(No Model.) 3 Sheets—Sheet 1.

C. F. ROPER.

MACHINE FOR GRINDING AND POLISHING.

No. 516,168. Patented Mar. 6, 1894.

Fig: 1.

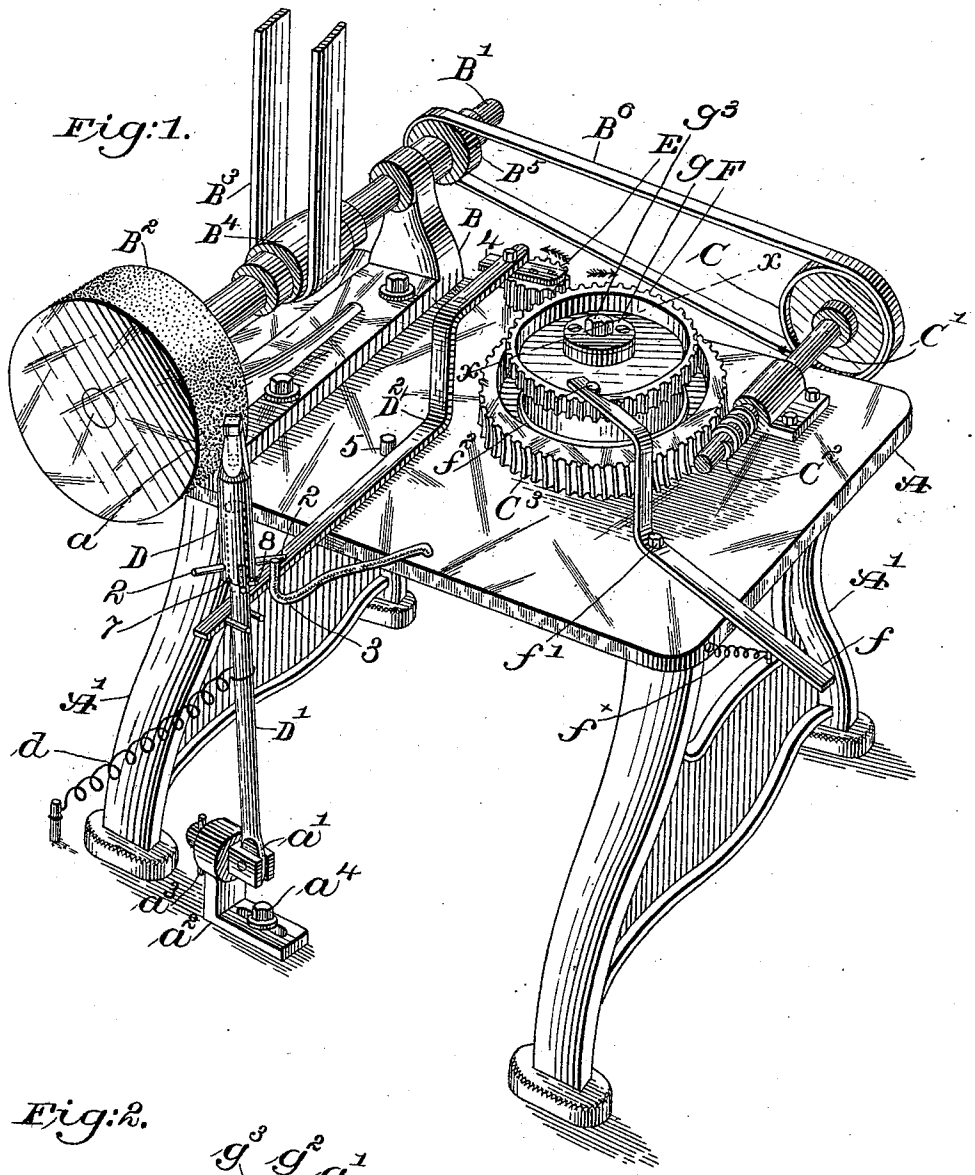
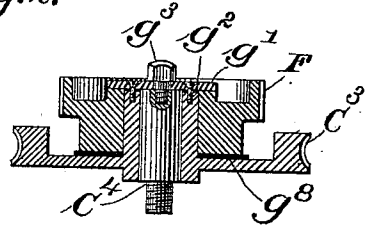


Fig: 2.



Witnesses.
Fred Washworth.
Fred S. Grinnell.

Inventor:
Charles F. Roper.
by Crosby & Gregory
Attys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

C. F. ROPER.

MACHINE FOR GRINDING AND POLISHING.

