Aug. 10, 1937. I. S. RIPLEY 2,089,619

FILE AND METHOD OF MAKING THE SAME

Filed Nov. 27, 1935 2 Sheets-Sheet 1

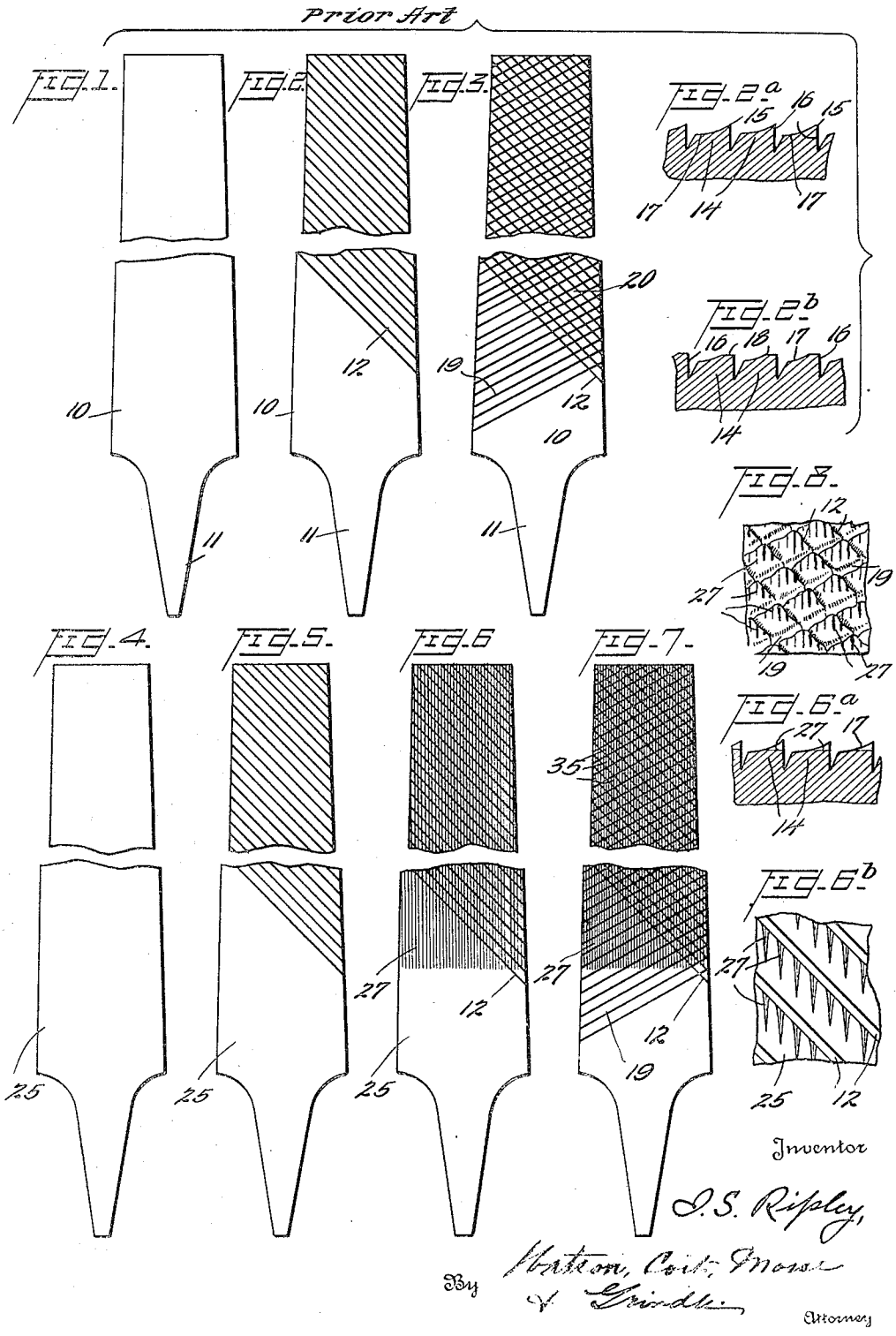

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FIG. 9.

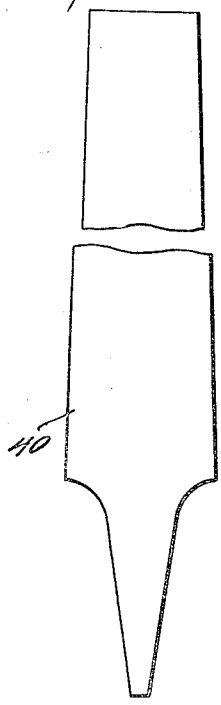


FIG. 10.

