# W. T. NICHOLSON.

## Apparatus for Tempering Files.

No. 164,656. Patented June 22, 1875.

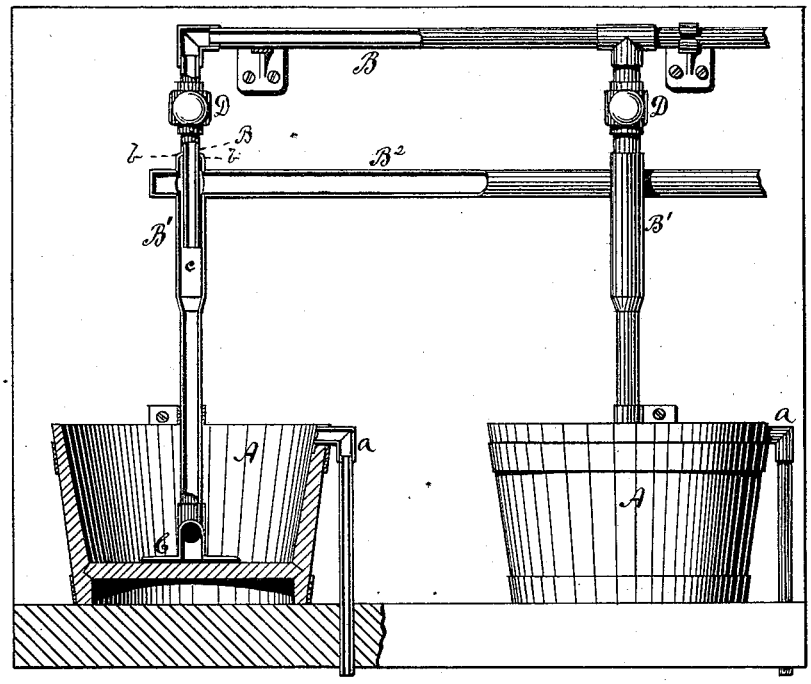


FIG. 1.

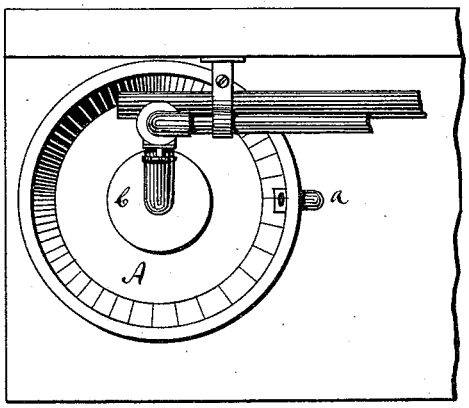


FIG. 2.

WITNESSES.

J. C. R. Woods.

Thomas Y. Cosgrove

INVENTOR.

William T. Nicholson

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

# UNITED STATES PATENT OFFICE.

WILLIAM T. NICHOLSON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE NICHOLSON FILE COMPANY, OF SAME PLACE.

## IMPROVEMENT IN APPARATUS FOR TEMPERING FILES.

Specification forming part of Letters Patent No. **164,656**, dated June 22, 1875; application filed May 17, 1875.

*To all whom it may concern:*

Be it known that I, WILLIAM T. NICHOLSON, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Apparatus for Hardening or Tempering Files, &c.; and I do hereby declare that the following specification, taken in connection with the drawings making a part of the same, is a full, clear, and exact description thereof.

My invention consists in certain means, hereinafter to be described, whereby the temperature of a tempering-bath composed of the usual saline solutions in use for tempering files or other steel tools may be kept more uniform, the solution be rendered more homogeneous in quality, and the heating of the bath, by repeated immersions of heated metal in it, be retarded.

Prior to my invention it has been customary in large establishments, where much hardening and tempering of steel tools are required to be done, to have a large reservoir or tank supplied with the proper solution, which is pumped in a continuous stream into the small vats or tubs in which the heated tools are to be plunged, an overflow-pipe conducting a quantity of the solution in the tubs which has become heated, equal to the quantity freshly supplied, back again to the reservoir. It follows of necessity that the tendency of the cooler solution supplied to the tubs is to settle gradually toward the bottom, and that in doing so the temperature of the fluid at different depths is not uniform. Again, the effect of plunging a heated tool—as, for instance, a file—into the bath is to greatly raise the temperature of the solution in the immediate vicinity of the metal so plunged, and the operator, knowing this, is accustomed to move the tool rapidly back and forth through the fluid, as well as plunge it lower in the bath, in order to bring its surface into contact with cooler portions of the bath. This tends, from the want of uniformity in the temperature of different stratums and portions of the bath, to spring the tool.

