(No Model.)

E., E. W., & E. C. STRANGE.

MANUFACTURE OF TWIST DRILLS.

No. 273,322. Patented Mar. 6, 1883.

Fig. 2.

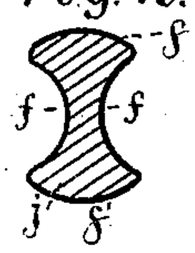


Fig. 1.

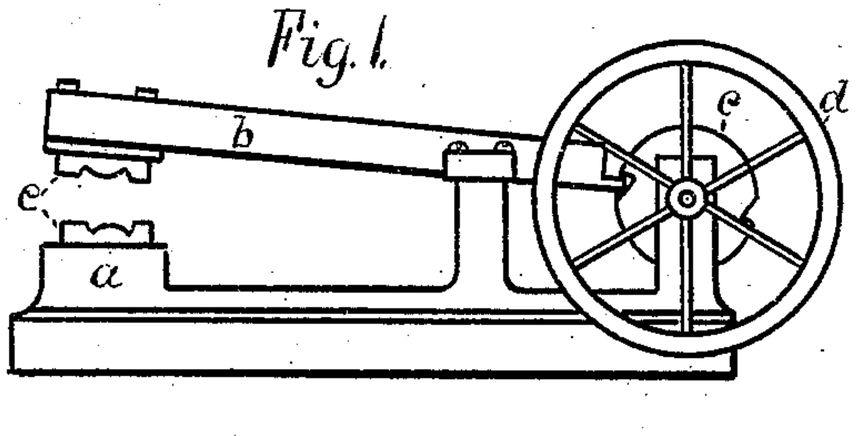


Fig. 3.

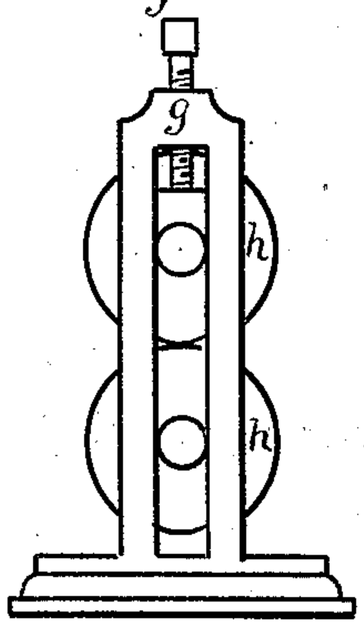


Fig. 4.

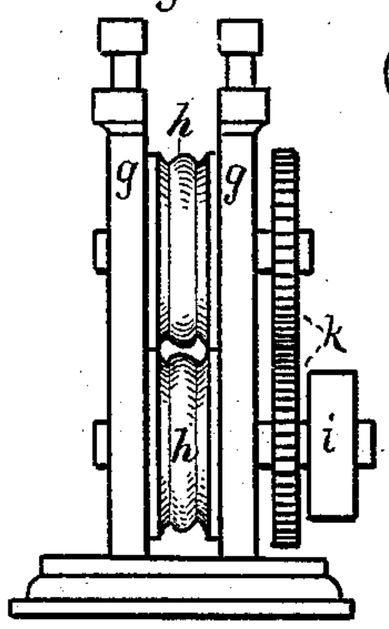


Fig. 5.

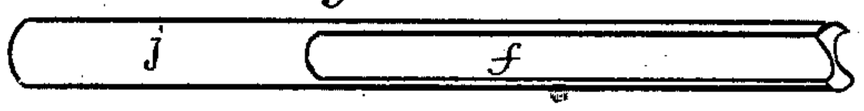


Fig. 6.

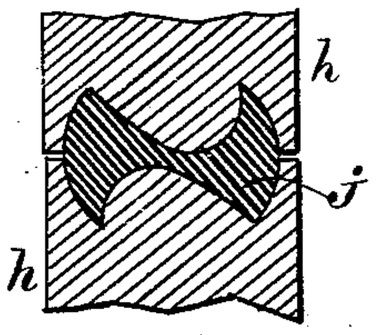


Fig. 8.