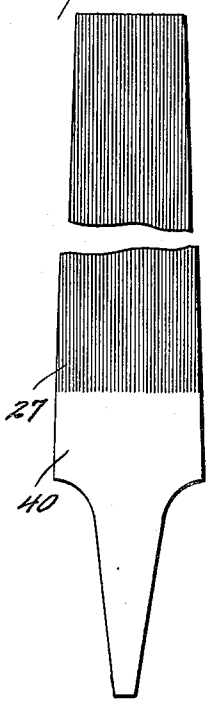


FIG. 11.

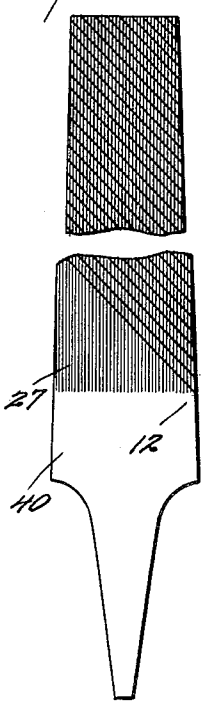


FIG. 12.

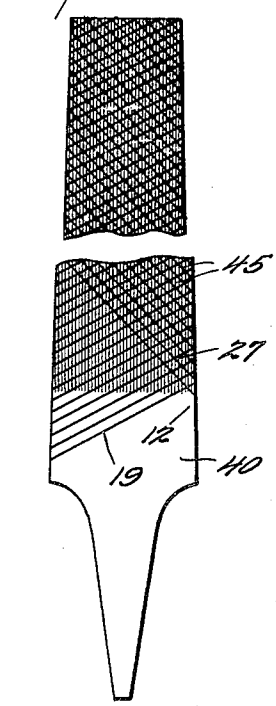


FIG. 13.

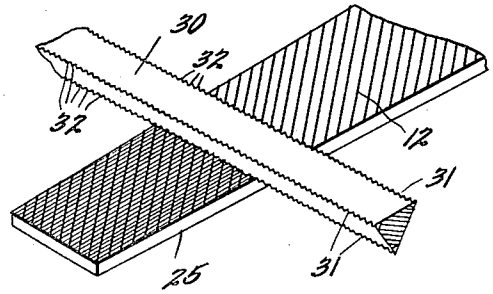
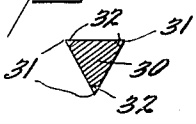


FIG. 14.



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2,089,619

FILE AND METHOD OF MAKING THE SAME

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Application November 27, 1935, Serial No. 51,960

13 Claims. (Cl. 76—24)

This invention relates to files and more especially to double-cut files and methods of making them.

The general object of the invention is to provide novel and improved files of this and similar types and also to provide new methods of file manufacture whereby such files may be easily and economically produced either by hand or by the employment of suitable machinery.

A more particular object of the invention is the provision in a double-cut file of teeth of novel configuration which render the file more efficient in operation and more adaptable in its utilization in connection with shaping various kinds of material.

More specifically, it may be stated that files embodying the principles of the present invention will remove more material per stroke at a given applied pressure than the ordinary file of the same degree of coarseness, and will at the same time afford a better frictional contact or grip on the metal or other material being filed, thus obviating the tendency of the file to "run" or slip laterally. These features are especially noticeable in working on bronze, brass, and other so-called "greasy" metals and are also in evidence in cutting and shaping cast iron, tool steel and other materials.

A further object of the invention is to provide a file of novel construction which will remove the material from the work in the form of shreds instead of chips as in the case of an ordinary file of the present standard manufacture. Such shreds do not fill up nor clog the throats between the teeth as rapidly as do the chips removed by means of the conventional double-cut files.

In all of its preferred embodiments, my invention contemplates the provision, in the approximately diamond-shaped or lozenge-shaped teeth of the double-cut files, of relatively slight grooves or scorings extending in the general direction of the axes of the files. These scorings or flutings appear plainly upon the backs of the teeth and also modify the effects of the over-cut and up-cut so as to produce entirely new and improved types of cutting edges. These scorings may be applied to the file blank at different stages in the manufacture of the files as will be fully disclosed as the description proceeds.

Other objects and features of novelty, both with respect to the novel files and to their methods of manufacture, will be apparent from the following specification when read in connection with the accompanying drawings in which certain embodiments of the present invention are illustrated by way of example.

