No. 651,748.

Patented June 12, 1900.

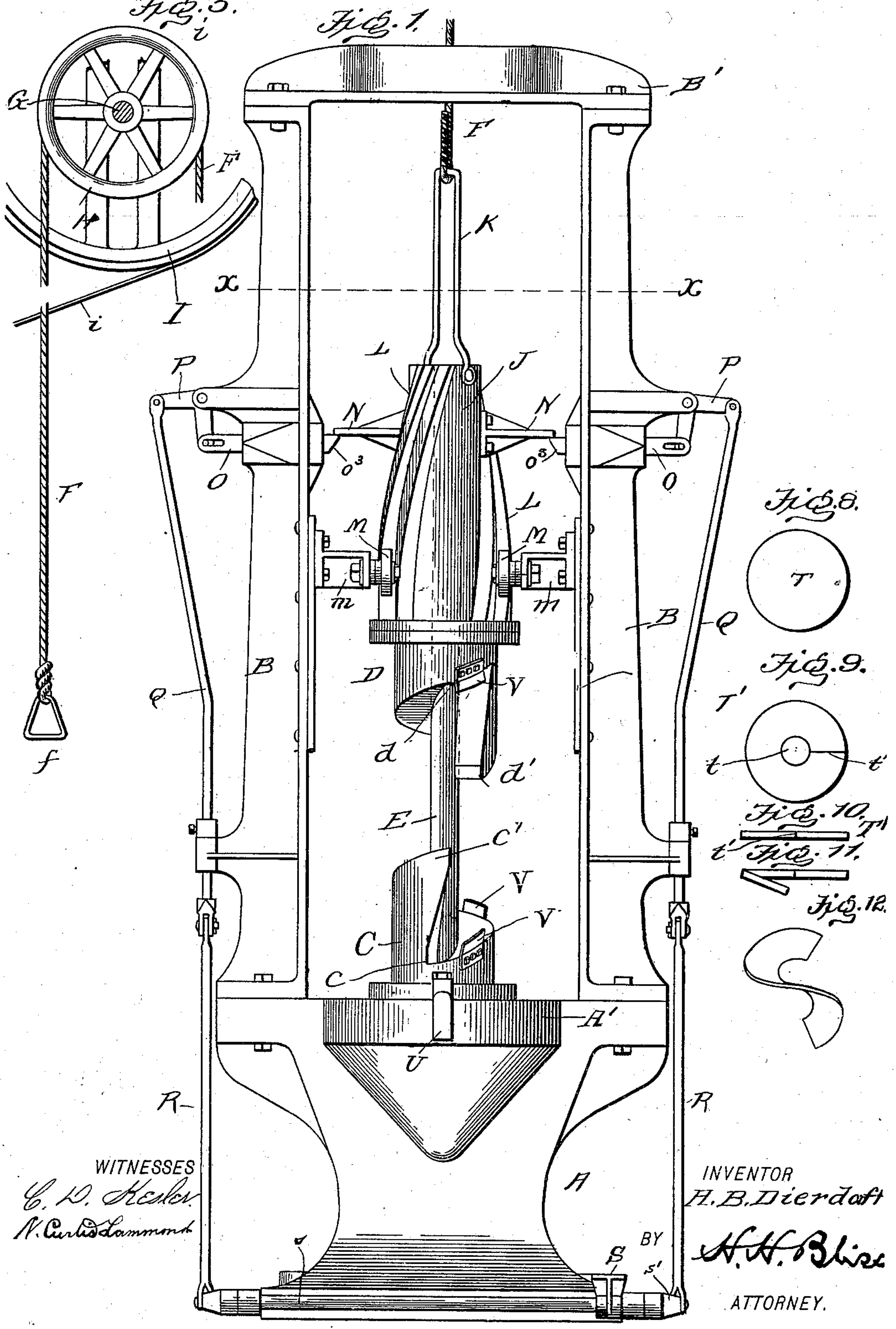
H. B. DIERDORFF.

