(No Model.)

H. H. WARREN.

APPARATUS FOR FORMING SPIRALS.

No. 446,042. Patented Feb. 10, 1891.

Fig. 1.

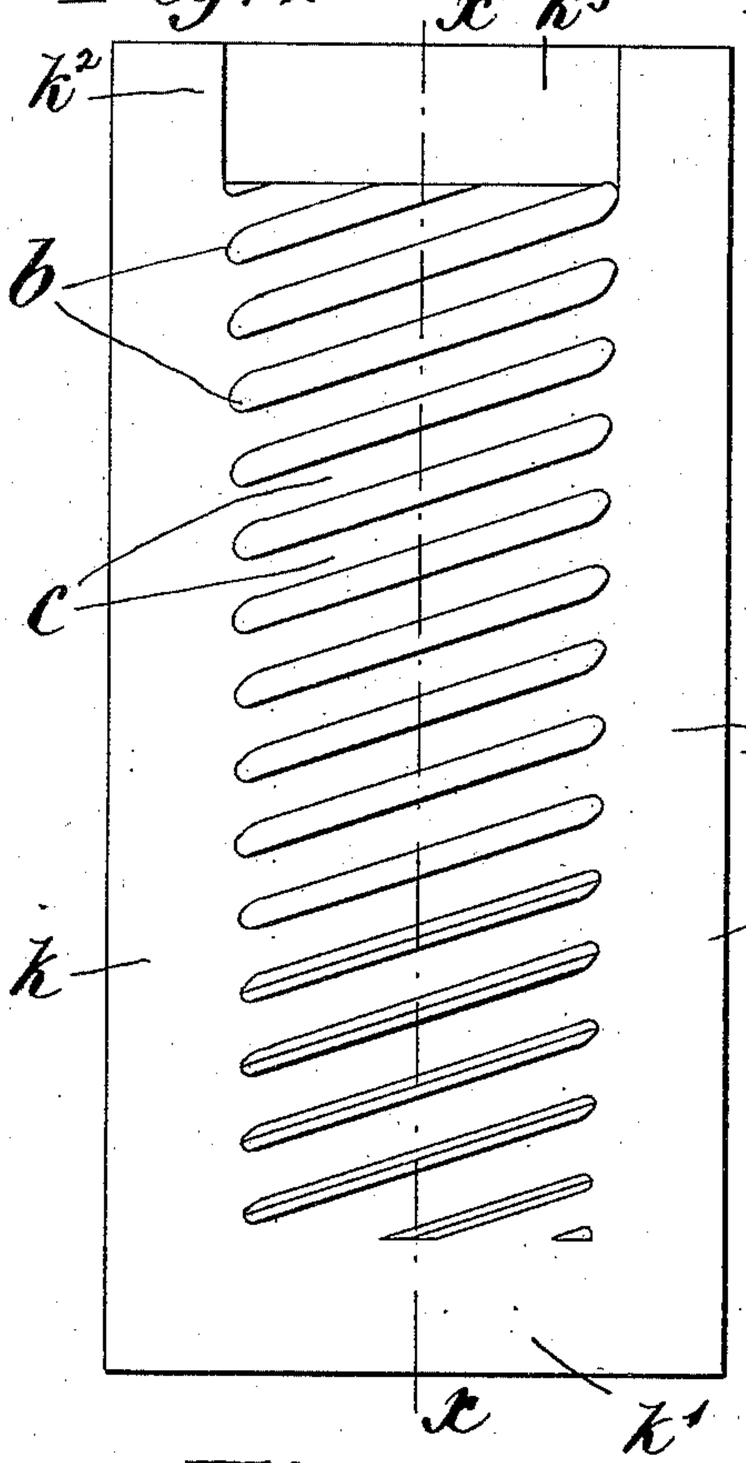


Fig. 2.