In the drawings:

Figures 1–3 inclusive illustrate in various ways certain steps in the manufacture of a double-cut file in accordance with present practices; Figure 1 showing in plan a file blank which may be considered to have been ground and draw-filed preparatory to cutting the teeth; Figure 2 a plan view of the blank, showing diagrammatically the appearance of the file after over-cutting; Figure 2A a greatly enlarged fragmentary sectional view of one surface of the file taken on a line at right angles with the over-cut; Figure 2B a similar view indicating the general appearance of the file surface after stripping the over-cut; and Figure 3 showing somewhat diagrammatically the appearance of the file in plan after the superposition of the up-cut upon the over-cut;

Figures 4–7 inclusive similarly illustrate various stages of the manufacture of a double-cut file in accordance with one embodiment of the present invention; Figure 4 being a plan view of the ground and draw-filed blank similar to Figure 1; Figure 5 being a plan view of the blank having the over-cut applied thereto as in Figure 2; Figure 6 a diagrammatic plan view of the over-cut blank with the scorings or grooves superposed thereon; Figure 6A a fragmentary greatly enlarged sectional view of the file surface as indicated in Figure 6, taken on a line at right angles to the direction of the over-cut; Figure 6B a plan view on the same scale of a portion of the file blank indicating the appearance of the surface of the file after the application of the grooves or scorings to the over-cut somewhat more accurately than the diagrammatic showing in Figure 6; Figure 7 a diagrammatic plan view on the same scale as Figure 6, showing the finished file after the up-cut has been applied to the scored over-cut surface; and Figure 8 is a somewhat diagrammatic plan view on an enlarged scale of a portion of a completed file such as shown in Figure 7;

Figures 9–12 inclusive are views similar to those in the preceding descriptions illustrating another embodiment of the present invention; Figure 9 being a plan view of the uncut blank as in Figures 1 and 4; Figure 10 a diagrammatic plan view showing the blank scored or grooved; Figure 11 a similar diagrammatic view showing the scored blank with the over-cut applied thereto; and Figure 12 a diagrammatic plan view of the finished file with both the over-cut and the up-cut applied to the previously scored blank;

Figure 13 is a view in perspective illustrating

the operation of scoring or grooving the file blanks; and

Figure 14 is a view in transverse section of the scoring tool shown in Figure 13.

In order to particularly point out the present invention and to distinguish it from the ordinary double-cut files and the conventional methods employed in their manufacture, a short exposition of the prior art will be set forth in connection with the first few figures designated with the legends "Prior art" in the drawings annexed hereto. Ordinarily, the blanks from which the files are made are sheared from the metal sheets or bars and are then forged and finally carefully and uniformly annealed. Then the surfaces of the annealed blanks are ground. After this, the blanks are finished by means of draw-filing in order to remove any unevenness left on the surface of the file by the grindstone. In Figure 1 the reference numeral 10 indicates generally the plain file blank at this stage of the process of manufacture, the blank being provided with the usual tang 11. The draw-filing process may be done either by hand or by suitable machinery which automatically reciprocates a file of the proper construction longitudinally of the blank. After this operation, the over-cut is applied as indicated at 12 in Figure 2 of the drawings, usually by means of a broad chisel of special configuration. This over-cutting operation produces the preliminary ridges or teeth 14 of the file blank each having a sharp edge or burr 15, a front surface or rake 16 and back or clearance 17, as shown in the enlarged fragmentary view of Figure 2A. In the usual method of manufacture, the next step is stripping the over-cut, which is accomplished by reciprocating a file across the surface of the blank in the same way as in the initial draw-filing. This serves to remove the sharp edges or burrs 15 of the teeth as shown at 18 in Figure 2B of the drawings. Then the up-cut is applied to the blank as indicated at 19 in Figure 3 of the drawings. This operation serves to break up the long ridges 14 comprising the initial teeth of the file into intersecting series of small substantially diamond-shaped teeth or scallops having converging cutting edges, as shown at 20 in Figure 3. It will be noted that the angle the up-cut makes with the axis of the file is considerably smaller than that of the over-cut.

With this résumé of the prior art, the description of my improved files and their methods of manufacture will be readily understood. One of the most efficient embodiments of the invention is illustrated in various stages of manufacture in Figures 4–7 inclusive of the drawings. Figure 4 illustrates a blank 25 in the same state as Figure 1 after it has been ground and draw-filed. In Figure 5 the blank 25 is represented as having applied thereto the over-cut 12 and corresponds exactly to the stage represented in Figures 2 and 2A illustrating the prior art.