SPIRAL DIE.

(Application filed Oct. 6, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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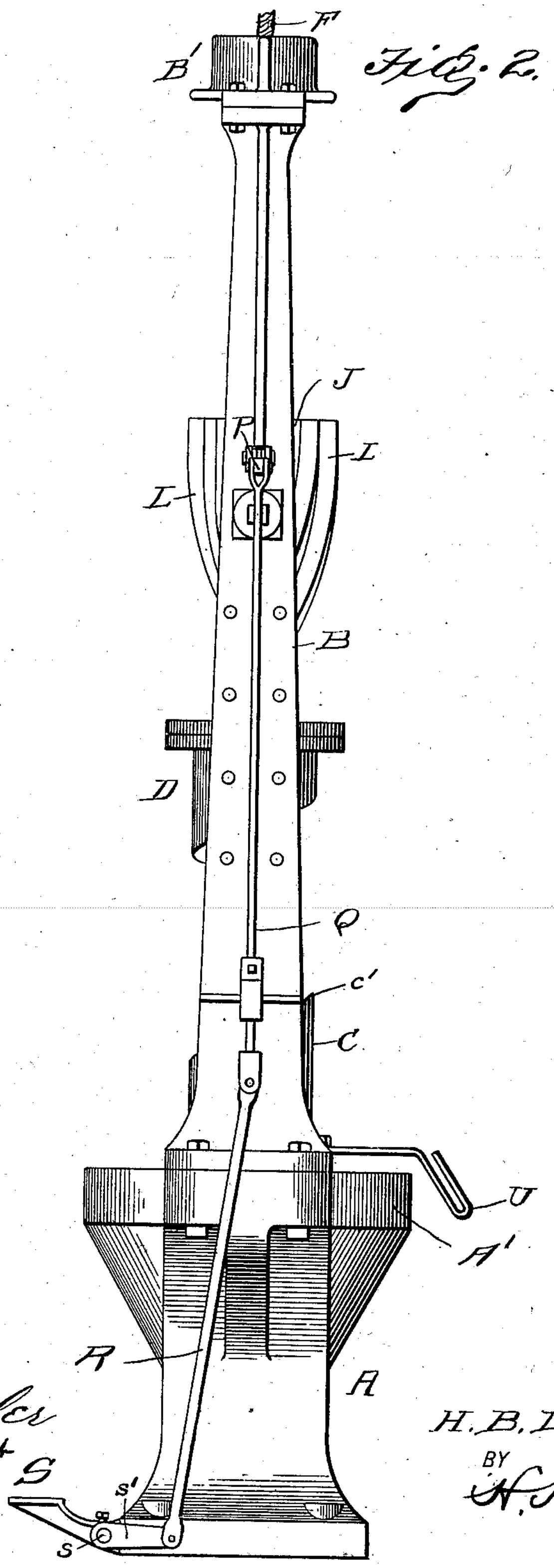
3 Sheets—Sheet 2.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

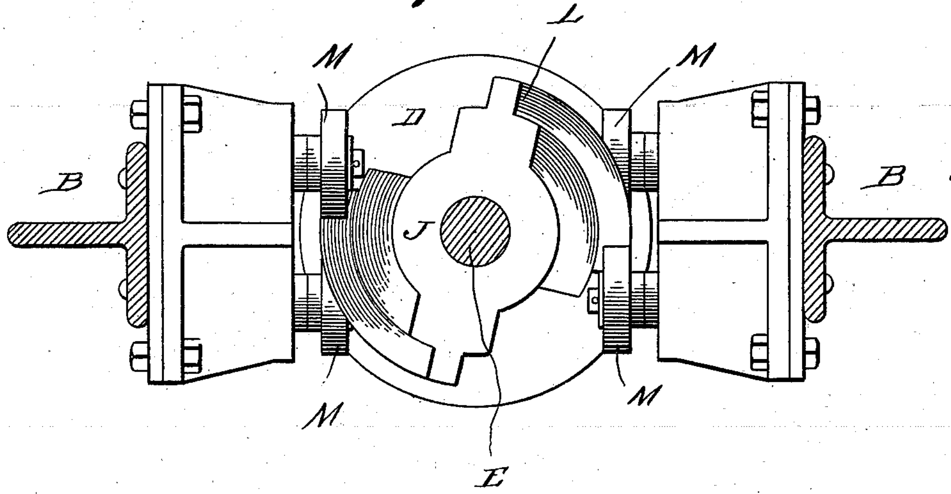


Fig. 5.

