UNITED STATES PATENT OFFICE.

ASAHEL K. EATON, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO KEZIAH A. VANDERBILT, OF SAME PLACE.

PROCESS OF OBTAINING CHROMIUM AND CHROMIUM ALLOYS.

SPECIFICATION forming part of Letters Patent No. 422,509, dated March 4, 1890.

Application filed March 30, 1889. Serial No. 305,395. (No specimens.)

To all whom it may concern:

Be it known that I, ASAHEL K. EATON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in the Process of Obtaining Chromium and Chromium Alloys, of which the following is a specification.

The metal chromium, as is well known, possesses many valuable qualities or properties; but it has hitherto been produced in such small quantities and at such great expense that its use in the arts has been extremely limited. I have discovered a process or way of obtaining this mineral both in a pure state and in alloy with other metals at an expense which is insignificant compared with that which its production has heretofore involved.

My present invention is based upon or involves a discovery made by me of certain chromites and the process of producing them, the complete process consisting, in general terms, in first producing a chromite of a desired metallic base, then reducing the chromite to an alloy, and then dissolving out or otherwise recovering the metal with which the chromium is combined. This process I shall describe in detail and then indicate the parts which I regard as the essential and important features therein.

As to the first step, which is the production of a chromite, I combine in equivalent proportions bichromate of potash and the sulphate of the desired base, the best of which for practical purposes I have found to be iron, copper, tin, or zinc. The bichromate of potash and one of the sulphates above named in a finely-divided condition are mixed in equivalent proportions and placed in a fire-clay crucible or other suitable receptacle and exposed to a temperature gradually increasing until it reaches a white heat. By this means a reaction is caused to take place, resulting in a mutual decomposition of the two substances. The results lead me to believe that the sulphuric acid of the sulphate combines with the potash of the bichromate, forming sulphate of potash, while the chromic acid, released by this reaction and losing a portion of its oxygen, is immediately reduced to chromous acid, which combines with the base and forms a chromite of that base. The sulphate of potash is readily removed by subsequent washing.

The second step—the reduction of the chromite—is effected as follows: A quantity of the chromite is mixed with any suitable reducing agent to take up the oxygen—such as charcoal or substances like sugar, which will become charcoal—and placed in a suitable retort or crucible. The compound is then exposed to a temperature sufficiently high to reduce the two metals of the chromite as an alloy.

The third step—the separation of the metallic chromium—is effected in any well-known way, as by dissolving out the baser metal.

As some examples of this process I may cite the following: I have produced chromite of zinc by combining sulphate of zinc and bichromate of potash in the manner above stated. This chromite, mixed with charcoal or equivalent reducing agent, I have heated until the zinc and chromium were run down in a metallic state as an alloy. I have then dissolved out the zinc with nitric acid, leaving the metallic chromium. In the same way I have produced alloys of chromium and copper, chromium and iron, chromium and tin, and others.

The difficulty of separating the chromium from the alloys will be greater or less, according to the metal with which it is alloyed. To obtain pure chromium, I prefer to produce the alloy of zinc and chromium, as this is very easily reduced. Moreover the other alloys named are products of great value themselves. For example, by adding to the alloy of chromium and tin a further proportion of tin an alloy resembling silver is produced, but which in every respect is superior to silver.

Chromium and copper make a chromium bronze of great value. Chromium and iron make an exceedingly-hard metal which takes a high polish.

In making the chromites I may employ the chlorides of the metals instead of the sulphates; but I prefer the latter.

What I claim as my invention is—

1. The process herein described of obtaining metallic alloys of chromium, which consists in first producing a chromite of the base of the desired metal and then reducing such chromite to an alloy, as set forth.

2. The process herein described of obtaining chromium, which consists in producing a chromite of a given metallic base, then reducing said chromite to an alloy, and then separating the baser metal from the chromium.

3. The process herein described, which consists in heating a mixture of bichromate of potash and the sulphate of zinc or its equivalent to form a chromite, then heating the chromite and a reducing agent to obtain an alloy.

4. The process herein described, which consists in heating a mixture of bichromate of potash and the sulphate of zinc or its equivalent to form a chromite, then reducing the chromite with carbon to an alloy, and then removing the baser metal from the alloy, leaving the chromium.

5. The method or process of obtaining chromium alloys by reducing the chromite of a metallic base by heat and a reducing agent, as set forth.

6. The method or process of obtaining chromium by reducing the chromite of a metallic base by heat and a reducing agent to obtain an alloy, and then separating the chromium from the other metal of the alloy, as set forth.

ASAHEL K. EATON.

Witnesses:
ROBT. F. GAYLORD,
FRANK E. HARTLEY.