will be several screw-threads on the roll, the number of the said screw-threads increasing as the diameter of the roll increases, the thread to be produced on the bolt remaining the same. Thus, in the rolls represented, and having three times the diameter of the bolt to be screwed, the threads on the rolls have a rise three times as great as that to be produced on the bolt, each of the rolls having three equidistant threads. If the rolls were of a diameter four times as great as that of the bolt to be screwed then the screw-threads on the said rolls would have a pitch four times as great as that of the thread to be produced on the bolt, and there would be four of the said screw-threads on each of the rolls, and so on for other proportions. It is only by adopting the relative proportions described that the bolt under operation has no tendency to advance into or out of the machine during the formation of the thread, a condition necessary to the correct figure and uniform pitch of the screw-thread formed.

Fig. 3 is a diagram illustrating the construction of the rolls, the said diagram representing the cylindrical surface of one of the rolls opened out, or uncoiled, or opened flat, and the inclined parallel lines represented indicate the inclination and distance apart of the screw-threads formed on the roll.

Fig. 4 represents, in plan, one of the rolls and the screwed bolt being operated upon, and shows the parallelism of the single thread produced on the bolt B with the threads on the roll C.

Although I have found in practice that the mechanism described and represented for producing the rising and falling parallel motion of the top roll answers every purpose; yet I do not limit myself to the use of that particular arrangement, as other equivalent mechanical arrangements may be adopted for producing a like motion in the top roll.

Having now described the nature of my invention, and the manner in which the same is to be performed, I wish it to be understood that I do not limit myself to the precise details herein described and illustrated, as the same may be varied without departing from the nature of my invention; but

I claim as my invention of new or improved machinery for the manufacture of screws—

1. The combination of a series of rolls having screw-threads formed on them, which screw-threads have a proportion both in number and pitch to the screw-thread to be produced on the bolt operated upon similar to the proportion between the diameter of the said rolls and the bolt operated upon—that is, if the rolls have a diameter three times the diameter of the said bolt the said rolls have three equidistant screw-threads, each thread having a pitch three times as great as that of the thread to be produced, substantially as hereinbefore described, and illustrated in the accompanying drawings.

2. In combination with rolls having screw-threads upon them proportionate in number and pitch to the screw-thread to be produced on bolts to be operated upon, as before described, the eccentric or equivalent means for the automatic rising and falling of one, in relation to the other, of said rolls, substantially as herein shown and set forth.

THOS. RICKETT. [L. S.]

Witnesses:
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RICHARD SKERRETT,
37 *Temple Street*, *Birmingham*.