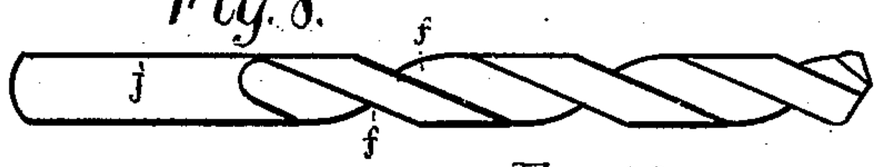


Fig. 12.

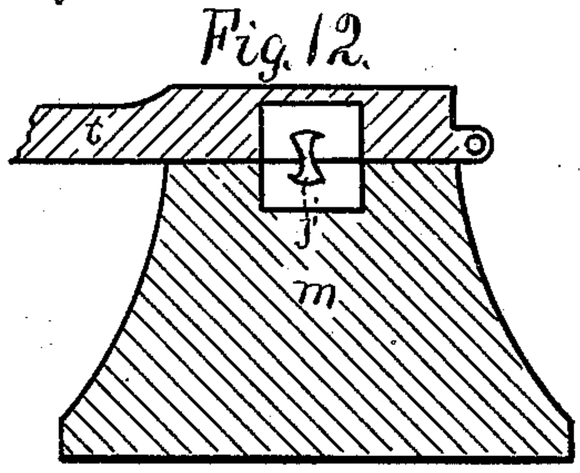


Fig. 7.

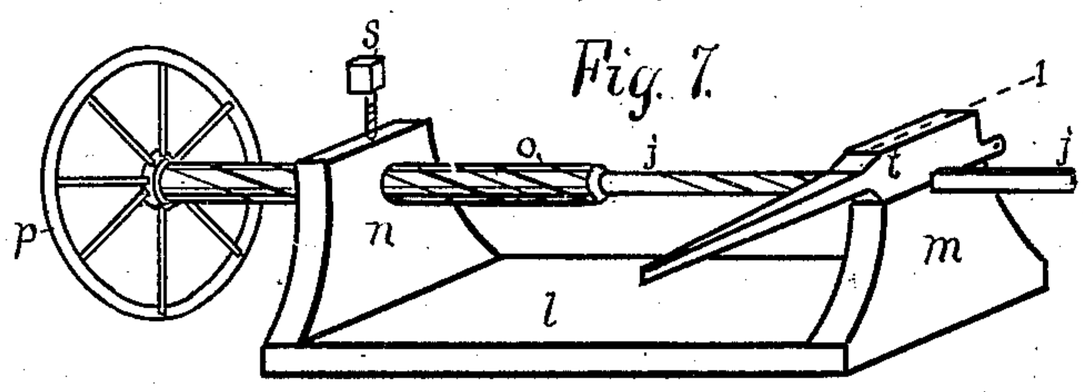


Fig. 11.

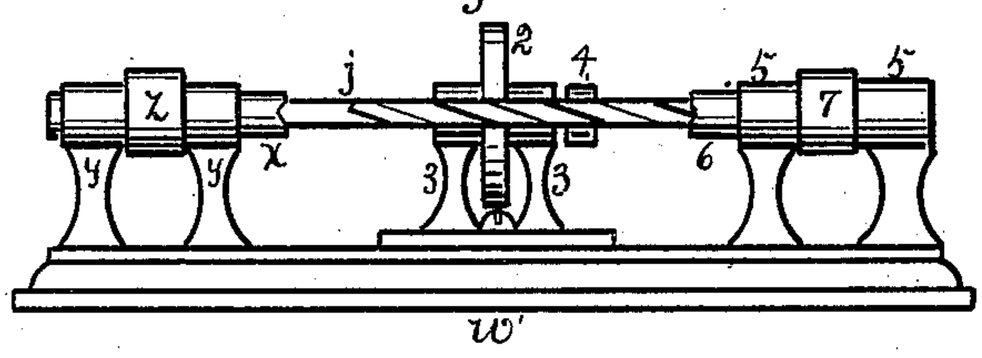


Fig. 9.

