(No Model.) 3 Sheets—Sheet 1.

C. S. CLARK & H. A. HARVEY.

MACHINE FOR ROLLING SCREW THREADS.

No. 306,132. Patented Oct. 7, 1884.

FIG. 1.

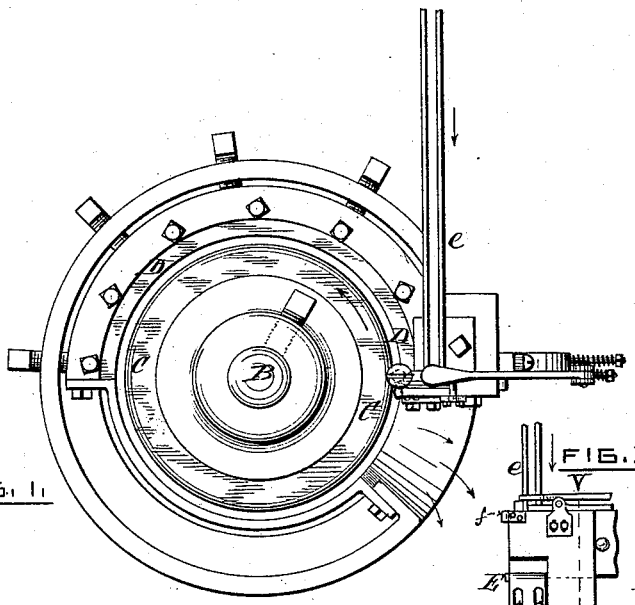


FIG. 3.

FIG. 4.

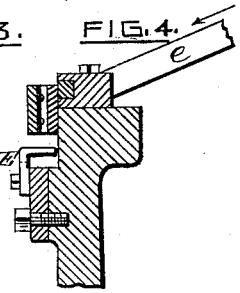
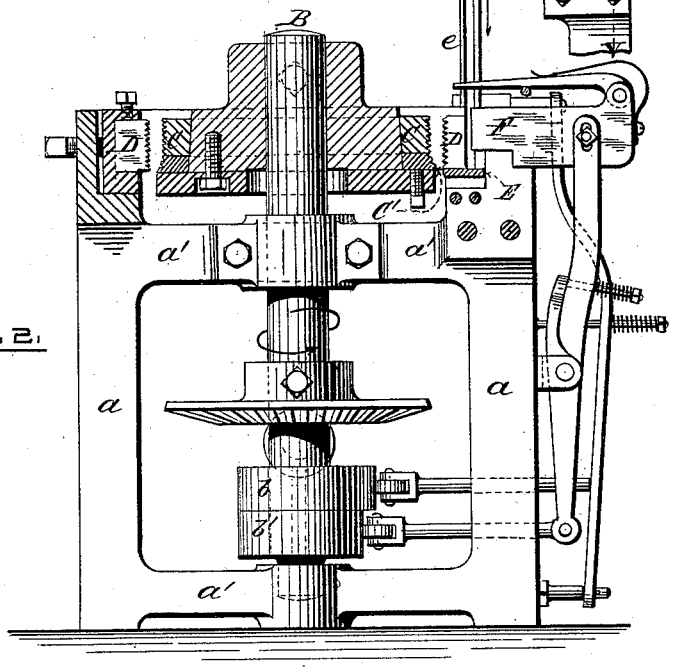


FIG. 2.



WITNESSES:

M. L. Adams

R. C. Howes

INVENTORS.

Charles S. Clark,
Hayward A. Harvey,
per Edw. E. Lemmon,
Atty.

(No Model.) 3 Sheets—Sheet 2.

C. S. CLARK & H. A. HARVEY.

MACHINE FOR ROLLING SCREW THREADS.

No. 306,132. Patented Oct. 7, 1884.

Fig. 5.

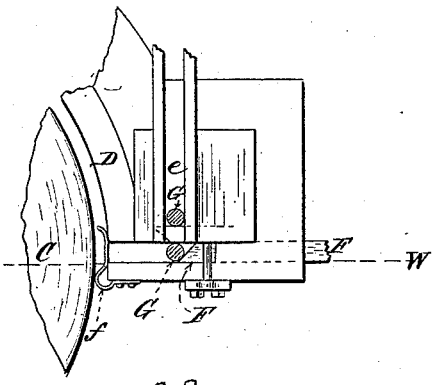


Fig. 6.