At this point, instead of stripping or again draw-filing the blank as shown in Figure 2B of the prior art disclosure, the sharp edges 15 of the preliminary teeth 14 are permitted to remain. Then the file blanks 25 having the over-cut 12 thereon are scored along a multiplicity of parallel lines extending generally in the same direction as the axis of the file. These lines are preferably parallel and the spacing therebetween may vary within rather wide limits, but the striations or grooves should preferably be close enough together so that several of them take effect on each of the subsequently formed scallops or double-cut teeth. The depth of these grooves 27 is readily appreciable with the naked eye and should not be confused with the minute scratches which are sometimes left in the file blank after the draw-filing operation. While the depth of the grooves may vary, for many purposes they may be approximately one-third of the height of the over-cut teeth.

These scorings may be applied to the file blank in any suitable or convenient way, either by hand or mechanically. Preferably the grooves are formed in the blank by means of a tool such as the one illustrated at 30 in Figures 13 and 14 which is of triangular cross-section having the three cutting edges 31 each provided with a series of triangular teeth or serrations 32 corresponding to the shape and spacing of the grooves desired on the file. In order to attain uniformity a preferred manner of execution of this step in the process is to place the file blanks upon the bed of a machine similar to those employed in draw-filing the blanks and securing the tool 30 upon a reciprocating carrier similar to that used in the draw-filing operation. The tool is drawn back and forth across the surface of the file until the scoring 27 is of the proper depth, in most cases this depth being, as already indicated, less than that of the over-cut or the up-cut which determines the height of the teeth.

Other possible ways of cutting the grooves will suggest themselves to those skilled in the art, and may include the use of straight or circular knurling tools, a special presser foot attached to the cutting machine, an artificial abrasive tool, or an artificial abrasive grooved wheel, or in fact by the use of any type of machine which employs a reciprocating tool or work carrier.

An approximation of the actual appearance of the cutting surfaces of the file shown diagrammatically in Figure 6 is presented in Figures 6A and 6B. In Figure 6A the grooves 27 appear in the tops of the single-cut teeth 14 and also pass through the front face or rake of each tooth. The scorings or grooves 27 extend along the backs or clearances 17 of each tooth for a distance which depends upon the depth of cut of the grooves. It must be realized that the teeth as actually formed by this operation will not be so geometrically perfect as suggested by the illustration in Figure 6A, but during the scoring process not only will some of the metal be cut away from the teeth, but other portions of the surface will be distorted and caused to flow and burrs will be formed adjacent the edges of the grooves 27. A fragmentary plan view of the preliminary roughened teeth formed by the over-cut 12 and the superposed grooves 27 is shown in Figure 6B, which is also in somewhat diagrammatic form.

The next operation comprises applying the up-cut 19 to the file blank. This serves to break up the elongated, serrated single-cut teeth 14 into a multiplicity of intersecting series of teeth or scallops 35 which have in general outline the typical configuration of the scallops 20 of the conventional file of the same grade. However, as will be clearly seen from the enlarged view shown in Figure 8, each of these teeth is longitudinally striated, the cutting edges are serrated and their backs scored by the lines which remain from the cutting of the grooves 27 after the application of the up-cut 19. Naturally the up-cut 19 causes the metal of each tooth formed to flow together somewhat and has the effect of not only closing or partially obliterating portions of the

over-cut, but also altering the regularity of the scorings or grooves **27**.

It will be noted that the actual appearances of the teeth as shown in Figure 8 are quite different from the regular, unbroken scallops formed by the conventional methods, and that this difference is reflected in greater efficiency, accuracy, and economy in the utilization of the new file. The spacing of the grooves **27** in most cases is different from the transverse spacing of the intersections between the over-cut and the up-cut so that the actual shape of the finished teeth in successive rows along the file differs considerably. Some teeth will be intersected at their apexes by one of the scorings **27** while others will be provided with score lines upon the tapering side edges thereof, the cutting points remaining as narrow, chisel-like edges.

Another embodiment of the invention is illustrated in Figures 9–12 of the drawings and shows the effect of applying the striations or scorings prior to both the over-cutting and up-cutting of the blanks. As before, the blank designated **40** in Figure 9 of the drawings has been ground and draw-filed preparatory to cutting. In Figure 10 the blank **40** has been scored as at **27** directly after it has been smoothed by the draw-filing operation. In Figure 11 the over-cut **12** has been applied over the scorings **27** and finally, as shown in Figure 12, the up-cut **19** has been applied. The teeth **45** in this figure are of similar general outlines to those shown at **35** in Figure 7 but are somewhat more sharply defined along the right-hand edges due to the over-cut having been applied after the scoring. The file produced by serrating the blank first, then over-cutting and up-cutting is equally as effective as the one produced by serrating after the over-cut and prior to the up-cut.

