2 Sheets—Sheet 1.

C. FAIRBAIRN & H. SIMON.

Machine for Impressing Screw-Threads on Bolts, &c.

No. 200,522. **Patented Feb. 19, 1878.**

Fig. 1

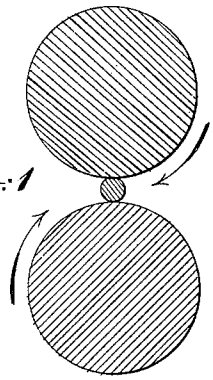


Fig. 2

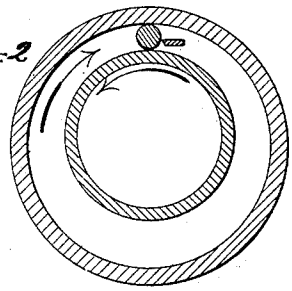
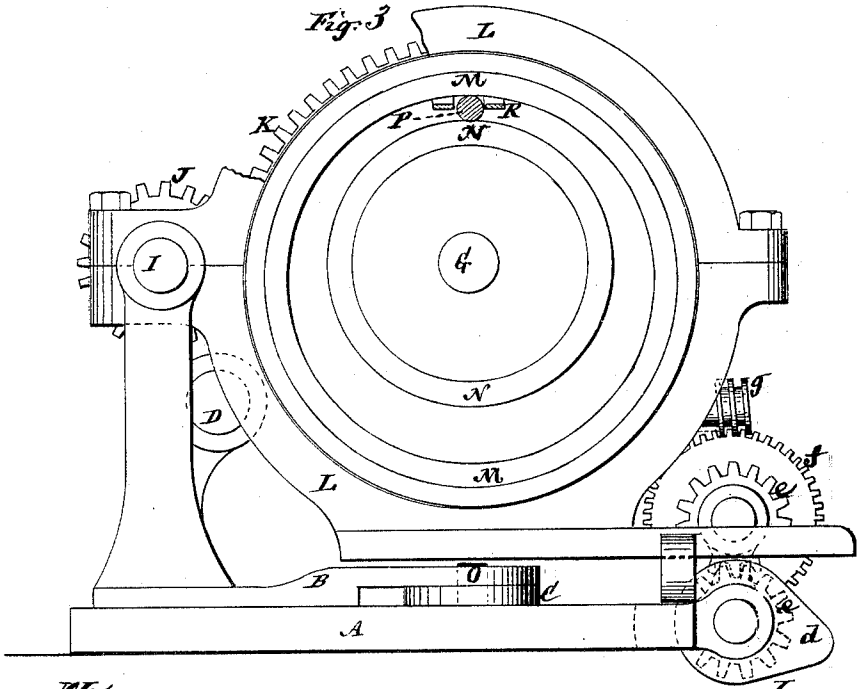


Fig. 3



Witnesses:
Jno. S. Haynes
L. Allen

Inventor
Charles Fairbairn
Henry Simon
by their Attorneys
Brown & Allen

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

2 Sheets—Sheet 2.

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Machine for Impressing Screw-Threads on Bolts, &c.

