

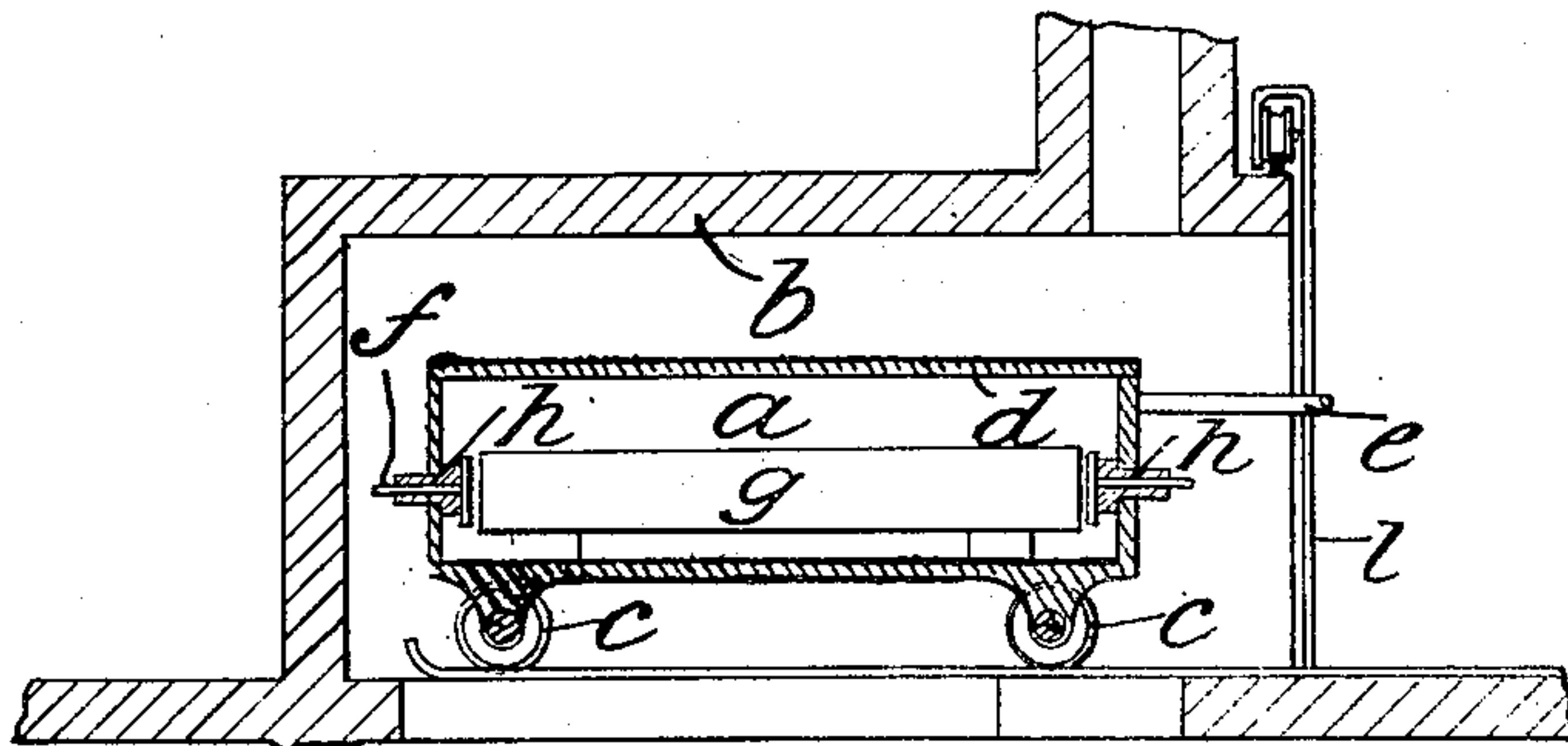
No. 843,563.

PATENTED FEB. 5, 1907.

W. F. L. FRITH.

PROCESS OF TOUGHENING OR ANNEALING STEEL, IRON, AND OTHER METALS.

APPLICATION FILED FEB. 24, 1902.



Witnesses—

Ellis Owen.

John Smith.

Inventor

W. F. L. Frith.

by W. E. Evans.
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM F. L. FRITH, OF LONDON, ENGLAND.

PROCESS OF TOUGHENING OR ANNEALING STEEL, IRON, AND OTHER METALS.

No. 843,563.

Specification of Letters Patent.

Patented Feb. 5, 1907.

Application filed February 24, 1902. Serial No. 95,468.

To all whom it may concern:

Be it known that I, WILLIAM FREDERICK LOWNDES FRITH, a citizen of Great Britain, residing at 24 Rood Lane Chambers, Rood Lane, London, E. C., England, have invented a new and useful Improved Process for Toughening or Annealing Steel, Iron, and other Metals, of which the following is a specification.