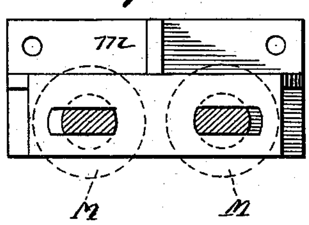


Fig. 6.

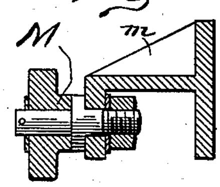
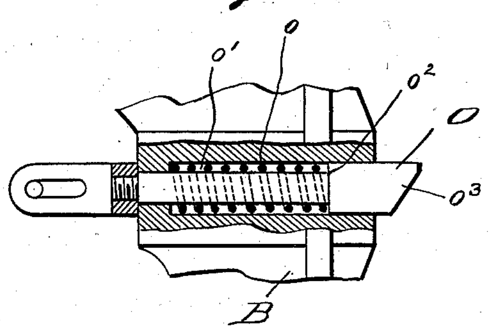


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY B. DIERDORFF, OF COLUMBUS, OHIO, ASSIGNOR TO JOSEPH A. JEFFREY, OF SAME PLACE.

SPIRAL-DIE.

SPECIFICATION forming part of Letters Patent No. 651,748, dated June 12, 1900.

Application filed October 6, 1899. Serial No. 732,819. (No model.)

To all whom it may concern:

Be it known that I, HENRY B. DIERDORFF, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Spiral-Dies, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a front elevation of a swaging or stamping mechanism embodying my improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a detached view of part of the die-lifting device. Fig. 4 is a cross-section on the line x x of Fig. 1. Figs. 5, 6, and 7 show details. Fig. 8 shows the initial sheet-metal blank. Figs. 9, 10, and 11 illustrate the steps followed in shaping the blank before subjecting it to the swaging or stamping machine. Fig. 12 illustrates the blank after it leaves the machine.

In the drawings the operative parts of the mechanism are shown as mounted upon a frame or bed. At the bottom of this frame there is a heavy base A, from which there extend upward the standards B B, and these are joined at the top by the cross-bar B'. The base A is preferably expanded at A' to provide an enlarged horizontal table-like device at the center. Upon this is secured centrally the lower die member or matrix C, and above this is supported movably the upper die member D. The operative faces of these dies are so shaped as to describe or conform to the spiral or helical shape of the article to be produced.

The lower part of the operative face of the lower die or matrix C commences at c and thence extends upward and around the vertical axis in a spiral path until it terminates at the projection or nose c', the total length of the spiral being such that the vertical plane of nose c' is in or a little beyond the vertical plane of the lower extremity c. The upper die D has its operative face similarly shaped, but inverted—that is to say, the extremity at the projection or nose d' is the lowest and the recessed end d is at the highest part. A compound movement is imparted to the upper die—that is to say, a movement one of whose components is a vertical motion and the other of which is a horizontal rotary motion—the resultant being a spiral movement of each point of its operative surface corresponding to the spiral shape to be produced by it upon the sheet metal. It is guided in its vertical movement by means of the guide-rod E, which rises from and is rigidly secured to the base A A', there being a central vertical aperture in the upper die D to receive this guide. It is moved vertically in the construction illustrated by means of a rope or cable F and a power-shaft G. The rope can be connected to the die by any suitable device and extends upward from its connection to a wheel or drum H on the drive-shaft G. This shaft is driven in any suitable way—for instance, by wheel I and belt i—and rotates continuously. The rope F is taken once, twice, or more times around the wheel or drum H, and its end is brought down to a point sufficiently near the bottom of the machine to permit it to be grasped by the operator, it preferably having a handle, such as at f, attached at that end.