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Fig. 4

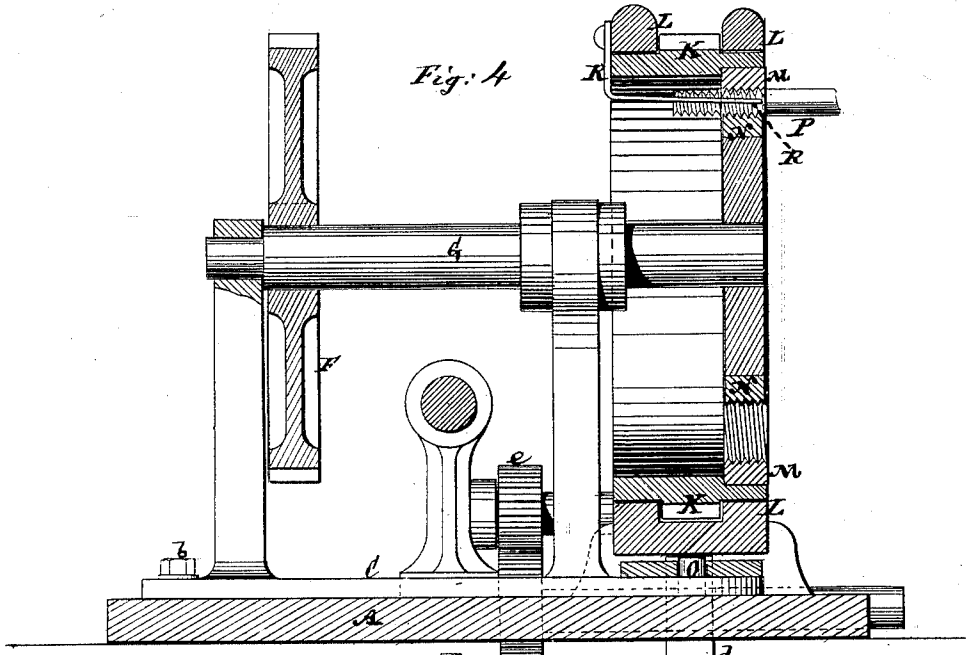
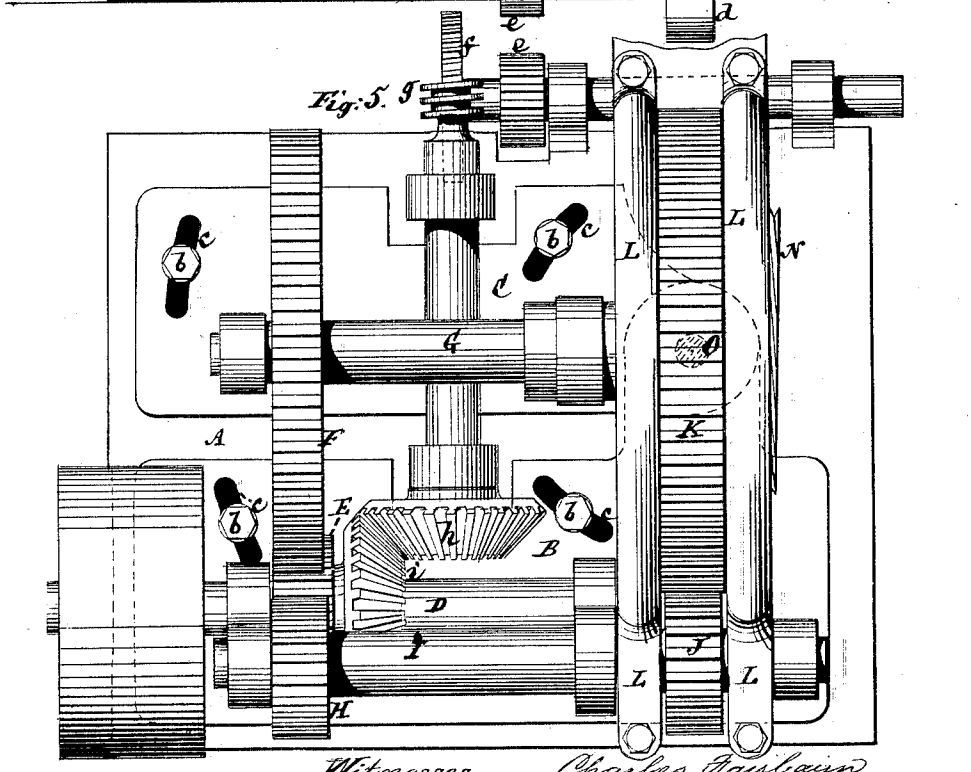


Fig. 5.



Witnesses:
Tyler Haynes
L Allen

Charles Fairbairn
Henry Simon
by their Attorneys
Brown + Allen

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

UNITED STATES PATENT OFFICE.

CHARLES FAIRBAIRN AND HENRY SIMON, OF MANCHESTER, ENGLAND.

IMPROVEMENT IN MACHINES FOR IMPRESSING SCREW-THREADS ON BOLTS, &c.

Specification forming part of Letters Patent No. **200,522**, dated February 19, 1878; application filed August 24, 1877; patented in England, November 20 1875.

To all whom it may concern:

Be it known that we, CHARLES FAIRBAIRN and HENRY SIMON, both of Manchester, England, have invented certain Improvements in Impressing Screw-Threads and other Figures or Patterns on Metal Rods or Bolt-Blanks, of which the following is a description:

This invention has more especially for its object the formation or impressing of screw-threads on bolts and metallic rods by the process of rolling.

The operation may be performed while the iron out of which the bolt is to be formed is either hot or cold.

The invention relates to a process of impressing screw-threads and other figures or patterns on metal rods or bolt-blanks by rolling the latter between surfaces arranged to rotate in reverse directions to each other, and in transverse relation to the longitudinal axis of the rod or bolt-blank, said surfaces having cut or formed on them the reverse pattern of the thread or device required to be impressed on the rod or bolt-blank. This process can be put into practical operation in various ways. Thus it can either be done by two oppositely-rotating rolls, arranged one outside of the other, at a suitable distance apart to receive the rod or bolt-blank in between them, or by two rings, or one ring and one disk or roll arranged to rotate in opposite directions, one inside of the other.