This invention relates to an improved process for treating steel, iron, and other metals, so as to give greater tenacity and elasticity and so as to render the metals treated highly resistant to the penetration of projectiles and to the corrosive action of sea-water and the weather.

The invention consists generally in heating the metal to be treated within a closed receptacle and subjecting the metal to fluid-pressure, such as the pressure of mercurial vapor, and allowing the metal treated to slowly cool while in the receptacle, an electric current being preferably passed through the metal treated while in the receptacle.

The accompanying drawing illustrates diagrammatically in sectional elevation apparatus employed to carry the invention into effect.

In carrying the invention into effect I preferably arrange the receptacle *a* upon wheels *c*, by means of which it may be conveniently run into the furnace *b*. I provide the receptacle *a* of any suitable form and with a cover *d*, which may be tightly bolted into position, so as to be pressure-tight.

The receptacle *a* is provided with an outlet by means of which the air within the receptacle *a* may find egress. An outlet-pipe *e* communicates with the outlet and is carried through the walls of the furnace and has for convenience a tap, by means of which such outlet-pipe may be closed. The receptacle may furthermore be provided at its opposite ends or sides with electrodes *f*, by means of which current may be caused to pass through the metal plates or bodies *g* to be treated. The electrodes *f* may conveniently be arranged within non-conducting bosses or bushes *h*, secured within the ends or sides of the receptacle, and the electrodes may be capable of adjustment therein.

The furnace *b* itself may be of any convenient kind and may derive its heat from any suitable source (not shown in the drawing) and may be provided with a sliding door *l*, closing an aperture through which the receptacle

may be run in or out of the furnace and by means of which the furnace may be effectively closed, so that the receptacle may be heated to the required degree.

In operation the plates or bodies *g* to be treated are placed within the receptacle *a*, and the receptacle has a quantity of mercury poured into it sufficient to generate the vapor for completely filling the receptacle. After the introduction of the mercury the cover or covers *d* are placed in position and screwed down tightly. The receptacle is then passed into the furnace *b* and heated for about twelve hours to about 1,000° Fahrenheit. The receptacle is then withdrawn and its contents are allowed to cool slowly. The duration of the heating and cooling periods vary with the different sizes and compositions of the articles to be treated. During heating or cooling a current may be sent through the apparatus, either constantly or intermittently, the quantity depending on the size of the plates or bodies to be treated and on the chemical constitution of the metal. As the receptacle becomes heated the valve on the outlet-pipe is opened, so as to allow the heated air to find egress, and the valve is maintained open until the vapor of mercury condenses and drops from the outlet-pipe. When thus an indication is afforded that the receptacle is filled with mercurial vapor, the valve is closed. It will thus be seen that I do not employ a uniform pressure of gas in the heating and cooling, but that the pressure depends wholly upon the temperature to which the metal is subjected under treatment.

Instead of mercurial vapor air, steam, or other vapor or gas under pressure may be employed for the same purpose, and instead of providing a portable receptacle a fixed chamber may be provided in connection with a suitable furnace or other source of heat.

The tenacity, elasticity, and toughness of plates or bodies treated according to the invention are increased, and they are rendered highly resistant to the penetration of projectiles and to the corrosive action of sea-water or the weather.

The process is not only applicable for treating steel, but also iron and other metals, while it is also capable of use for annealing or tempering plates or bodies which may or may not have been previously subjected to a hardening process.

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

1. A process of treating steel and other metals, comprising a subjection of the metal to heat and to direct action of metallic vapor under pressure in a closed receptacle, said pressure varying with and corresponding to the temperature to which the metal is subjected.
2. A process of treating steel and other metals, comprising a subjection of the metal to heat and to direct action of mercuric vapor under pressure in a closed receptacle, said pressure varying with and corresponding to the temperature to which the metal is subjected.
3. A process of treating steel and other metals comprising a successive heating and cooling of the metal under pressure by the direct action of metallic vapor in a closed receptacle, said pressure varying with and corresponding to the temperature to which the metal is subjected.
4. A process of treating steel or other metals comprising a successive heating and cooling of the metal under pressure by the direct action of mercuric vapor in a closed receptacle, said pressure varying with and corresponding to the temperature to which the metal is subjected.

5. A process of treating steel and other metals comprising a subjection of the metal to heat and to the direct action of vapor under pressure in a closed receptacle, said pressure corresponding to the temperature to which the metal is subjected, while an electric current is being passed through the metal.

6. A process of treating steel or other metals comprising a subjection of the metal to heat and to the direct action of gaseous vapor in a closed receptacle, said pressure corresponding to the temperature to which the metal is subjected, and the passing of an electric current through the metal while heated.

7. A process of treating steel or other metals, comprising a subjection of the metal to heat and to direct action of mercuric vapor in a closed receptacle, said pressure corresponding to the temperature to which the metal is subjected, and the passing of an electric current through the metal while heated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

W. F. L. FRITH.

Witnesses:

WILLIAM EDWARD EVANS,
GEORGE ISAAC BRIDGES.