No. 516,168. Patented Mar. 6, 1894.

Fig: 3.

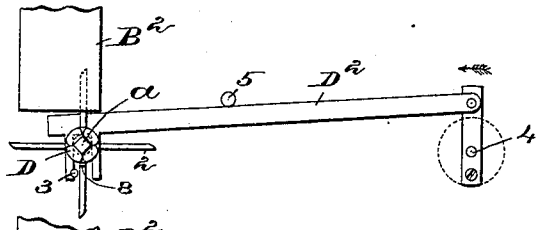


Fig: 4.

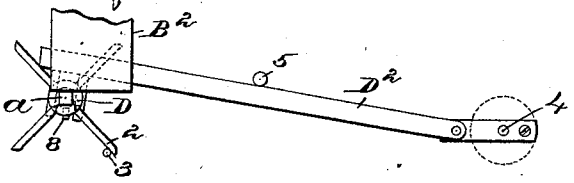
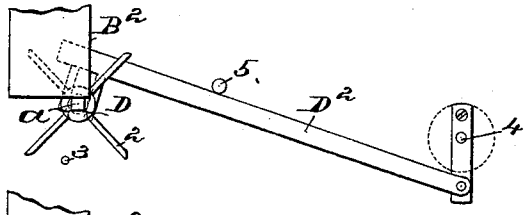


Fig: 5.



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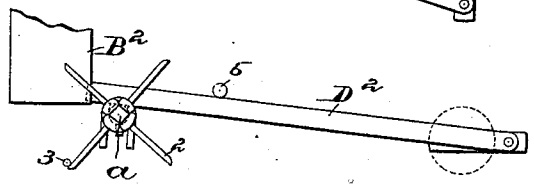


Fig: 7.

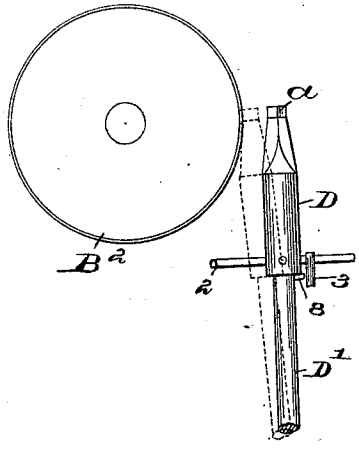


Fig: 8.

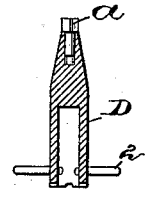
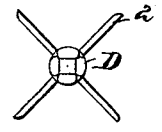


Fig: 9.



Witnesses.

Louis N. Bovell

Maurice L. Emmy

Inventor:

Charles F. Roper

by Crosby & Gregory

Attys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3

C. F. ROPER.

MACHINE FOR GRINDING AND POLISHING.

No. 516,168. Patented Mar. 6, 1894.

Fig: 10.