These two of various modes of putting into practice said process are illustrated by diagrams in Figures 1 and 2 of the drawing.

In some cases it will be found necessary to support or guide the metal rod or bolt-blank under operation, so as to keep it in place during the process of rolling. This is especially necessary when the method of operating illustrated in Fig. 1 is adopted.

The invention consists in a novel construction and arrangement, relatively with each other, of the oppositely-rotating disks, rings, or rolls, whereby the angularity of the thread or impression on the rod, bolt, or blank is produced in part by the angular directions of the thread or impressing projections on the disks, rings, or rolls, and in part by an angular disposition of the axes of said disks, rings, or rolls relatively with each other, substantially as hereinafter described.

The invention likewise consists in a certain combination of an internally-threaded rotating hollow roll or ring with an externally-threaded and oppositely-rotating roll, which combination is selected in the subsequent description to illustrate our invention.

Furthermore, the invention consists in a novel combination of various details in the construction of the machine, whereby a simple and efficient mechanism for putting the invention into practical use is obtained; and it also consists in a combination of a cutter for removing surplus metal with the rotating devices which produce the impression.

In the accompanying drawing, Figs. 1 and 2 are diagrams, as hereinbefore referred to, illustrating two modifications of our improved means for impressing a screw-thread on a rod or bolt-blank by rolling. Fig. 3 is a front view of a machine for putting into practice the modification shown in Fig. 2. Fig. 4 is a vertical section of the same, taken centrally in direction of the longitudinal axes of the rotating impressing devices; and Fig. 5, a plan of said machine.

A is a bed-plate, and B C adjustable sole-plates secured thereon. D is a driving-shaft, supported in standards on the sole-plate B, and serving to give motion by means of a gear, E, to a spur-wheel, F, on a shaft, G, which is supported by standards on the sole-plate C. Said gear E also gives motion to a pinion, H, on a shaft, I, which is supported in standards on the sole-plate B, and which carries a pinion, J, that gives motion to a toothed rotating annular head, K. This head K rotates within a frame, L, and carries concentrically within it an outer impression-ring, M, within which is an inner impression ring, disk, or roll, N, carried by the shaft G.

The sole-plates B and C are adjustable about a pivot, O, as a center of motion, for a purpose that will be hereinafter described, and are secured at any desired adjustment on the bed-plate A by screws *b*, passing through slots *c*.

The rings M and N, which produce the required screw-thread or impression by rolling on the rod or bolt-blank P, rotate in reverse

directions relatively with each other, and are suitably grooved or cut on their working-surfaces, which act upon the rod or bolt-blank entered between them. Said rings may be of cast-iron or steel.

Various means may be employed for bringing the rings M and N into proper position for rolling the work; but the frame L, which carries the rotating head K, with its attached ring M, is here represented as made capable of rising and falling to adjust the groove or impressing surface of said ring to a proper working distance from the grooved or impressing surface of the inner ring N. This is done by hanging said frame L to rock on the shaft I, and controlling the up-and-down movement of the frame either by treadle and weight or otherwise, at the will of the operator, or by automatic means—as, for instance, by a cam, *d*, gears *e e*, worm-wheel *f*, and screw *g*, deriving its motion, by bevel-gears *h i*, from the shaft D, for altering the position of the outer ring with reference to the inner ring, to provide for introducing the rod or bolt-blank P in between said rings, and operating on and retiring the same after the thread or pattern has been impressed by rolling on the rod or blank. A treadle motion, however, operating in conjunction with an adjustable stop, will form a very convenient means for entering or withdrawing the work, and for impressing the screw-thread or pattern on the rod or bolt-blank.

Either a straight or tapering or combined straight and tapering screw may be impressed or rolled by these devices.

To form a screw, in cutting the threads on the rings M N, the grooves between the threads at the front of the rings—that is, on the side nearest the operator—are of the same shape and dimensions as the thread to be impressed on the bolt-blank, but gradually taper deeper or wider toward the back of the rings, whereby the thread is raised, when rolling cold iron, by the deeper grooves at the back of the rings, and the superfluous metal thus produced is removed by a steel-cutter, R, which is constructed to also form a support or rest to hold the rod or bolt-blank in position while having the threads rolled in or on it by the rings M N. The grooves are made the same pitch as the threads to be screwed on the rods; but the angle of the grooves on the impressing rings or rolls is made less than the angle required to make the bolt fit its nut. To make up, however, the complement of the angle, the rings M are made angularly adjustable by or at their axes in relation with each other, by means of the sole-plates B C about the pivot O, subject to retention in position by the screws *b*, passing through the slots *c*. The impressing rings or rollers (of which, if desired, there may be more than two) can thus be placed at an angle to one another in addition to the angular disposition of the threads or grooves thereon, and, according to the arrangement of these angles, the rod or bolt-blank is made to move backward more or less slowly, as required, while revolving about its axis. By this means the threads may be impressed very gradually and receive a high finish.