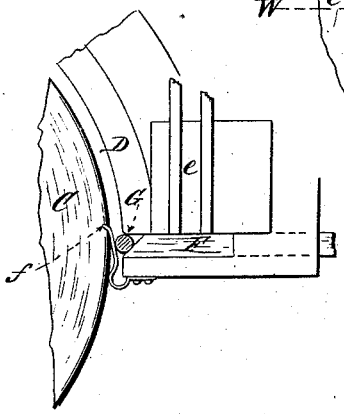


Fig. 7.

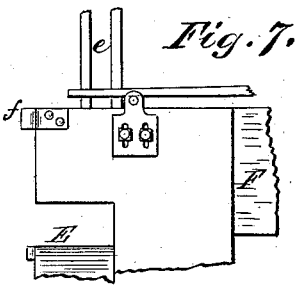
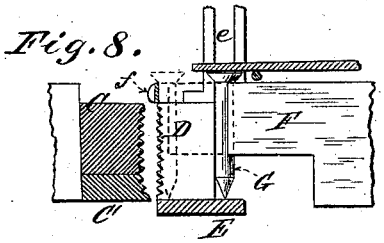


Fig. 8.



Witnesses:
M. L. Adams
R. C. Howes

Inventors:
Charles S. Clark,
Haymond A. Harvey,
Per Edw. E. Quinby,
Atty.

(No Model.) 3 Sheets—Sheet 3.

C. S. CLARK & H. A. HARVEY.

MACHINE FOR ROLLING SCREW THREADS.

No. 306,132. Patented Oct. 7, 1884.

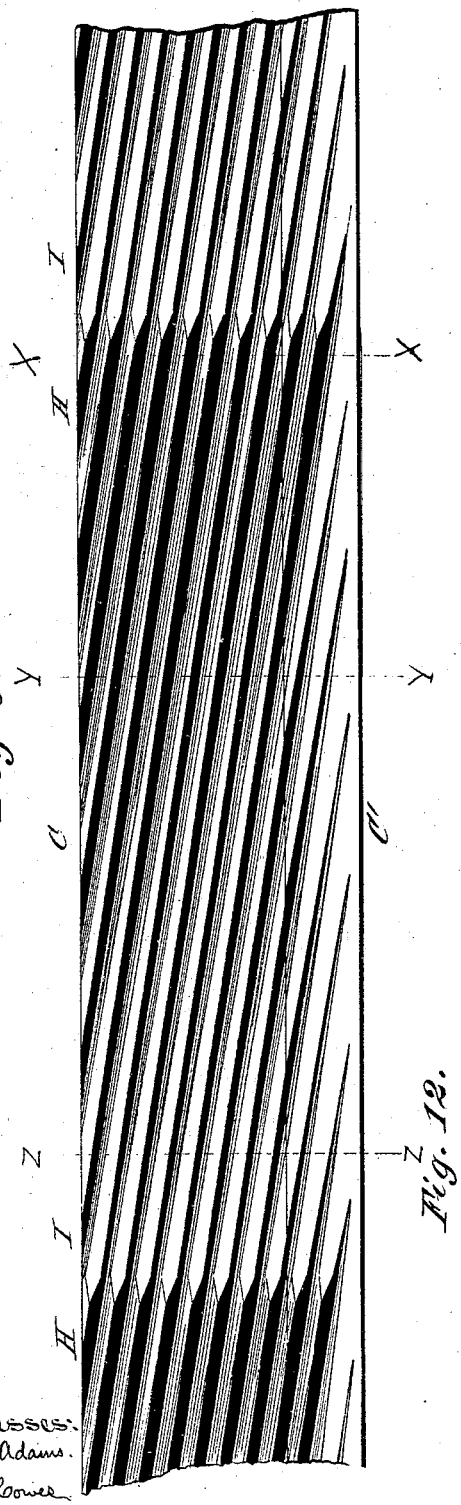


Fig. 9.

