

# UNITED STATES PATENT OFFICE.

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## WIRE AND METAL CLEANING BATH.

No. 914,916.

Specification of Letters Patent.

Patented March 9, 1909.

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*To all whom it may concern:*

Be it known that I, JAY C. BENEKER, a citizen of the United States, residing at Pueblo, in the county of Pueblo and State of Colorado, have invented certain new and useful Improvements in Wire and Metal Cleaning Baths, of which the following is a specification, containing such a full, clear, and exact description as will enable any one skilled in the art to use the same.

In the usual process for cleaning or pickling, the wire, rods or black sheets are subjected to the action of a dilute solution of sulfuric or hydro-chloric acid. The scale usually consists of a mixture or compound of ferrous and ferric oxids. The acid appears to dissolve the ferrous oxid, leaving the ferric oxid in the form of a pulverulent substance readily washed off. However, before all of the scale has been loosened, the exposed metal has been vigorously attacked by the acid, thus occasioning much waste of acid and steel, and at the same time liberating hydrogen, some of which seems to be absorbed or occluded by the metal resulting in that characteristic acid brittleness, necessitating subsequent treatment for its removal. Experiment has demonstrated that fully two-thirds of the acid used is consumed in dissolving the metal itself, only a third serving the purpose for which it is intended.

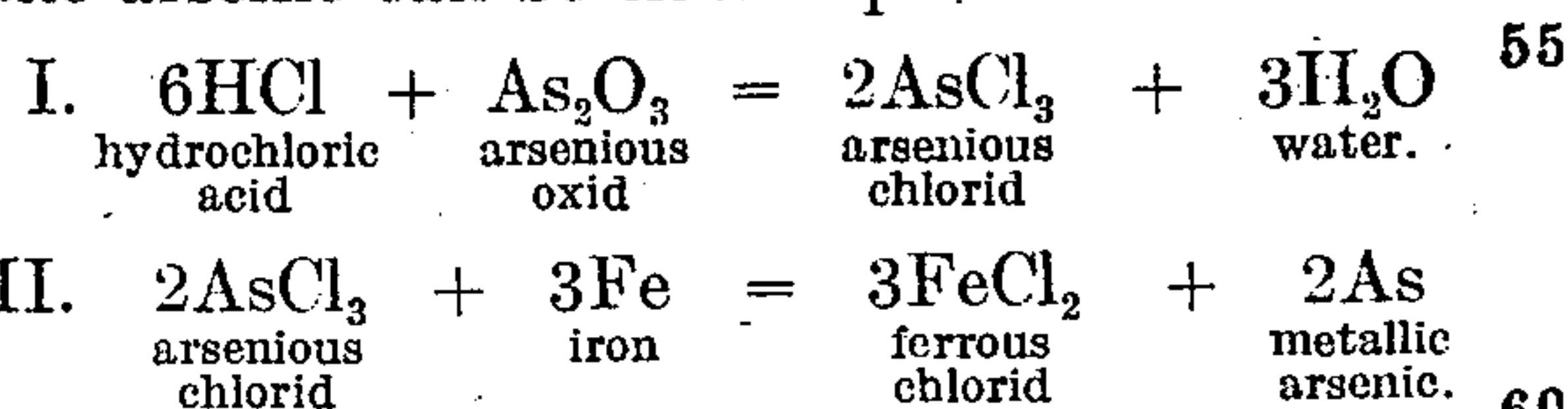
By this process it is aimed to overcome the objectionable features mentioned, such as excessive consumption of acid and metal, pitting of the metallic surfaces and acid brittleness.

I find that by the addition of a small amount of a compound of arsenic—an amount equivalent to .005% arsenious oxid being sufficient—to the dilute acid, the action of the acid is limited to the solution of the scale, the metal itself being but slightly attacked.

I believe the action is as follows: The acid removes the scale, exposing the metallic surface of the iron or steel which, in contact with the compound of arsenic, results in an interchange of metals, a small amount of iron entering into solution and arsenic being thereby deposited in the form of a thin black metallic coating which protects the metal against further action of the acid.

The chemical reaction for the solution of

arsenious oxid in acid and the deposition of the arsenic can be thus expressed:



In carrying out the process of the present invention, I take a suitable quantity of a dilute solution of acid, as, for instance, 100 gallons, and add thereto a small amount (preferably from .001% to .005%) of a compound of arsenic, as, for instance, arsenious oxid. The solution thus formed may be employed cold, although I have found that more rapid results are obtained when the solution is heated to about 195° F. The metal to be treated will be immersed in the solution, either hot or cold, and allowed to remain therein until all of the scale has been removed and the metal surface exposed, after which the black metallic coating of arsenic will be deposited on the outside of the metal. The metal is then ready for removal from the bath, although it is not necessary to time its removal with great exactness, for the reason that after the deposit of the metallic arsenic the further action of the acid will be arrested, so that there will be no appreciable loss of metal, even if it be allowed to remain in the solution after the complete removal of the scale.

I find that the rods or sheets, being free from pitted surfaces and acid black, are much improved for the subsequent operations of drawing, galvanizing or plating by the dip process.

I find that besides producing an improved product, the cost of the cleaning operation is greatly reduced over the usual practice on account of the large saving in acid and metal—the cost of the arsenic compound being insignificant when compared to the saving effected.

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

1. The process of cleaning or pickling iron or steel products, which consists in subjecting the same to a solution of acid containing a small percentage of a compound of arsenic, substantially as described.

2. The process of cleaning or pickling iron or steel products, which consists in subjecting the same to the action of a solution of acid containing a small amount of arsenious oxid, substantially as described.

3. The process of cleaning or pickling iron or steel products, which consists in subjecting the same to the action of a dilute solution of acid containing a small percentage of a compound of arsenic, substantially as described.

4. The process of cleaning or pickling iron or steel products, which consists in subjecting the same to the action of a dilute solution of acid containing a small amount of arsenious oxid, substantially as described.

5. The process of cleaning or pickling iron

or steel, which consists in subjecting the same to the action of a solution of acid containing a sufficient quantity of a compound of arsenic to coat the surface of the iron or steel with a protecting film of metallic arsenic, substantially as described.

6. The process of cleaning or pickling iron or steel, which consists in subjecting the same to the action of a dilute solution of acid containing a sufficient quantity of a compound of arsenic to coat the surface of the iron or steel with a protecting film of metallic arsenic, substantially as described.

JAY C. BENEKER.

Witnesses:

J. B. McKENNAN,  
JACOB CAMBIER.