For certain other purposes, it may be desired to apply the scoring to the file after both the over-cut and up-cut have been applied and this method and resulting article comprise still another embodiment of the present invention.

From these disclosures, it will be realized that by means of the present invention there have been provided novel and improved files and methods of producing them which attain the stated objects in an efficient and economical manner; the principles of the invention being applicable to double-cut files of various degrees of fineness.

It is understood that various changes and modifications may be made in the embodiments illustrated and described herein without departing from the scope of my invention as defined by the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. The method of making a double-cut file, which includes in combination with the teeth-cutting steps, the step which comprises forming in the metal of the working surface of the file a series of shallow grooves, said grooves extending substantially in the direction of the longitudinal axis of the file and being of less depth than the height of the teeth whereby the resulting conventional double-cut teeth are serrated.

2. The method of making a double-cut file, which includes in combination with the application of the over-cut and the up-cut, the step which comprises forming in the working face of the file a series of narrow, shallow, closely adjacent scorings extending at an angle to both the over-cut and the up-cut, and of less depth than either of said over-cut or up-cut.

3. The method of making a double-cut file, which includes in combination with the application of the over-cut and the up-cut, the step which comprises forming in the working face of the file a series of narrow, shallow, substantially parallel, closely adjacent scorings extending at an angle to both the over-cut and the up-cut, and of a depth of the order of magnitude of approximately one-third of the depth of the over-cut.

4. The method of making a double-cut file, which comprises the steps of scoring the blank along a plurality of spaced lines extending substantially in the general direction of the axis of the blank, then applying the over-cut, and then applying the up-cut, the scorings being of less depth than either the over-cut or the up-cut.

5. The method of making a double-cut file, which comprises the steps of applying the over-cut to the blank, scoring the blank along a series of spaced lines extending in the same general direction as the axis of the blank, and then applying the up-cut, the scorings being of less depth than either the over-cut or the up-cut.

6. The method of making a double-cut file, which comprises the steps of applying the over-cut to the blank, scoring the blank along parallel, closely spaced lines extending in the same general direction as the axis of the blank, and then applying the up-cut, the scorings being of less depth than either the over-cut or the up-cut.

7. The method of making a double-cut file, which comprises the steps of applying the over-cut to the blank to form a series of temporary teeth of the single-cut type, then serrating the edges of said temporary teeth, and then dividing the serrated teeth thus formed into series of jagged double-cut teeth by applying the up-cut, the serrations being of less depth than said over-cut or up-cut.

8. The method of making a double-cut file, which comprises the steps of applying the over-cut to the blank to form a series of temporary teeth of the single-cut type, then applying to the forward edges and backs of said temporary teeth serrations of a depth less than the depth of said over-cut, and then dividing the serrated teeth thus formed into series of jagged double-cut teeth by applying the up-cut.

9. The method of making a double-cut file, which comprises the steps of applying the over-cut to the blank, then applying the up-cut thereto, and then scoring the file along a series of closely spaced, substantially parallel lines extending in the same general direction as the axis of the blank, the scorings being of less depth than either the over-cut or the up-cut.

10. A double-cut file having upon its working face a plurality of intersecting series of raised scallops forming the substantially lozenge-shaped teeth of the conventional double-cut type, there being a plurality of generally longitudinally extending scorings on the working face of said file, the spacing of the scorings being without regard to the spacing of the intersections of the lines of over-cut and up-cut of said file, whereby the teeth of the file are non-uniformly serrated.

11. A double-cut file comprising teeth having the conventional, forwardly convergent cutting edges thereon, there being a plurality of spaced scorings on said file, said scorings being of less depth than either the up-cut or the over-cut of the file, and the direction of said scorings being

at an angle to both the over-cut and the up-cut, whereby both of the convergent cutting edges of said teeth are provided with serrations.

12. A file of the type described having intersecting series of substantially pointed teeth on its working surface, there being serrations on the cutting edges and backs of said teeth, said serrations being of less depth than the height of said teeth.

13. A double-cut file having upon its working face a plurality of intersecting series of raised scallops forming the substantially lozenge-shaped teeth of the conventional double-cut type, the cutting portions of said teeth being serrated, the serrations extending in the general direction of the length of the file.

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