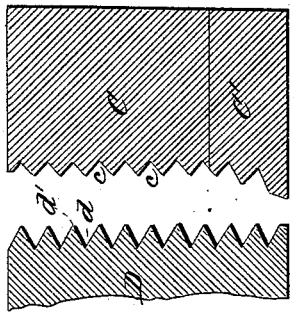


Fig. 10.

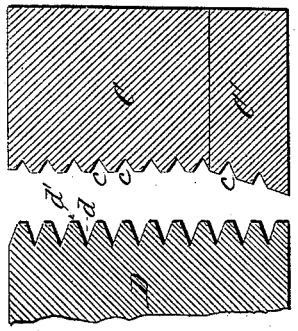


Fig. 11.

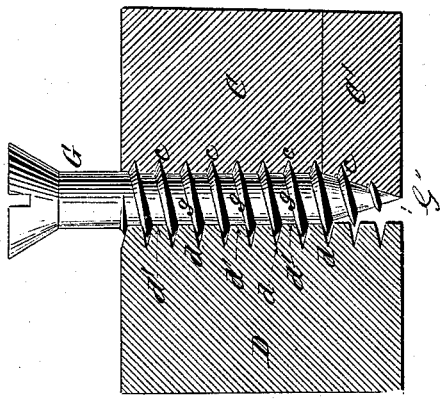


Fig. 12.

Witnesses:
M. L. Adams.
R. C. Howes

Inventors:
Hayward A. Harvey,
Charles S. Clark,
Per Edw. E. Lunby,
Atty.

UNITED STATES PATENT OFFICE.

CHARLES S. CLARK, OF PROVIDENCE, R. I., AND HAYWARD A. HARVEY, OF ORANGE, N. J.; SAID CLARK ASSIGNOR TO SAID HARVEY AND THE HARVEY SCREW AND BOLT COMPANY, OF CONNECTICUT.

MACHINE FOR ROLLING SCREW-THREADS.

SPECIFICATION forming part of Letters Patent No. 306,132, dated October 7, 1884.

Application filed May 2, 1884. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. CLARK, of Providence, Rhode Island, and HAYWARD A. HARVEY, of Orange, New Jersey, have invented certain Improvements in Machines for Rolling Screw-Threads, of which the following is a specification.

These improvements relate to the construction of a rotating cylindrical die and a stationary curved die for progressively forming threads upon screw-blanks, which are caused to roll around the concave face of the stationary die by the impingement upon them of the periphery of the rotating die; and also to the measuring of the blanks by their points in the act of feeding them to the dies. The peculiarities in the construction of the dies are such that the rotating cylindrical die is capable of alone performing the function of giving shape to the thread upon the blank, and the stationary curved die can be made to act merely as a back rest.

The drawings, representing a machine for rolling wood-screws embodying our improvements, are as follows:

Figure 1 is a top view. Fig. 2 is a side elevation, partly in section. Fig. 3 is an elevation of the part of the machine shown in the upper right-hand corner of Fig. 2 in section. Fig. 4 is a vertical section taken through the line V V on Fig. 3. Fig. 5 is a top view, upon a larger scale, of the feed mechanism, showing a blank fed from the lower end of the ways and standing in front of the delivery-slide. Fig. 6 is a similar view showing the delivery-slide in the act of pushing a blank toward the rotating die. Fig. 7 is an elevation, upon a larger scale, of the upper portion of the parts shown in Fig. 3. Fig. 8 is a vertical section taken through the line W W on Fig. 5. Fig. 9 represents a development upon a plane of the periphery of the rotating die. Fig. 10 is a transverse section of the rotating die, taken through the line X X on Fig. 9, also showing in transverse section a portion of the stationary die. Fig. 11 is a transverse section of the rotating die, taken through the line Y Y on Fig 9, showing in transverse section another portion of the stationary die; and Fig. 12 is a transverse section of the rotating die, taken through the line Z Z on Fig. 9, showing in transverse section still another portion of the stationary die.

In our machine the thread upon the body of the blank, including that upon its point, is formed by a single progressive operation, and one part of our invention relates to the shape of the dies by which the formation of the thread in a single progressive operation is effected. Thus the rotating die has formed upon its periphery a series of inclined parallel ribs, which have the shape of V-threads for portions of their lengths, and are then transformed into truncated threads, having their faces gradually and progressively increased in width from the point where they begin to take the truncated shape to the point where the truncated shape terminates and the V shape begins.