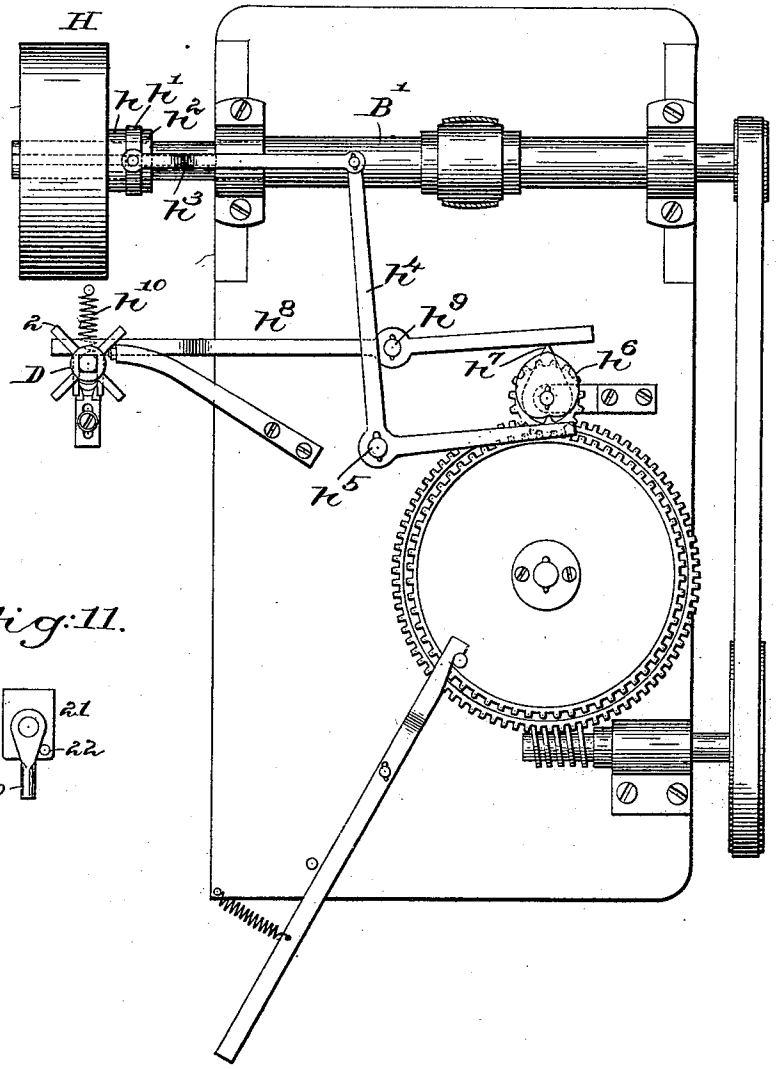


Fig: 11.

Witnesses.
Frederick L. Emery
Louis N. Dowell

Inventor:
Charles F. Roper
by Crosby & Gregory Attys.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES F. ROPER, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO THE HOPEDALE MACHINE SCREW COMPANY, OF SAME PLACE.

MACHINE FOR GRINDING AND POLISHING.

SPECIFICATION forming part of Letters Patent No. 516,168, dated March 6, 1894.

Application filed October 24, 1892. Renewed January 6, 1893. Serial No. 496,004. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. ROPER, of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Machines for Grinding and Polishing Many-Sided Articles, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

The object of this invention is to provide a machine by which many-sided articles, such as the heads of screws to be ground and polished, or either, may be deposited in a work-holder and the latter moved in such manner as to bring one after the other of the sides or faces of the screw-head against a grinding or polishing wheel or device, the work-holder being left at rest after the last side or face of the article has been acted upon.

My improved machine contains the following instrumentalities, viz:—a work-holder; a grinding and polishing wheel or device having a flat grinding face broader than the surface to be ground; devices to rotate the work-holder intermittingly; devices to make and break contact between the said screw-head and the said wheel, the partial rotation of the work-holder being effected while the wheel and screw-head are out of contact; and devices to change the relative positions of the work-holder and said grinding wheel or device, whereby the screw-head is acted upon by different portions of the wheel during the rotation of the said grinding wheel.

Other features of this invention will be hereinafter set forth in the specification and defined in the claims at the end thereof.

Figure 1 of the drawings, in perspective, shows a machine embodying my invention, the work-carrier being shown as holding a screw, the head of which is to be ground or polished. Fig. 2 is a partial section in the line x Fig. 1. Fig. 3 is a detail in plan view showing the work holder, some of its actuating parts, and the grinding wheel in the position Fig. 1; Figs. 4 to 6 inclusive, views of the same parts, but in different positions in their cycle of movement; Fig. 7, a detail showing the grinding wheel in end view, and the work holder by full lines in the positions Figs. 1 and 3, the dotted lines being the position Fig. 4; Figs. 8 and 9, respectively, a vertical section and plan view of the work holder with a screw blank in place; Fig. 10, a modified form of my invention; and Fig. 11, is a detail showing the pivoted dog 20 instrumental in rotating the work-holder in one direction, as will be described.

The frame-work consists essentially of a bed-plate A, standing on suitable legs A′. The bed-plate which may be of any suitable shape is shown as provided with a bearing stand B adapted for the reception of the rotary shaft B′ carrying the wheel B^2, which may be of any usual or suitable abrasive material, it being preferably a grinding or polishing wheel containing corundum or like material, the said wheel presenting a broad flat grinding face as contradistinguished from a V-shaped edge, the grinding face of the wheel being broader than the face of the screw to be ground, whereby the screw-head may traverse the grinding surface of the wheel during the rotation of the latter, thus enabling the screw head to be acted upon by different portions of the grinding face of the wheel, and obviate the wearing of a groove in the wheel as would be the case if but a narrow portion of the grinding surface of the wheel acted against the screw-head. This shaft is driven by a suitable belt B^3 extended about a pulley B^4, and has a second pulley B^5 which drives a belt B^6 extended over a pulley C on a shaft C′ shown as provided with a worm C^2 engaging and rotating a worm gear C^3, the hub of which rotates about a center shown as a stud C^4, see Fig. 2.

