

UNITED STATES PATENT OFFICE.

JOSEPH S. DURNING, OF EMSWORTH, PENNSYLVANIA.

PROCESS OF TEMPERING AND HARDENING METALS.

SPECIFICATION forming part of Letters Patent No. 475,725, dated May 24, 1892.

Application filed August 13, 1891. Serial No. 402,519. (No specimens.)

To all whom it may concern:

Be it known that I, JOSEPH S. DURNING, a resident of Emsworth, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Processes of Hardening Metals; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the tempering and hardening of metals, and relates more particularly to the tempering and hardening of malleable cast-iron, although I claim the application of it to all metals to which the invention may be found applicable.

The object of my invention is to provide a process by which malleable cast-iron or other suitable metals may be tempered and hardened so as to possess the temper and hardness of high grades of tool steel, and after subjection to the process may be tempered by heating and submersion in substantially the same manner as such steel.

As above stated, I include within the scope of my invention any metals to which it may be applicable; but for the purpose of illustration I will describe the process as applied to malleable cast-iron, as experience has proven its perfect adaptability to the tempering and hardening of that metal.

It is well known that malleable cast-iron possesses special properties of softness and flexibility combined with a degree of toughness which makes it very suitable for certain grades of castings requiring such properties; but on account of its property of softness is unfit for purposes of manufacturing articles requiring temper and hardness. By this process this metal, which would be far preferable for many articles of manufacture if only certain parts thereof could be hardened, can be hardened at these points and possess the properties of high-carbon steel.

The process is as follows: I take a piece of malleable cast-iron of the desired shape and coat it at all the points desired to be hardened with a composition formed of flour, prussiate of potash, and a liquid obtained by boiling in water the leaves, sprouts, or roots of the plant known as the "American laurel," a name given to an evergreen shrub of the genus *Kalmia*. Sufficient of the liquid so obtained is added

to the flour and prussiate of potash to bring the mixture to the consistency of a paste. This paste is then applied by means of a brush or in other suitable manner to the surface of the malleable cast-iron or to the part or parts thereof to be tempered. The metal is then heated to the proper temperature, generally a shade higher than a cherry-red. The metal is then taken in this highly-heated condition and plunged into a vessel containing a liquid obtained from the laurel, as above described. The metal is allowed to remain in the liquid until it is cooled off, a time varying according to the thickness of the metal. It will be found upon withdrawing the metal that the parts thereof coated and subjected to the treatment above described will have acquired the properties of steel of high carbon. The metal, which was formerly tough, soft, and malleable, has become tempered and hardened. A further peculiarity and merit is that upon reheating the part or parts thus tempered it is not reduced to its original state—malleable iron—but upon plunging again in its heated state into ordinary water, as in tempering steel, the parts treated in accordance with the process not only retain their hardness, but may be even more highly tempered and hardened, according to the treatment, which is similar to the treatment of tempering cast-steel.

It is readily apparent that the process can be applied with special advantages to articles which can be more readily formed of malleable cast-iron, yet whose manufacture from such metal has been precluded heretofore because, as the malleable cast-iron was soft, the bearing-points on such articles could not withstand the wear to which they would be subjected. By this process this difficulty has been overcome, as such bearing-points may be hardened in the manner above described to any desired degree. For example, in the manufacture of a horseshoe, for which I file an application for Letters Patent of even date herewith, it will be seen to possess marked advantages, the shoe being cast from malleable iron a more perfect shoe can be obtained, while the calks and toes when treated by this process will possess a degree of hardness adapted to withstand the severe wear to which they are subjected. In the composition and

liquid employed in the process I claim the chemical equivalents adapted to produce the same results.

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

1. The herein-described process of tempering and hardening metals, consisting in coating the surface of the metals with a mixture composed of flour, prussiate of potash, and a liquid concoction from the laurel-plant, heating said metal, and plunging it when highly heated into liquid, substantially as described.

2. The herein-described process of tempering and hardening metals, consisting in coating the surface of the metal with a mixture composed of flour, prussiate of potash, and a liquid concoction from the laurel-plant, heat-

ing the metal, and plunging it when highly heated into such liquid concoction, substantially as described.

3. A composition for tempering and hardening metals, containing a liquid concoction from the laurel-plant, substantially as described.

4. A composition for tempering and hardening metals, containing flour, prussiate of potash, and a liquid concoction from the laurel-plant, substantially as described.

In testimony whereof I, the said JOSEPH S. DURNING, have hereunto set my hand.

JOSEPH S. DURNING.

Witnesses:

HENRY FEURHAKE,
ALBERT C. WILLIAMS.