The frame of our machine consists of the uprights *a a* and the horizontal members *a' a'*, the latter affording the bearings for the vertical shaft B, which supports and carries the rotating die C. The curved stationary die D is supported in the usual way upon the top of the frame and partially surrounds the rotating die.

By means of the usual gearing rotation is imparted to the vertical shaft B, and hence to the rotating die C.

The shaft B is provided with the cams *b b'*, for imparting the rocking motion for operating the usual mechanism for checking the blanks and delivering them one by one to the dies.

Heretofore the blanks, preparatory to their delivery to the dies, have been supported by their heads. Therefore any variation in the length of the blank involved a corresponding variation in the length of the threaded part of the blank. Our improvement in the means of feeding consists in causing each blank, preparatory to its delivery to the dies, to be supported upon its point—that is, upon the end of the shank opposite the head. This we accomplish by means of the adjustable gage-plate E, upon or against which the points of the blanks rest as they are checked off one by one from the lower end of the inclined ways *e*.

In order to prevent the blank while resting upon the gage-plate E from tipping against the die, we affix to the frame the spring-finger *f*, against which the blank may lean until the check-slide F moves forward, by which the blank is brought into an upright position against the delivery end of the check-slide preparatory to being fed to the dies. This mode of delivering the blank, which we term "measuring by the point," is especially important for effecting the proper presentation of the blank to the part C′ of the rotating die, which forms the gimlet-point.

Preparatory to having the thread rolled upon it, the blank G is usually pointed or rendered more or less nearly conical.

During the operation of rolling the thread the blank has a slight tendency to elongate. It will hence be seen that the vertically-adjustable gage-plate E affords the means of accurately controlling the elevation at which the blank is fed to the dies, so that the lower or pointed end of the blank will be properly presented to the gimlet-pointing die. In making the adjustment the slight elongation to which the blank is subjected during the rolling process is taken into account, and the gage-plate is adjusted to elevate the blank, so that when elongated the metal of its lower end will completely fill the depressions in the gimlet-pointing die.

The ribs upon the gimlet-pointing die C′, with the exception that the face of that part of the die is inclined, are the same as the ribs upon the part C of the die which form the thread upon the body of the blank—that is, they have for a portion of their length the shape of V-threads, and are then transformed to the shape of truncated threads of gradually increasing width of face. The continuous increase in the width of the faces of the truncated ribs is especially essential when the gimlet-pointing die is employed, because the grip of the dies upon the sides of the thread is in such case continued without any diminution of energy until the conclusion of the rolling operation.

In operation the V-shaped portions of the ribs first impress a V-shaped spiral groove in the body of the blank and then gradually widen the bottom of this groove by crowding the metal of the blank laterally, and this lateral crowding of the metal continues until the blank has completed its journey through the dies. The metal displaced laterally by the wedging action of the ribs enters and finally fills the spaces between the ribs, and is thus made to take the form of a spiral thread around the body of the blank.

The length of the arc of the circle occupied by the ribs from the place where they have the V shape to the place where their truncated shape terminates will of course vary according to the radius of the die.

In the drawings we have intended to represent two sets of ribs, each occupying one-half of the circumference of the die. In Fig. 9 of the drawings, therefore, the V-shaped portions H of one set of ribs are shown in juxtaposition with the terminal truncated portions I of the other set of ribs.

The stationary die is provided with a series of inclined parallel ribs which for a portion of their lengths are V-shaped in cross-section, and are then transformed into truncated threads having faces progressively increasing in width, similarly to the reversely-inclined ribs on the rotating die; but the sides of the ribs which constitute the side walls of the recesses in the stationary die are less inclined relatively to each other than the side walls of the corresponding ribs upon the rolling-die for the purpose of preventing the sides of the ribs of the stationary die from having any bearing upon the sides of the threads formed upon the blank by the rotating die. This mode of construction is illustrated in Fig. 12, which is a transverse section taken through a portion of the rolling-die and a portion of the stationary die, showing the screw in elevation. This section is taken near the point at which the screw is completely finished and discharged from the dies.

