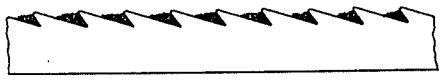
S. WHYTE.

PROCESS OF RESHARPENING FILES.

APPLICATION FILED APR. 16, 1919.

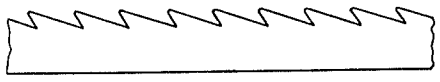
1,314,450. Patented Aug. 26, 1919.

Fig. 1.



1 CLEAN WITH NITRIC ACID
2 WASHING WITH WATER

Fig. 2.



3 CHALKING

Fig. 3.



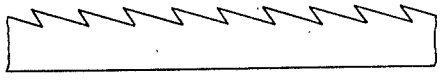
4 DIP INTO COPPER SULFATE SOLUTION
5 (OPTIONAL) DIP INTO MERCUROUS NITRATE SOLUTION

Fig. 4.



6 ETCH IN STRONG HCl AT 60° C (OR STRONG HNO_3 OR $HNO_3+HCl+H_2O$) OR ETCH IN 10% HCl OR HNO_3 USING ELECTROLYTIC CURRENT, WITH FILE PLACED AS ANODE.
7 WASH WITH LIME WATER

Fig. 5.



WITNESSES

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PROCESS OF RESHARPENING FILES.

1,314,450. Specification of Letters Patent. Patented Aug. 26, 1919.

Application filed April 16, 1919. Serial No. 290,576.

To all whom it may concern:

Be it known that I, SAMUEL WHYTE, B. Sc., a subject of the King of Great Britain and Ireland, and residing at "Shirley", Earlswood Road, Redhill, in the county of Surrey, England, have invented certain new and useful Improvements Relating to Processes of Resharpening Files, of which the following is a specification.

This invention relates to the renewing of the cutting edges of files or other appliances having similar multiple cutting edges, by etching.

It has been proposed to renew the cutting edges of files and the like by treatment with sulfuric acid followed with nitric acid and also to employ mixtures of sulfuric and nitric acids.

It has also been proposed to employ an electrolytic current to aid the etching with such acid mixtures, and in some cases to protect the edges or crests of the teeth by the use of Brunswick black, or other resistant varnish.

The object of the present invention is to enable substantially improved results to be obtained industrially.

The invention consists in selectively etching files and the like for renovation, by protecting the crests of the teeth by a metallic deposit before etching.

The invention further consists in protecting the crests of the teeth and then selectively etching by acid solutions assisted by electrolysis preferably at ordinary temperature.

The invention further consists in dipping the files in an acid bath containing nitric acid for cleaning, then after washing and chalking, dipping them into a metal depositing bath say, for example, a bath containing a copper salt, thus depositing a film of metal on the upper teeth edges, and finally etching them in a bath of strong hydrochloric acid.

In carrying this invention into effect by way of example, I first dip the files in a bath of dilute nitric acid for a very short time, say one to two minutes, to clean the surfaces thoroughly and remove any clogging material. I then wash them in water and rub in chalk or other inactive material to fill up the grooves. I then dip them in a bath of copper sulfate to deposit a thin film of copper on the upper teeth edges. I again wash in water, and after removing the chalk or the like I finally immerse them in a bath of strong hydrochloric acid at about 80° C. At this temperature the grooves will be etched sufficiently to undercut the copper and reproduce the required sharp edges in about seven to eight minutes, the electrolytic couple formed by the copper and steel producing a relatively quicker chemical action in the immediate vicinity of the copper and so helping to reproduce the original contour of the teeth.

It is found that under the above conditions there is a slight chemical action on the copper also and if it be desired to prolong the deepening of the grooves, mercury, which is not attacked by the HCl under the above conditions, may be used on the copper edges in contact with the acid. A coating of mercury can be rapidly produced by dipping the coppered file in a dilute solution of mercurous nitrate.

Instead of using strong hydrochloric acid, I may employ to finish the files a bath of about equal parts of hydrochloric acid, nitric acid and water, or I may use a more dilute solution of HNO_3 alone (about 1 part HNO_3 to 3 parts H_2O), but this is less satisfactory.

Instead of strong acid solutions as described, very dilute solutions of hydrochloric or nitric acid, or mixtures thereof, may be used (say 10%), the files being made the positive poles of a battery of low voltage. Negative poles may be iron rods. In this case mercury is employed on the upper edges of the teeth, as above indicated.

I employ suitable frames into which the files are inserted and held for dipping into the vats, and arrange for the mechanical lowering of the files into the respective vats. I also prefer to provide for circulation of the etching and washing fluids.

The final washing is preferably effected in an alkaline water, say lime water.

The accompanying drawing illustrates the various stages of the process, as herein described. In said drawing the figures illustrate, on an enlarged scale, the condition of the file and its teeth at the different stages. Figure 1 shows the old worn file, the ends of the teeth being more or less rounded off and the spaces between the teeth being largely filled up with iron filings, grease and the like. The first step of the process is

cleaning with nitric acid, followed by the second step, namely, washing with water. These two operations remove the filings and dirt between the teeth, leaving the clean file as shown in Fig. 2. The third step of the process, namely, chalking, leaves the file with the appearance shown in Fig. 3, namely, with the spaces between the teeth substantially filled with a deposit of chalk. The fourth step of the process, dipping into copper sulfate solution followed by the fifth step, if desired, namely, the dipping into a solution of mercurous nitrate, does not substantially affect the filling of chalk, but coats the uncovered points of the teeth with copper, with or without mercury. The sixth operation, etching in strong hydrochloric acid, or etching in dilute hydrochloric or nitric acid with an electrolytic current, in which operation the file is placed as the anode in an electrolytic bath, followed by washing with lime water, gives the finished product, namely, that shown in Fig. 5, in which the teeth are sharpened by the chemical or electrochemical action, the deposit of chalk between the teeth having been removed by the chemical action of the acid. The files are then dried and may be oiled to prevent rusting and are ready for shipment or use.

I claim:

1. Process for renovating files and the like by selective etching, which comprises protecting the tooth crests by a metallic deposit relatively resistant to acid and thereafter etching by an acid solution.

2. Process for renovating files and the like by selective etching, which comprises protecting the grooves by filling the same, protecting the tooth crests by a metallic deposit relatively resistant to acid, and thereafter etching by an acid solution.

3. Process for renovating files and the like by selective etching, consisting in protecting the tooth crests by a metallic deposit relatively resistant to acid and thereafter etching by an acid solution, said solution being aided by the action of an electric current.

4. An improved renovating process for files and the like, comprising nitric acid cleaning, root protection, metallic deposition on the crests, root exposure, then acid etching.

5. A process which comprises cleaning worn files, substantially filling the grooves with a relatively inert material, coating the tops of the teeth by treatment with a solution of a copper salt, removing said inert material from the grooves, pickling the files in an acid bath and accelerating action of said bath by electrolysis.

In testimony whereof I have signed my name to this specification.

SAMUEL WHYTE.