Referring to the drawings illustrating my invention, A A, Figure 1, represent two of the series of tubs or vats, such as are commonly used to hold hardening-solutions. One of these is shown in section and the other in elevation. It is to be supposed that in connection with the apparatus there is a reservoir containing a suitable solution for hardening purposes, and which is to be supplied to the vats in the manner hereinafter explained. Overflow-pipes *a* keep the fluid in the vats at a fixed level, and discharge into the reservoir.

The first object of my improvement being to keep the particles of solution in the tubs in constant agitation, and cause them to thoroughly commingle, so as to produce uniformity of temperature, I inject near the bottom of each vat a continuous blast or current of air under pressure. The pipe B is connected with a suitable air-chamber, in which a pressure of several atmospheres is maintained by a blowing-engine, and discharges a stream of air into the pipe B′, which is of enlarged diameter, for a purpose hereinafter explained. This pipe B′ has its outlet near the bottom and in the center of the tub A, and is furnished with a distributer, C, which may be a circular plate set close to the bottom of the tub, or may be of bulbous form perforated with holes around its edge. The form is immaterial, so long as the effect of the device is to so contract the discharge aperture or apertures as to cause the air forced through the pipe B to be spread out radially. The obvious effect of this arrangement is to cause the solution in the tub to be kept in a state of constant agitation by means of the cold-air currents which are forced through the lower stratums, and rise through the fluid to seek the surface, and thus the particles of the solution constantly changing place are made to thoroughly commingle and insure both uniformity of temperature and of quality. The quantity of air which it is desired to introduce to obtain the amount of agitation required can be easily regulated by means of a valve, D, in the pipe B, and the operator in hardening a tool is not, therefore, obliged to seek a cooler medium by moving it violently through the fluid, because fresh particles of the solution are constantly being brought into contact with the surface of the tool.

The next object of my improvement is to

provide a means for retarding, as much as possible, the tendency of the solution in the tub to become heated from the effect of continued use. The introduction of the air-blast above described tends greatly to accomplish this result; but, to heighten its effect, I prefer to combine the air-blast, before it enters the tub, with a stream of hardening-solution, which is to be injected into the tub, and thus cool the fluid in comparatively small quantities at a time. Accordingly the pipe $B^2$ is connected with the discharge-orifice of a pump, which is constantly drawing from a reservoir containing a large quantity of solution, and forcing it through the pipes $B^2$ and $B^1$.

As above stated, the air-pipe B enters the pipe $B^1$, the latter being sufficiently enlarged in diameter not only to receive the former, but to furnish an annular space through which the fluid solution delivered through the pipe $B^2$ can be discharged around the lower end of the pipe B into the pipe $B^1$ in the form of a hollow cylinder, and the upper end of the pipe $B^1$ is accordingly constructed so as to make a tight joint with the outside of pipe B at *b b*. The incoming stream of fluid solution and the incoming stream of air mingle together in that portion of the pipe $B^1$ which serves as a chamber, *c*, for that purpose. They then proceed commingled, and are discharged radially through the distributer C, and thence are disseminated through the whole body of fluid in the tub. This arrangement admits of the economical use of ice for cooling the fluid, instead of placing a large quantity of ice to be melted in the reservoir, as is customary, and thereby deteriorating the strength of the solution, besides unduly wasting the ice. The pipe $B^2$, at some convenient place, may be made into the form of a coil and packed with ice, so that the fluid passing through the pipe will be cooled by the refrigeration of the pipe. The same thing can be done to the air-pipe B, and thus a constant injection of mixed air and fluid of a very low temperature can be secured.

I have described a distributer, C, as a part of my apparatus, for the reason that I consider that a device of that character is important to obtain the best results. I wish it understood, however, that I do not regard a distributer as indispensable to the practical working of the apparatus, inasmuch as the mixed air and solution, or either alone, when injected near the bottom of the vat under pressure, will naturally effect the agitation of the whole body of solution in the vat.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of an air-pipe, B, whether with or without a distributer, C, and a vat, A, containing a hardening-solution, whereby the particles of the solution are kept in constant agitation to produce uniformity of temperature and quality, substantially as described.

2. The combination of a vat, A, for containing a bath for hardening heated steel articles, the pipe B for conveying a stream of air, and the pipe $B^2$ for conveying a stream of hardening-solution, said pipes having a common discharge, $B^1$, into the vat A, substantially as described, for the purposes specified.

WM. T. NICHOLSON.

Witnesses:

THOMAS F. COSGROVE,

J. C. B. WOODS.