It will be seen that the threads *g g g*, &c., upon the body of the blank fill the recesses *c c c*, &c., both in the part C of the rolling-die which forms the thread upon the body of the blank, and in the part C′ of the rolling-die which forms the gimlet-point. It will also be seen that the threads *g g g*, &c., of the blank do not fill the recesses *d d d* formed in the stationary die D, and that the faces *d′ d′ d′*, &c., of the ribs of the stationary die alone bear upon the screw, their bearing being upon the core of the screw between the convolutions of the thread.

One of the results of this mode of organizing the dies is that in rolling certain sizes of screws no back rest or inclined stationary die is needed for the gimlet-point G′. Therefore in changing the machine for rolling gimlet-pointed screws of different lengths it will only be necessary to change the rotating die, the stationary die being made of any desired width to accommodate it to the purpose of performing its function of a back rest for supporting the longest screw for which the machine is intended.

Another important consequence resulting from this mode of constructing the dies is that during the operation of rolling the thread the position of the blank is controlled by the rotating die, and the blank will have no tendency to run up or run down in the course of its journey through the dies. This results from the fact that the ribs of the stationary die are so shaped that their faces only bear upon the blank, provided, of course, that the blank is fed to the dies at the time when the V-shaped portion of the rotating die is opposite the V-shaped portion of the stationary die.

As the blank is rolled along the face of the stationary die by the action of the rotating die, the spiral groove between the convolu-

tions of the thread formed upon the blank gradually becomes flat-bottomed, and its flat bottom gradually widens. This transformation in the shape of the spiral groove is effected by the ribs of the rotating die, so that at any given point in the course of the journey of the blank between the dies the ribs of the rotating die completely fill the convolutions of the spiral groove upon one side of the screw-blank, while the ribs of the stationary die at the same point do not fill the grooves upon the other side, but bear only upon the core of the screw. Thus the stationary die performs merely the function of a back rest.

We claim as our invention—

1. In mechanism for feeding screw-blanks to dies for rolling the threads upon them, the adjustable gage-plate E, for supporting the blank upon its pointed end, and thereby gaging its position relatively to the dies preparatory to the feeding operation.

2. The gage-plate E, for fixing the position of the pointed end of the blank, in combination with the check-slide F and the spring-finger *f*, for holding the blank against the delivery end of the check-slide, substantially as described.

3. In a machine for rolling threads on screw-blanks, a cylindrical die having formed upon its periphery a series of inclined parallel ribs or screw-threads of uniform pitch, which for portions of their lengths are V-shaped in cross-section and are then transformed into the shape of truncated screw-threads having faces progressively increasing in width from the point where they commence to take the truncated shape to the point where the ribs having the truncated shape terminate and those having the V shape begin.

4. In machines for rolling screw-threads upon screw-blanks, a rotating cylindrical die having formed upon its periphery a series of inclined parallel ribs, which for portions of their lengths are V-shaped in cross-section, and are then transformed into the shape of truncated screw-threads having faces progressively increasing in width from the point where they commence to take the truncated shape to the point where the ribs having the truncated shape terminate and those having the V shape begin, in combination with a stationary curved back rest having formed upon its face a series of inclined parallel ribs similar in form to the series of reversely-inclined parallel ribs upon the face of the rotating die, but of less area in cross-section, and thereby adapted to bear only upon the core of a screw-blank rolled between dies, as described.

5. In machines for rolling screw-threads on screw-blanks, a rotating cylindrical die, substantially such as described, in combination with a stationary curved die having formed upon its face a series of inclined parallel ribs, which are similar to the series of reversely-inclined parallel ribs formed upon the rotating die, excepting that the sides of the ribs which constitute the walls of the recesses between the ribs are less inclined relatively to each other than the sides of the corresponding portions of the ribs of the rotating die.

CHARLES S. CLARK.
H. A. HARVEY.

Witnesses as to Charles S. Clark:
W. H. THURSTON,
I. C. HOWES.

Witnesses as to Hayward A. Harvey:
R. C. HOWES,
W. L. ADAMS.