The work-holder D, in this instance of my invention, is shown as a sleeve socketed or shaped at its upper end to receive the shank of a screw a, which I shall hereinafter in some instances designate as the work, said screw being represented as having a four-sided head, but a head with more or less than four sides may be done equally well by but slight changes, as will be described. The work-holder is represented as adapted to turn about a post D′ universally jointed at its lower end, the particular joint shown consisting of a bifurcated stud a' extended through an ear of a suitable stand a^2 adapted to be adjusted as to its position by a screw a^4, the said stud,

free to turn in said stand, being shown as kept in place therein by a pin a^3 extended through the stud at the rear of the stand.

The work-holder in accordance with my invention must have an intermitting rotation in order that one face after another of the screw-head may be subjected to the action of the grinding wheel until all the faces have been ground or polished.

In the form in which I have chosen to illustrate my invention in practice, the work-holder has a series of projections as 2, one for each side or face to be ground, and the frame-work has a pawl-like projection 3 to contact with the said projections 2 one after the other as the work-holder is to be partially rotated.

Another essential requisite of this invention is that the grinding contact between the wheel and article be made and broken in such manner as to grind the flat faces from edge to edge in succession and then break the contact between the article and grinding wheel and bring a new face against the grinding wheel. I have illustrated one simple manner of doing this which I will now describe.

The post D′ is embraced by a lever D^2 connected to a vibrator E at 4, each rotation of the vibrator causing the lever to be moved in such manner about the fulcrum 5 as to give to the work-holder such motion as to effect the make and break of contact of the wheel and the work, I for the best results in the simplest manner preferring to give to the work-holder four motions, or motions to put the screw head against the wheel near one edge, move the screw-head across the grinding face of the said wheel, to thus effect the grinding of one side of the head, then move the screw-head away from the grinding wheel, thus breaking the contact between the said wheel and said head, and then the work-holder, while the head of the screw is not in contact with the grinding wheel, is moved toward the opposite edge of the wheel or to its starting position. It would not be possible to do the work for which my machine herein described has been devised, by the employment of a grinding wheel having a V-shaped periphery, as in United States Patent No. 371,847. During each movement of the work-holder away from the wheel, one of the projections 2 meets the pawl device 3 and effects as stated, the partial rotation of the work-holder to bring another side of the screw-head toward the wheel, and after each partial rotation the work-holder is made to approach the grinding wheel or device and put the work against it, as before described. The path of movement of the work-holder is and may be substantially that common to a four-motioned feed in a sewing machine, and instead of the exact form of devices shown to effect the movement of the work-holder, I may employ as equivalents any devices commonly used to impart to the feeding device of a sewing machine its movements to engage and move the cloth, retire from the cloth, and then re-engage the cloth for the next feed movement. The spring d keeps the part D′ in engagement with the lever D^2.

The device designated as the vibrator, is shown as a wheel E having a crank pin 4, said vibrator in this instance of my invention being rotated by an actuating device F shown as a gear having four times as many teeth as the vibrator, said gear being connected frictionally with and so as to be rotated by a driving wheel C^3 except when said gear F is locked by a suitable locking device, the latter in this instance of my invention being shown as a lever f, pivoted at f' and acted upon a spring $f^\times$, the lever having a notch to engage a projection f^2 of the gear F and lock or stop it after the vibrator has moved the work-holder to effect four contacts with the grinding wheel, the number of such contacts depending, however, on the number of sides or faces to be ground or polished between the starting and stopping of the actuator.

If the work should have six sides or faces instead of four, the actuating device and vibrator will then be so proportioned as to insure six rotations of the vibrator to one of the actuating device F, the rotative steps of the work-holder for a complete rotation being broken up into six rather than four steps.

In operation, the operator has only to put the shank of the screw into the work-holder and release the actuating device so that the continuously-rotating wheel C^3 may start it and effect the rotation of the vibrator so that it, through its connections with the work-holder, will put the flat sides of the head of the screw in succession see Figs. 3 to 6, against the grinding wheel, the projection or projections on the actuating device being caught by the locking device and held after all the sides of the screw which it is desired to treat have been acted upon by the wheel B^2. The wheel F is kept pressed down on a friction surface g^8 of leather or equivalent material, by the washer g' acted upon by suitable screws g^2, and the stud screw g^3 keeps both wheels C^3 and F on the stud C^4. The work-holder having been brought to rest, the screw is removed, another put in its place, and the actuating device released as before. The under side of the work-holder is provided with a series of notches 7 to engage one after another a pin or projection 8 and constitute a locking device for the work-holder.