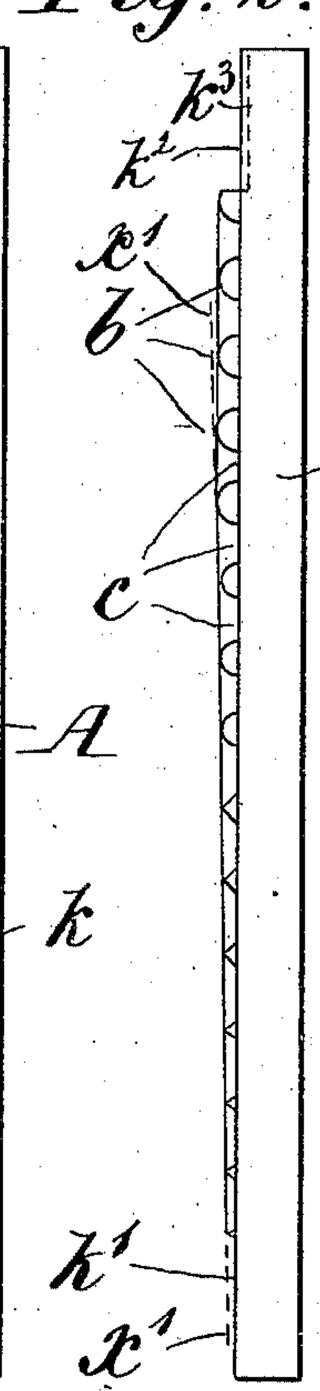


Fig. 3.

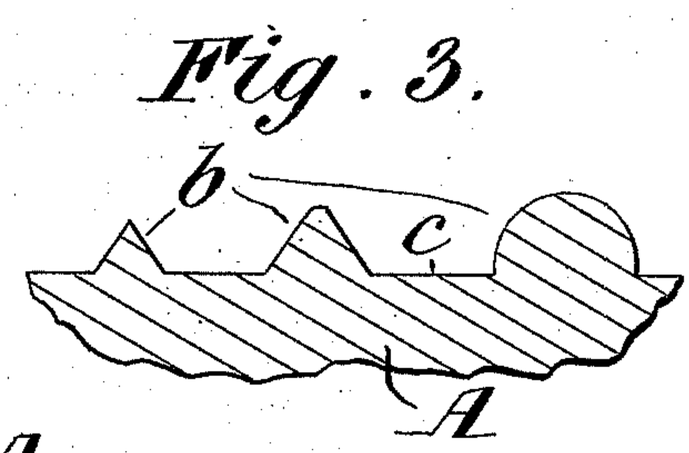


Fig. 4.

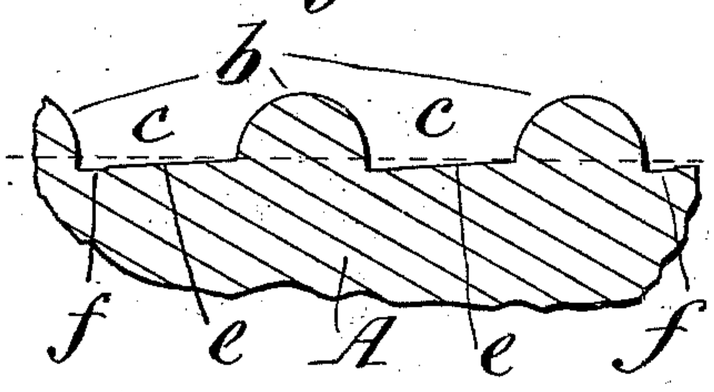


Fig. 5.

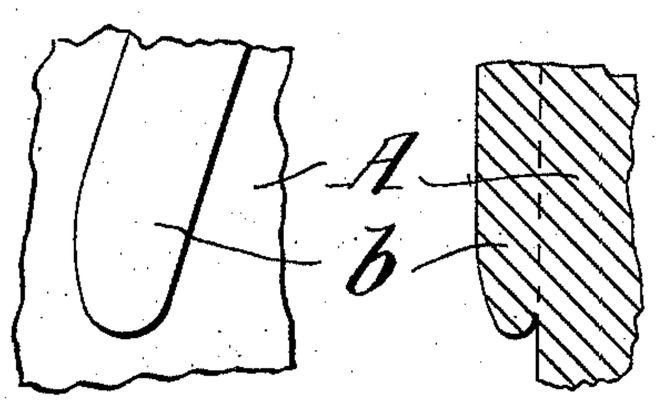
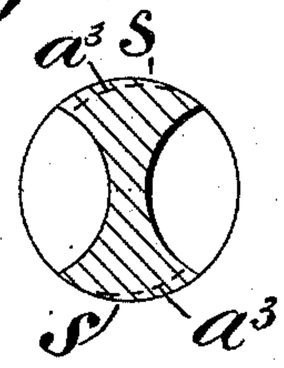


Fig. 6.



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APPARATUS FOR FORMING SPIRALS.

SPECIFICATION forming part of Letters Patent No. 446,042, dated February 10, 1891.

Application filed October 10, 1890. Serial No. 367,735. (No model.)

To all whom it may concern:

Be it known that I, HENRY HARRISON WARREN, a citizen of the United States, residing at Massena, in the county of St. Lawrence and State of New York, have invented new and useful Improvements in Apparatus for Forming Spirals; and I do hereby declare that the following is a full, clear, and exact description of the same.

