

S. DARLING.
 PROCESS OF AND APPARATUS FOR HARDENING FILES, &c.
 No. 105,180. Patented July 12, 1870.

Fig 1

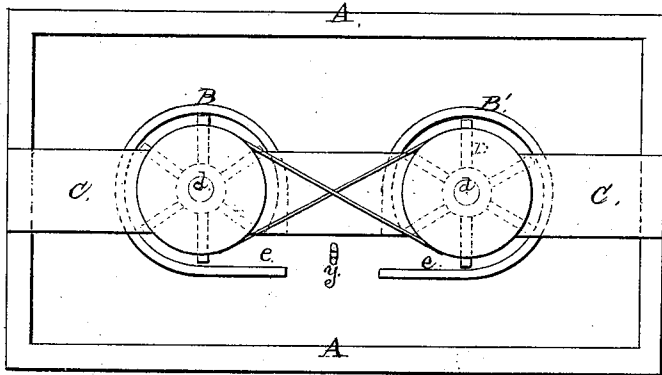
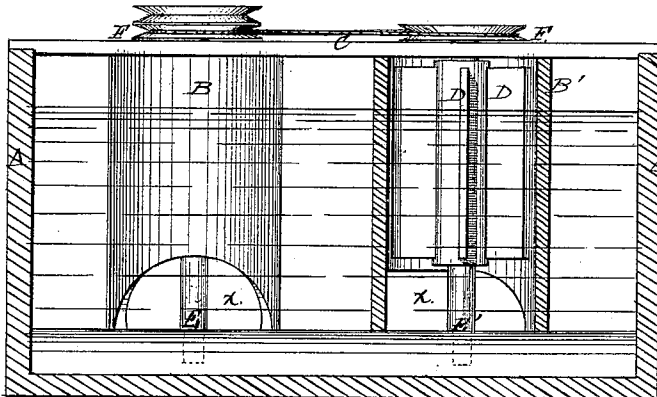


Fig 2



Witnesses.
H. G. Metz

Sam^l Darling, Inventor
by Crosby, Hallett & Gould
his Attorneys.

United States Patent Office.

SAMUEL DARLING, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO DARLING, BROWN AND SHARPE, OF SAME PLACE.

Letters Patent No. 105,180, dated July 12, 1870.

IMPROVEMENT IN PROCESS AND APPARATUS FOR HARDENING FILES, &c.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, SAMUEL DARLING, of the city of Providence and State of Rhode Island, have invented a New Process and an Apparatus for Hardening Files and other articles made of steel; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My invention consists in a process and an apparatus, hereinafter described, whereby the water or hardening liquid used to harden steel and steel implements may be thrown with great velocity, and in two or more columns, upon the sides of the article, all the columns or bodies of water being simultaneously driven against the article being treated.

Figure 1 represents a top view of an apparatus embodying my invention, and

Figure 2, a vertical longitudinal section of the same, one of the wheel-cases being also in vertical section.

In the form which I have chosen to illustrate my invention, I place within a case, cistern, or tank, A, of appropriate size, two or more vertical cases or tubes, B B', secured in their upright positions between the bottom of the tank and any appropriate cross-piece or support, C.

Within each of these tubes or cylinders is centrally placed, in proper bearings, a revolving water-driving paddle-wheel, D, the paddles or wings extending radially from the central spindle or shaft, and reaching far enough to barely escape contact with the inner face of the cylinder.

To the top of each of these shafts E E' is affixed a driving pulley, F F', a crossed belt connecting the same, to give revolutions in opposite directions to the shafts and paddles. Another fixed pulley on one of the shafts admits of connecting the same with any of the shafts of a mill or factory, to put the apparatus in motion.

Each of the vertical tubes has a vertical opening at one side, as shown at *e e*, for the exit of the water discharged therefrom by action of the wheels, such openings being a straight passage-way, the outer line or wall of which should be continuous with and tangential to the periphery of the shell.

When only two wheels are used, these mouths or outlets are so located relatively the one to the other, as to discharge toward each other, as shown, the file or other article to be hardened being held in a vertical position between them. A top view of a file in position to be hardened is shown at *y* in fig. 1.

The tank being supplied with water or other hardening liquid, and the wheels put into action with a high velocity, sufficient to discharge or drive the liquid from the cylinder at the rate of, say five hundred feet per minute, the file or other article (being first duly heated) is held vertically about midway between the two streams thus generated, and its opposite sides are simultaneously and equally acted upon and hardened, and this hardening is uniform throughout its whole length. The larger the article to be treated the

greater must be the velocity or throw given to the liquid.

The bottom of each cylinder is partially cut away at its sides, or it may be upheld by supports, to permit a free circulation of the liquid. (See *x x*, fig. 2.)

By reason of the great velocity given to the currents which dash against the file, the particles of liquid remain in contact with the heated metal for so short a period, and are succeeded by others in such quick succession, that they do not grow warm, as if the water were quiescent or in slow motion, and the continuous supply of fresh particles has also a more complete and efficient action upon the metal.

In hardening files, &c., by the modes of hardening in liquids, as heretofore practiced, it is found that many are left with soft spots in them, and are so irregularly or defectively hardened that they require to be hardened over again, or are thrown away as useless.

It is estimated that about twenty per cent. would be added to the value of the files if they were all as hard as they should be.

Such defective hardening and loss it is believed may be avoided mainly, if not entirely, by the use of my apparatus, which hardens the entire faces or surfaces uniformly and rapidly, this rapidity of treatment being of great importance, in order that the action on the surface of the metal shall take place before the article has time materially to cool throughout or the water to become heated.

I find that by my rapid process, the metal need not be heated to as high a degree as has heretofore been considered necessary. This is a most important consideration, as the character and quality of the steel are injuriously affected by such high heating.

Instead of two cylinders and wheels, three or more may be used when the character and shape of the article to be hardened require it, their discharge-spouts being in such case arranged relatively to each other, as may be found expedient.

By my process, not only are articles better and more perfectly hardened, but those of a size too large to be properly hardened by ordinary means heretofore employed can be successfully treated.

Instead of filling the tank with the water or other liquid, it may be conveyed to the cylinders near their tops by pipes leading from any reservoir or source of supply.

I claim as a new process of hardening steel and implements made therefrom—

1. Properly heating the article, then immersing it in the hardening liquid, and treating two or more sides or faces thereof simultaneously to currents of such liquid driven against them at high velocity, substantially as described.

2. The combination of two or more water-driving wheels, D D', with their cylinders B B', and spouts *e e*, substantially as and for the purpose set forth.

Witnesses:

PHILIP C. SCOTT,
LEVI SALISBUY.

SAMUEL DARLING