The die D, as shown, has a guiding and supporting arm or bar J secured to the upper end of it and projecting therefrom upward to a suitable distance. The rope F can be attached directly to this, though I prefer to interpose a link or yoke K between them to insure flexibility. The upwardly-extending arm or bar J also serves as a means for guiding the die D in its rotating movements. For this purpose it is furnished with one or more helical, inclined, or spiral flanges or splines L, extending from the top to the bottom on spiral lines. M indicates the parts (preferably antifriction-rollers) of the stationary guideway for the spiral flanges or splines L, said rollers or guides M being held by bars m, secured to the upright parts B of the frame or bed. When the die and its carrying-bar J are rising or falling, a rotary movement around the vertical axis is imparted to them by these last-described devices.

The vertically-moving parts above described can be supported when desired as follows:

N are arms or wings extending out from the sides of the bar J.

O O are stops mounted in the upright parts B of the frame and adapted to slip into and out from the path of the arms N. Springs o

in chambers at o', respectively, Fig. 7, bear against the shoulders o^2 of the stops O and normally tend to hold them in operative position. Their inner faces are beveled, as at o^3, and consequently when the parts D and J are rising the arms N will when they impinge upon the beveled faces o^3 push the stop-bars O outward and move up beyond them. As soon as said arms N have reached points above the stops O the springs o immediately thrust the latter to the normal position, and the bars N are prevented from descending and held in this uppermost position; but the operator can when he desires instantly release them by withdrawing the stops O through the following device controlled by his foot.

P P are bell-levers pivoted to the main frame and also pivoted to one of the stops O.

Q Q are links pivoted to the levers P and at their lower ends connected to the pitmen R R. The latter are in turn pivoted to arms s' of the rock-shaft s of the treadle device S, mounted near the bottom of the frame.

T indicates the original blank of sheet metal. From the center of this there is punched or cut out a disk of metal to leave an aperture t, and there is also cut therein the slit at t', the blank after it is cut being indicated by T'. The blanks are then heated, and after heating their edges adjacent to the slit t' are opened, as shown in Fig. 11, to provide a passage-way for the central guide-stem E, so that the blank can be placed upon the spiral surface of the matrix C. As soon as it has been so placed the operator presses his foot upon the treadle at S and then, through the pitman R, the links Q, and the bell-levers P, draws out the stops O, and the die D instantly descends under the action of gravity. It impinges upon the blank T' and presses it to conform to the shape of the surfaces of the dies. The die D as it descends is compelled by the splines L and the rollers or guides M to rotate as well as descend, and the nose or projection d' of the die D is enabled to pass beyond the vertical line of the nose c' of the stationary matrix, and consequently the resulting shape of the sheet metal is such that one end thereof slightly overlaps the other, as shown in Fig. 12. This overlapping permits riveting one section of the spiral to another. At the same time that the operator is thus allowing the die to fall he grasps the rope F or its handle f, and should the metal require one or more supplemental blows they are caused by his exerting slight downward pull on the rope F and then releasing it, as the downward pull increases the friction of the rope upon the revolving drum, and this is instantly translated into an elevation of the die D, and upon his releasing the rope from the strain the die drops. He is enabled in this way to give a large number of rapid blows in a brief period of time. As soon as the sheet metal is seen to be in the proper shape he draws upon the rope F continuously long enough to cause it to lift the parts D and J upward and until the arms N force the stops O and rest upon them, after which the piece of metal that has been shaped is removed and another blank is applied.

At U there is a device for bending the ends of the blanks T' from the shape in Fig. 10 to that in Fig. 11. At V there are retaining or guiding devices secured to the dies to prevent the blanks from escaping from the position in which they should be held while forming.

