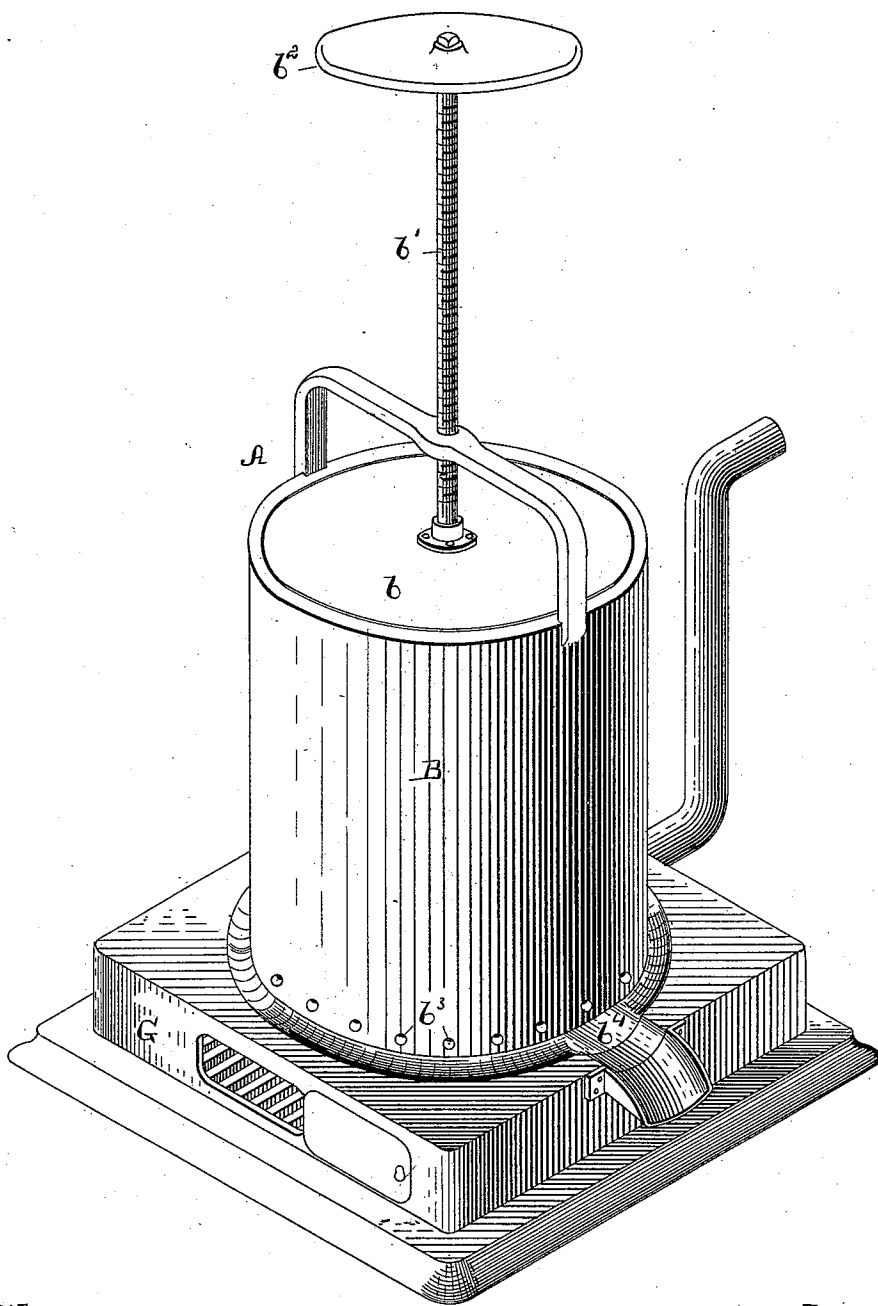


(Specimens.)

S. E. CHEESEMAN.
METHOD OF FORMING ALLOYS.

No. 466,455.

Patented Jan. 5, 1892.



Witnesses:

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UNITED STATES PATENT OFFICE.

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METHOD OF FORMING ALLOYS.

SPECIFICATION forming part of Letters Patent No. 466,455, dated January 5, 1892.

Application filed October 2, 1890. Serial No. 366,868. (Specimens.)

To all whom it may concern:

Be it known that I, SHERWOOD E. CHEESEMAN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Process of Making Alloys; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

The drawing is a view in elevation of the means employed to expel the mercury from the amalgam.

The various steps employed by me in carrying out my newly-discovered method are as follows: As an illustration of the method, I will describe the process of making an alloy of silver and copper.

First. I prepare fourteen (14) ounces of a saturated solution of sulphate of copper and place it in a pint vessel. To this I add one ounce of zinc in thin pieces or strips. A chemical reaction takes place by which copper is precipitated, being displaced by the zinc to form zinc sulphate, which is held in solution. Decant twelve (12) ounces of the liquid from the precipitated copper and retain it for use, as subsequently described.

