

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN COMPOSITIONS FOR CEMENTING IRON.

Specification forming part of Letters Patent No. 24,429, dated June 14, 1859.

### *To all whom it may concern:*

Be it known that I, JOB JOHNSON, of East Brooklyn, Long Island, in the State of New York, have invented a cementing powder or mixture for cementing, converting, refining, strengthening, and steelifying iron; and I hereby declare that the following is a full and exact description thereof.

I take quick or caustic lime free from earthy or foreign substances and add to it an equal quantity of bone-dust or baked bones finely divided and a like quantity of charcoal, of which I prefer oak. I then mix these ingredients intimately and expose them to the influence of the weather for one, two, or more days, according to the hygrometric condition of the atmosphere, dry weather being most favorable. I then take any convenient form of cementing or converting furnace, of brick, iron, or other material, and commence by spreading a layer of the mixture on the bottom and interstratify the articles of iron to be operated upon with the mixture till the furnace is charged, taking care to assort the various articles, so as to insure the required uniformity of treatment. I then close and lute with fire-clay, so as to prevent access of air, and apply heat externally, testing from time to time by means of trial-pieces, which can be removed at pleasure. When I find that the process has well commenced I study to regulate the external heat so as to preserve an equable and not too elevated temperature. By this means and process I am enabled to give to iron entirely new properties and qualities, as well as to convert, or partially convert, it into steel at pleasure. Iron subjected to this treatment assumes great rigidity and hardness without losing its property of malleability and ductility. Shafting, piston-rods, axles, journals, and such like may be hardened and strengthened by an exterior coating of steel, possessing all the properties of cast-steel, while the interior retains all its fibrous structure. In like manner railway bars and wheels, chains, anchors, anvils, and large articles generally may be hardened and strengthened to any required extent, while smaller articles—such as axes, hammers, files, rivets, wire rods, hoes, keys, &c.—may be finished in iron and then converted, or partially converted, into steel without impairing their forms or requiring reconstruction. This process also gives to iron the property of resisting oxidation in a high degree, and,

among other things, is most important in its application to preparing plates for ship-building, boilers, bridges, and other like purposes.

The rationale of my process I believe to be capable of explanation upon well-known scientific facts and grounds. The important part that carbon plays in the conversion of iron into steel is at the bottom of all existing modes of operating; and in making use of quicklime I have a ready means of fixing this element in its purest and most convenient form—namely, by absorption of carbonic acid from the atmosphere. At all events, I find that no other substance with which I am acquainted is capable of supplying this agent with such successful results, and lime, therefore, in its purest and most active condition is an essential ingredient of my process.

It is a well-known fact that the Danemora iron of Sweden, which furnishes the best steel, contains a notable quantity of phosphorus—to such an extent, indeed, that when bent or twisted at a dull-red heat it gives out a strong odor of phosphorus. From this and other facts Brande and other practical chemists maintain that the presence of phosphorus is essential to the production of first-rate steel, and my own experience leads me to the same conclusion. For this reason I add to my mixture bone-dust, in which the phosphorus exists in the form of basic phosphate, and either enters into combination with the iron or by catalytic action aids in accomplishing the desired result. It is deserving of notice that the mixture may be used again and again, care being taken to expose it to the influence of the atmosphere after every operation, in order that the carbonic acid may be restored. I usually add lime.

I do not claim the use of lime, bone-dust, and charcoal in any definite proportions, but vary them according to the nature of the operations and the desired results.

I disclaim the use of any other ingredients which have heretofore been used in cements in combination with the above or any of them; but

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

The combination and use of lime, bone-dust, and charcoal, in the manner and for the purposes substantially herein described.

Witnesses: JOB JOHNSON.

J. A. O'CONNOR,  
JOHN S. BISHOP.