The die D is detachably secured to its support or carrier J, and similarly the lower die or matrix C is removably secured to the base or bed of the frame. Each mechanism is provided with a series of two or more pairs of dies of different diameters to correspond with the different sizes of spiral-blanks that are to be formed therewith.

By having the guide parts L and M external to the die and to its support or carrier I can cause it to be rotated with a greater leverage and more power than if the spiral guide were in the interior of the die or holder. With the parts arranged as shown the central guide E may be a simple cylindrical rod or stem fitted into an easily-bored socket in the die C and corresponding passage-way bored in the die D and its holder J.

Of course it will be understood that there can be modifications in several respects without departing from the essential features of the mechanism. The guiding parts can be inverted, the rollers or equivalents being put upon the die or holder, and the feathers or splines or equivalent grooves can be provided on the frame.

What I claim is—

1. In a machine for forming sheet-metal spirals, a pair of dies each having a spiral operative face, and of which one is movable longitudinally toward and from the other, and also movable around its longitudinal axis, substantially as set forth.

2. In a machine for forming spiral sections of sheet metal, a pair of dies, formed with spirally-shaped operative faces, and one of which is movable toward and from the other, and one of which is rotatable around their common axis, substantially as set forth.

3. In a machine for forming sheet-metal spirals, a die having a spiral face extending around a central axis, and of a length greater than one complete turn of the spiral around said axis, combined with an opposing die and means for reciprocating and turning one of said dies, substantially as set forth.

4. In a machine for swaging or pressing sheet-metal spirals, two dies each having an operative spiral face opposed to a similar spiral face upon the other, and each of said operative spiral faces being longer than one complete spiral turn around the axis, substantially as set forth.

5. In a machine for forming sheet-metal spirals, a die having an operative spiral face, an opposing die also having an operative spi-

ral face, and a guide or stop to prevent the outward escaping of the blanks from said spiral face, substantially as set forth.

6. The combination, with a die having a spiral operative face, of an opposing die having a spiral operative face, means for moving one of said dies toward and from the other, means for turning one of said dies, and a friction-controlled connecting device for throwing the die mechanism into and out of operation, substantially as set forth.

7. In a machine for forming spiral metal sheets, a pair of dies, each having a spiral operative face, and of which one is movable toward and from the other, in combination with an interior guide for said die situated at its axis, and an exterior rotation-causing guide engaging therewith, substantially as set forth.

8. In a machine for shaping sheet metal a rotating and longitudinally-moving die, in combination with a spirally-arranged guide engaging with the die and situated outside thereof, substantially as set forth.

9. In a machine for shaping sheet metal a rotating and longitudinally-moving die, a spirally-arranged guide feather or spline connected to the die and external thereof and a stationary guideway engaging with said guide, substantially as set forth.

10. In a machine for shaping sheet metal, a rotating and longitudinally-moving die, and a similarly-moving die-support, to which the die is detachably secured, a spirally-arranged guide feather or spline externally connected to the die-support, and a positively-acting stop for the die-support to prevent its downward movement, substantially as set forth.

11. In a machine for shaping sheet metal the combination of a lower die or matrix, an upper rotating and longitudinally-moving die, a similarly-moving support for the die, a centrally-arranged guide for the movable die, an externally-arranged spiral guide for the movable die, and a positive stop for holding the movable die against movement, substantially as set forth.

12. The combination of the frame, the die or matrix C removably fastened to the frame, the guide E at the center of said die, the rotating and longitudinally-moving die D, the support J for the die D detachably connected thereto, and fitted to the said guide E, the external spirally-arranged guide, and the friction-controlled mechanism for moving the die E, substantially as set forth.

13. The combination of a die having a spiral operative face, an opposing die having a spiral operative face, means for moving one of said dies longitudinally, and means for turning one of said dies around a longitudinal axis, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY B. DIERDORFF.

Witnesses:
A. D. SHAW,
F. E. COLTON.