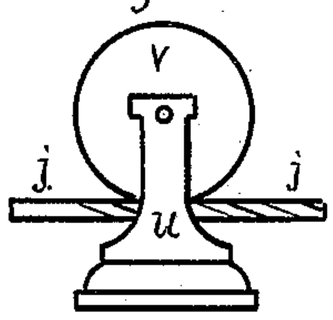
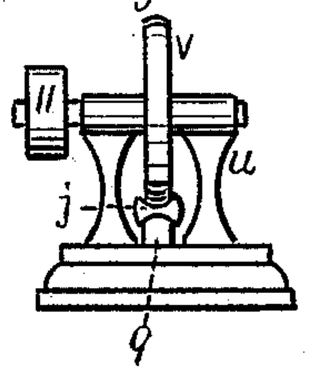


Fig. 10.



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Emerson C. Strange.
By Porter & Hutchinson Attys

UNITED STATES PATENT OFFICE.

ELIAS STRANGE, ELIAS W. STRANGE, AND EMERSON C. STRANGE, OF TAUNTON, MASSACHUSETTS.

MANUFACTURE OF TWIST-DRILLS.

SPECIFICATION forming part of Letters Patent No. 273,322, dated March 6, 1883.

Application filed May 9, 1881. (No model.)

To all whom it may concern:

Be it known that we, ELIAS STRANGE, ELIAS W. STRANGE, and EMERSON C. STRANGE, of the city of Taunton, State of Massachusetts, have invented Improvements in the Manufacture of Twist-Drills, of which the following is a specification.

This invention relates to the manufacture of that class of drills known as "twist-drills," which are usually formed by the process of "milling" a spiral groove in opposite sides of the drill, so as to produce what are known as "straight cutting-lips;" and the invention will, in connection with the annexed drawings, be hereinafter fully described, and specifically defined in the appended claim.

In said drawings, Figure 1 is a side elevation of a power pony-hammer with dies for performing the first or forging step in our process of manufacturing said drills. Fig. 2 is an enlarged cross-section of a drill-blank as it leaves the dies of the hammer. Fig. 3 is a side elevation, and Fig. 4 a front elevation, of a pair of rolls by which the second step or stage of our process is effected. Fig. 5 is an enlarged perspective view of the drill-blank after it has been operated upon by said rolls. Fig. 6 is a cross-section of Fig. 5, showing the blank within the rolls. Fig. 7 is a perspective view of a machine by which the twisting or third step in the manufacture of our drills is effected. Fig. 8 is an enlarged side elevation or plan of the twisted drill. Fig. 9 is a side elevation, and Fig. 10 a front elevation, of a milling or grinding machine by which the grooves of the drill are smooth-finished after being twisted. Fig. 11 is a side elevation of a machine by which the drill is ground true and round upon its outside.

In said Fig. 1, *a* represents the bed of the hammer, and *b* the helve, which is pivotally mounted in a standard of bed *a*, as shown. Said helve is actuated in the usual manner by cam-disk *c*, which is mounted on the arbor of the fly-wheel *d*, and upon said arbor a pulley is arranged for the actuating thereof by a belt. In bed *a* and the front end of helve *b* are respectively mounted the dies *e*, which are formed with such configuration of face that when the drill-blank, which is a round steel rod of the desired thickness and length, is heated and subjected to the active operation of said dies said blank will, in the desired portion of its length, be forged into the form shown in Fig. 2—that is, its cross-section will represent two arcs of a circle, as shown at 8, and two grooves, (marked *f*.)

In Figs. 3 and 4, *g g* are the side frames, between which are mounted the groove-faced rolls *h h*, upon suitable arbors journaled in boxes that are vertically adjustable in said frames in the usual manner. Upon the arbor of the lower roll *h* is secured a pulley, *i*, and upon the arbor of each roll is secured an enmeshing gear, *k*, to insure coincident rotation of said gears when said pulley is actuated by a belt. After the drill-blank is subjected to the forging or hammering process by the dies it is next rolled by means of the rollers *h h*, which are formed with such outline of face as will give a contour of cross-section similar to that shown in Fig. 6. Said rolls are either formed with sufficient eccentricity relatively to their axes or are arranged to have an automatic alternating movement toward and from each other, in order that the drill-blank, when being rolled, shall receive a gradual taper in its thickness from the point of intersection of the cylindrical or shank part and the grooves *f* to the grooved end of the drill-blank, in order that it shall have greater strength near the inner ends of the grooves than at the front or grooved end. Fig. 5 shows the drill-blank after it has been subjected to the action of rolls *h*. After the drill-blank has been thus rolled it is next twisted, which may be effected by the machine shown in Fig. 7, wherein *l* is the bed and *m* and *n* standards. In standard *n* is journaled an arbor, *o*, wherein is cut a spiral groove of the same pitch as that desired in the twist of the drill *j*. Pin *s*, threaded in standard *n*, engages in the groove of arbor *o* to insure the required relative rotation and lineal movement of the arbor, the same being actuated by the hand-wheel *p*. To the opposite standard, *m*, is hinged the lever *t*, coincidently in which and its standard are formed seats corresponding to the half-diameter of the grooved portion of the rolled drill-blank, as shown in the enlarged detached Fig. 12.