This invention is not limited to the exact shape shown for the work-holder, nor to the exact devices shown for rotating the work-holder intermittingly; nor for dividing each complete rotation of the work-holder into more or less steps; nor to the exact shape of the vibrator, nor of the locking device for the actuator F. The actuating device will be changed and one of another size substituted when an article having a different number of sides or faces is to be treated. The actuating device in reality constitutes a pattern surface,

as it determines the number of movements of the work-holder toward and from the grinding wheel, or the number of makes and breaks of contact between the work and grinding wheel during one cycle of rotation of the work-holder. This invention is not, however, limited to the exact shape shown for the pattern device. For simplicity, it is preferred to move the work across the wheel during the grinding operation, but my invention would not be departed from by giving to the wheel a movement parallel to its center of rotation and moving the work-holder merely toward and from the wheel. In Fig. 10, I have shown my invention so modified.

In Fig. 10, the grinding wheel H is mounted on a sleeve-like hub h feather keyed to the shaft B′, the inner end of said hub having an annular groove which receives in it a ring having a stud h^2 embraced by a link h^3 jointed to a lever h^4 pivoted at h^5 and acted upon by a cam h^6 fast on a gear E common to Fig. 1, said cam sliding the wheel on the shaft B′.

In the modification Fig. 10, the cam h^7 under cam h^6 performs the function of the vibrator in Fig. 1 and acts on the lever h^8 pivoted at h^9, said lever having a fork-like projection h^{10} to embrace, as in Fig. 1, the rod carrying the tool-holder D like that in Fig. 1.

The tool-holder in Fig. 10, is moved by the lever h^8 and spring h^{10} toward and from the wheel H in a curved path, and is rotated as it is retracted from the wheel by one of the projections 2 striking the dog 20, see Fig. 11, pivoted on the stand 21, the said dog at such time being prevented from turning by the stop 22, but when one of the projections 2 in the movement of the tool-holder toward the wheel H strikes the dog, the latter is free to swing and the tool-holder is not rotated, but is left locked in position by a co-operating locking device, as provided for in Fig. 4. The grinding or polishing operation is the same whether the work or the wheel be moved horizontally, the gist of the invention lying in the fact that the face on the screw-head to be ground traverses the grinding surface of the wheel, so that different portions of the wheel not in the same circumferential line act upon the screw-head during the rotation of the wheel. Should the flat side of a screw-head be put against the grinding surface of the rotating wheel and the screw-head not be moved or made to traverse the said surface as the surface rotated, then the wheel would soon have a channel or groove worn in its periphery, but by traversing the screw-head across the grinding face of the wheel at a point where the said grinding face is broader than the face of the screw-head to be ground, the grinding surface of the wheel may also be kept true and even, and the head of the screw be kept flat and true.

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

1. In a machine for grinding and polishing the flat sides of screw-heads, the following instrumentalities, viz:—a grinding wheel having a grinding surface wider than the face of the screw-head to be ground; a work-holder; devices to rotate said work-holder intermittingly; devices to move the work-holder toward and from the grinding wheel to make and break contact between said screw-head and said grinding wheel; and devices to insure the traversing by the screw-head of the said grinding surface during the rotation of the latter, whereby the contact of the face of the screw-head with a grinding surface wider than said face insures true grinding of the screw-head and obviates grooving of the grinding face, substantially as described.

2. In a machine for grinding and polishing screw-heads having plane faces, the following instrumentalities, viz:—a rotating grinding wheel having its grinding surface wider than the face of the screw-head to be ground; a work-holder; devices to rotate said work-holder; and devices to change the relative positions of the work-holder and said grinding wheel and cause the face of the screw to traverse in the rotation of the wheel a portion of the grinding surface of the wheel of greater width than the width of the face of the screw head, whereby the screw-head is acted upon by different portions of said grinding wheel during its rotation and whereby contact between the screw-head carried by the work-holder and the said grinding wheel is made and broken at intervals, the contact between the screw-head and the grinding wheel being preserved while the screw-head is traversing the face of the grinding wheel, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES F. ROPER.

Witnesses:
H. L. KINSLEY,
E. D. BANCROFT.