The cutter R, which may be made of hardened steel, and serves to remove superfluous metal, as well as to support the rod or bolt-blank, as hereinbefore described, is constructed or set to incline upward in a backwardly direction, so that when the screw-threads on the rod or bolt-blank are passing through the finishing portion of the impressing-rings, said support or cutter is clear, and does not injure the finished threads. When operating on cold iron the cutter is indispensable, as the cold iron cannot be elongated or drawn out; but with hot iron the cutter may or may not be used, inasmuch as the hot iron can be drawn out, and the process is so gradual that the iron is improved in the operation.

When impressing-rolls arranged one outside the other, as represented in Fig. 1, are used, the plain steel cutter hereinbefore referred to may be replaced by a circular or revolving cutter in the form of a worm-wheel placed between the rolls, and hollowed out in the face to suit the exact size of the screw which is being made. In this hollow the bolt is supported while being screwed, and the two edges of the wheel-face act as a continuous cutter, and by their constantly-changing surface are prevented from becoming heated. The hollow face of this revolving cutter has threads or teeth cut to the angle of the screw which is being made.

It will be obvious that not only screw-threads, but various ornamental patterns, can be impressed on rods by this invention.

In impressing screw-threads on rods or bolt-blanks, it is found in practice that, according to the different screws to be made and according to the finish to be imparted to the threads, it is sometimes desirable to give to the one impressing ring or roll a surface speed slightly in excess of the other, thereby establishing a rubbing action, as it were, which improves the surface of the rolled bolt and takes off the scale. This rubbing action may be increased by cutting transverse plain grooves in the threaded surface of the rings, deepest at the back of the latter, and gradually running out toward the inside or front of the rings, but leaving the two outside or finishing grooves intact to finish the threads on the bolts as they are delivered backward.

The width of the grooved surface of the rolling or impressing rings may be about equal to the diameter of the rod to be screwed.

It stands to reason that any kind or form of thread—that is, a thread of any depth or width, or single or double, or otherwise, and having any desired inclination—may be readily formed on rods by this invention, which will be found to be of special value for the manufacture of screw-nails and large and small wood-screws, or bolts for armor-plates, in which generally a very large percentage of the iron has heretofore been taken off by

the cutting-tools, this percentage rising as high as from thirty to sixty per cent. on the screwed portion of the bolt.

A machine may be constructed in accordance with this invention which will roll right and left hand threads on different ends of one and the same bar at the same time; or two machines, as herein described, may be combined to do the same, either of which will be found useful in the construction of railway-couplings; or, again, a machine constructed as represented in Figs. 3, 4, and 5 may be used for producing both right and left hand screws, by simply arranging its parts so that the inner impressing-ring can be made to approach the outer ring to perform its work either at top or bottom, or, in other words, on either side of the axis of the outer ring. In the one case the screw produced will be a right-hand one, and in the other case it will be a left-hand one.

We claim—

1. In a combination of oppositely-rotating threaded disks, rings, or rolls, arranged to move in transverse relation to the longitudinal axis of the bolt, rod, or blank to be impressed, the disks, rings, or rolls having their axes of rotation arranged at an inclination in relation with each other equal to a portion of the angle of the thread to be produced on the rod, bolt, or blank, and having their impressing-threads at an angle equal to the difference between the angle of inclination of the axes of said disks, rings, or rolls and the angle of the required thread or impression on the bolt, rod, or blank, substantially as specified.

2. The combination of the internally-threaded rotating hollow roll or ring M with the externally-threaded and reversely-rotating roll N, essentially as and for the purpose herein described.

3. The combination of the rocking frame L, the internally-threaded rotating-ring M, sole-plate B, with its attached standards adjustable on or about a pivot, O, the externally-threaded disk or ring N, the sole-plate C, with its attached standards, also adjustable on or about the pivot O, and means for raising and lowering the internally-threaded outer ring M, substantially as specified.

4. The cutter R, in combination with the grooved disks, rings, or rolls, essentially as and for the purpose herein set forth.

CHARLES FAIRBAIRN.
HENRY SIMON.

Witnesses:
I. HERBERT BROWNE,
ARTHUR C. HALL.