Second. To the flask containing the precipitated copper, some undissolved zinc, and the remainder of the supernatant liquid left after decanting twelve (12) ounces, as above described, I add one-half ($\frac{1}{2}$) ounce of concentrated sulphuric acid to dissolve the remaining zinc. This is decanted and the precipitated copper washed with a mixture of one dram of sulphuric acid and eight (8) drams of distilled water, and finally with water.

Third. Transfer the precipitated copper to an earthenware vessel, add one-half ($\frac{1}{2}$) ounce of mercury, and warm over the flame of a Bunsen burner. Amalgamation takes place as soon as the mass begins to steam. When this is complete, the amalgam, which now weighs about one and one-half ($1\frac{1}{2}$) ounces, is placed in a mortar and ground, then filtered through chamois-skin in the usual manner to free it from excess of mercury.

Fourth. Remove the amalgam from the chamois-skin and mix with it a few drops of an alkaline liquid holding zinc arsenite in suspension. This is prepared as follows: Dis-

solve one-half ($\frac{1}{2}$) ounce of caustic potash and one-fourth ($\frac{1}{4}$) ounce of arsenious acid in a small quantity of water by a gentle heat, and add the solution to the twelve (12) ounces of zinc-sulphate solution decanted from the precipitated copper, as described in the first step, and warm the mixture over the flame of a Bunsen burner. Zinc arsenite and potassium sulphite are formed, together with some zinc hydrate, (the zinc being in excess of the arsenious acid,) while there still remains sufficient caustic potash to maintain a decidedly alkaline reaction.

Fifth. Ten (10) grains of finely-divided silver are placed in a vessel and ninety (90) grains of the amalgam, prepared as above, are added thereto. By a catalytic action of the zinc arsenite the silver is brought into the form of an amalgam with the copper and the mercury. Any insoluble arsenite may be used instead of the zinc arsenite. At this stage it is necessary to expel the mercury from the metal amalgam, which I preferably accomplish as follows: Let A in the accompanying drawing represent a press, and B the receiver of the press; b , the plunger in the receiver B, which is operated by the screws b' and the wheel b^2 . b^3 are perforations in the side of the receiver B near the bottom. b^4 is the conduit upon the top of the furnace around the receiver B below the opening b^3 in said receiver. The metal in the amalgamated condition is placed in the receiver B, and the plunger b is forced within the receiver and the mass is compressed, and the mercury oozes through the perforations b^3 in the receiver B and passes to the conduit b^4 . Heat being applied within the furnace C to the receiver B and to the mass in the receiver, there is an expansion of the mercury which would, out of the receiver, cause the metal to fly into many pieces. Within the receiver the mass is subjected to heat sufficient to volatilize the mercury, and the metal remaining is then ready for such treatment as is required in the arts. The metal taken from the receiver is similar to bronze as above prepared, and can be fashioned in any form required while in an amalgamated state and the mercury expelled afterward.

In alloying other metals—such as tin—from one to three per cent. of tin should be used

in the form of No. 40 foil. The tin causes slow setting of the amalgam, and the metal, after the mercury is volatilized, is poor in edge strength and brittle, and non-ductile if more than three per cent. is added. Zinc should be used chemically pure, and in the form of foil or granulated. Three or four per cent. of the zinc is sufficient to unite with the amalgam. The zinc causes slow setting; but if the mercury is well expelled it sets faster than if all the mercury were left in. Zinc makes the metal ductile and malleable. Cadmium causes very quick setting of the amalgam, and about one per cent. should be used in the form of No. 40 foil in shavings or filings. The setting qualities of lead are about the same as zinc. The lead can be used in the form of lead foil No. 60 or shavings. Should more than ten per cent. of lead be used, it renders the metal non-ductile. In alloying cobalt with copper the metal should be washed, as in other cases, one hour after adding the cobalt. Nickel should be treated about the same as cobalt, and from four to five per cent. of cobalt or nickel can be used. The sulphate of nickel is preferable to the metal, as the sulphate quickly assimilates with the amalgam while the metal is taken up slowly. Platinum must be finely divided and from two to four per cent. used.

Either the sulphates or oxides of the above metals can be used instead of the metals.

The chemical reagent as herein described is made the subject of an application filed in the United States Patent Office on the 16th of October, 1891, Serial No. 408,913.

Having fully described my invention, what I now claim as new, and desire to secure by Letters Patent, is—

1. The herein-described method of making alloys, consisting of precipitating copper from a solution of its sulphate, adding mercury, and then an insoluble arsenite suspended in alkaline liquid to the amalgam, followed by the addition of the metal with which, in addition to copper, it is desired to form an alloy and subsequently removing the mercury.

2. The herein-described method of making alloys, consisting in precipitating copper from a solution of its sulphate with zinc, adding mercury, and then zinc arsenite in an alkaline mixture to the amalgam, followed by the addition of the metal with which, in addition to copper, it is desired to form an alloy, and subsequently removing the mercury.

SHERWOOD E. CHEESEMAN.

Witnesses:

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