To twist the heated drill-blank, it is placed between lever *t* and head *m*, and its shank is secured in arbor *o* by a set-screw or other means, the inner ends of the grooves being placed close to the inner face of standard *m* and lever *t*, when, by rotating and retracting arbor *o*, as described, the drill-blank will be drawn past lever *t* and standard *m*, and will thereby acquire the same pitch of spirality or twist as the groove in said arbor *o*. After the drill-blank is thus twisted its grooves are finished by grinding or milling with a rotary cutter, which finishing may be effected by the machine shown in Figs. 9 and 10, in which *u* represents a frame, in which is mounted, upon a suitable arbor, the grinding or cutting disk *v*, driven by a belt on pulley 11, the drill being moved upon a die or bed, *g*, past the cutter, which thereby imparts a uniform finish, depth, and configuration to the grooves. After the grooves of the drill-blank are thus perfected its exterior is finished, either before or after it is tempered, by grinding, which may be effected by the machine shown in Fig. 11, in which *w* is the bed, from which rise the standards 3 3, upon or in which is journaled the arbor of the grinding-wheel 2, which may be rotated by a belt upon pulley 4, secured to its arbor.

In the standards *y* the arbor *x* is journaled, which is driven by a belt upon its pulley *z*; and in this arbor one end of drill *j* is centrally secured, while its other end is similarly secured in arbor 6, which is journaled in standards 5, and is provided with a pulley, 7, for its rotation by a belt.

The standards 3 may be formed upon or provided with a supplemental bed moving upon ways both transversely to and in the axial direction of drill *j*, in order that the grinding-wheel 2 may be adjusted toward or away from the drill to insure the requisite diameter thereof, and along the length thereof in order to insure a uniform diameter throughout its length, such movements of the wheel and its supporting-frame being in accordance with the well-known method of grinding cylindrical bodies to a uniform diameter by means of a rapidly-rotating wheel revolving in the same direction as the more slowly-revolving body, whereby their contact-surfaces move in opposite directions, and so insure a free cut and consequent accuracy in the diameter of the body so ground. The drill, after being finished in its grooves, as described, may be tempered as the next stage, and then ground upon its exterior, as described, or it may be so ground upon its exterior and then tempered, as may be preferred, for if tempered last its color will be dull, but if ground last it will of course be bright.

We are aware that it is a common and almost universal practice to form the spiral grooves in twist-drills by subjecting the blanks directly to the actions of mills or cutters, and we of course make no claim to milling merely; and we are also well aware that one of the oldest, and perhaps the oldest, methods of forming twist-drills is to form a ribbon of steel of the desired width and thickness, and when heated to twist the same into a spiral form, to be pointed and tempered to serve as a drill. We are also aware that forging or rolling grooves in metal for various purposes and in various configurations is an old and well-known practice, and hence we do not claim any of the separate means or methods employed by us in manufacturing our drills; nor do we claim any of the machines or devices herein shown, the same being introduced for the more ready explanation of our invention and for the purpose of showing some means for carrying the same into effect.

We claim as our invention—

The herein-described improvement in the art of making twist-drills, the same consisting in first forging, hammering, or swaging the blanks to impart thereto the incipient grooves, then rolling the blanks to more nearly finish and consolidate the same, then twisting the grooved portion of the blank, then milling or grinding the grooves to perfect the same, and then cylindrically grinding and afterward tempering, or tempering and then grinding the drill, as a bright or dull colored finish is required, all substantially as specified.

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ELIAS W. STRANGE.
EMERSON C. STRANGE.

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