The present invention has reference to further improvements in the inventions for which Letters Patent of the United States were granted May 15, A. D. 1888, and No. 382,710, also May 20, 1890, No. 428,498, to adapt the apparatus to a more suitable form for the purposes therein set forth, and to enable the apparatus to form the spirals to such configuration that they will only require to be ground or polished to such an extent as to impart to them the required finish, and thus save the amount of grinding which, particularly in the case of twist-drills, is required to bring them to the desired configuration.

In the drawings hereunto annexed similar letters of reference indicate like parts.

Figure 1 is a plan of the improved apparatus. Fig. 2 is a side elevation of the apparatus shown in Fig. 1. Fig. 3 is a section at line $x\,x$, Fig. 1, showing the forms of the projections b. Fig. 4 is a section at line $x\,x$, showing the configuration of the spaces c between the ridges b, which enables the dies to form the spiral to the exact configuration required. Fig. 5 is a plan and side elevation of the termination of the ridges b to enable the said ridges to form the ends of the grooves in the spirals to a suitable configuration. Fig. 6 is a cross-section of a spiral formed by dies A, showing the effect of the configuration of the spaces c upon such spirals.

Letters A are swaging and rolling dies, which are used in pairs to operate substantially in the same manner as described in the aforesaid patents.

In the present case the dies A are provided with parallel ridges b of any desired distance of centers or pitch, which may in certain cases be an increasing pitch for the first portion of the operating or swaging ridges b to the finishing or last-acting portion of ridges of the dies. The ridges b are of but slightly-increasing length, as shown, and are preferably made with various configurations. In the first one-third part (or thereabout) of the length of that part of the dies A that is provided with ridges b, they are of V shape, as shown on an enlarged scale in Fig. 5 to the left, and not only do they increase in height as they approach the second one-third part of the length of the dies A, as indicated by the line $x'\,x'$, that is provided with ridges, but also decrease in acuteness. In the second third part of the length of the dies A that is provided with ridges b these said ridges continue regularly to increase in height and to decrease in acuteness, and are preferably made of V shape, with the vertex of the angle of the V rounded off, as shown in the center part of Fig. 5. In the remaining or finishing one-third portion of the ridges they are preferably of equal height and approximately of semi-cylindrical configuration, as shown to the right in Fig. 5.

The object of forming the first part of the dies with ridges b of V form is to give the ridges greater penetrating power; otherwise they may be made of semi-cylindrical form throughout, increasing in height and size for a given portion of the length of the dies, and of equal size for the remainder for the purpose of imparting to the body formed into a spiral a better finish than would be imparted by dies having a continuously-increasing size of ridges throughout all the ridges.

The next important part of the invention consists in the configuration of the spaces c between the ridges b. Heretofore the spirals that have been formed by swaging and rolling dies have been made to the configuration shown in section in Fig. 6 by solid lines, after which an amount of "clearance" has been provided to the back of the ridges s by grinding off the portions excluded by the dotted lines $a^3\,a^3$. Instead of providing the dies A with a perfectly flat and level surface parallel with the line of action of the dies A, the spaces c are inclined slightly, as shown by the solid lines in Fig. 4. The dotted line $y\,y$ represents the plane of the dies as heretofore constructed.

The inclines e preferably terminate in a more or less abrupt enlargement f, so that in the process of rolling the spirals with dies A constructed as above described the desired

clearance is imparted to them without the grinding heretofore required for that purpose, and by this means a somewhat larger spiral may be formed out of the same amount of material.

In the present case the dies A are provided with the side margins *k*, as heretofore, and preferably in addition thereto with end margins *k' k²*. When the margin *k²* is provided, it will be provided with a suitable depression *k³* to prevent it from injuring the clearance that has been imparted to the spiral.

The ends of the ridges *b* are configurated, as shown in Fig. 5, to impart to the ends of the grooves formed in the spirals such configuration as may be desired.

The length of the ridges *b* may be made such as is required to form a spiral that may afterward or at the same time as desired be divided in an ordinary manner into two spirals.

What I claim is as follows:

1. In dies for rolling and swaging spirals, the combination of a pair of dies moving in parallel or approximately parallel planes, each of which is provided with parallel ridges *b* of increasing height and size, configurated as described, the whole substantially as set forth.

2. In dies for rolling and swaging spirals, the combination of the dies A A, provided with ridges *b* and arranged to act together, substantially as described, for rolling and swaging spirals, with the spaces intervening between said ridges provided with inclined surfaces, substantially as described.

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