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# UNITED STATES PATENT OFFICE

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## METAL COLORING

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4 Claims. (Cl. 148—6.5)

Our invention relates to the art of metal coloring and has a special application to firearms. It is customary to color the outside of barrels and other metallic parts of firearms for the purpose of preventing rust as well as for improving the ornamental appearance of such parts. Our invention is, however, not restricted to guns, being also applicable to decorative metal devices for the interiors of buildings, etc. We are particularly concerned with articles of ferrous metal, such as steel.

A particular object of our invention is to provide a solution and process for the coloring of metal parts which will be less expensive, more expeditious, and in general more satisfactory than the means and methods hitherto known to the art.

After considerable experimentation, we have discovered a chemical formula which gives greatly improved results in much less time than previously known formulas with which we are familiar, our improved formula being relatively inexpensive and requiring a minimum of equipment and labor, and involving less time for its successful application.

Our improved formula comprises an aqueous solution of mercury bichloride and potassium chlorate, acidified with nitric acid. Other acids were investigated by us as substitutes for nitric, which, according to their dissociation constants, might have been considered as equivalents. However, we have found that nitric acid gives vastly superior results to any of the other acids investigated.

We have also found that greatly improved results may be obtained by applying the coloring solution by means of a special dipping process which will be described below.

*Example*

The following is an example of a preferred formula for our improved solution, it being understood that the same is to be taken as merely illustrative of the invention and not at all as limiting:

| | | |
|---|---|---|
| Mercury bichloride | pound | 1 |
| Potassium chlorate | do | 1 |
| Dilute nitric acid (6.0 normal) | cc | 150 |
| Distilled water, sufficient to make | gallons | 1½ |

The proportions of ingredients may be varied within the following approximate ranges, according to the quality of the metal being colored:

| | | | |
|---|---|---|---|
| Mercuric chloride | pounds | 0.50 to | 1.25 |
| Potassium chlorate | do | 0.50 to | 1.25 |
| Dilute nitric acid (6 normal) | cc | 100 to | 200 |
| Distilled water, quantity sufficient to make | gallons | | 1½ |

For best results, the chemicals should preferably be chemically pure.

Since it is especially desired to produce an attractive blue color according to our invention, the success of the operation is to be determined by the color produced and the evenness thereof. Thus, we have found from our experiments that certain solutions produce colors varying from a dull gray to a muddy bluish black, all of which are unsatisfactory. However, the above formula produces an attractive steel blue if properly applied. With a modification of the procedure, as described below, a good blue-black may be obtained.

Our preferred procedure is as follows: The bluing solution, of which the above is an example, is preferably kept at a temperature between 160 and 170° F. The steel part which is to be colored is, after thorough cleaning, plunged into boiling water, which should be quite clean, where it is allowed to remain for about 2 minutes, which is usually sufficient time to heat up the metal to the boiling temperature of water. The metal part is then withdrawn from the boiling water and quickly submerged in the hot bluing solution, where it is allowed to remain for about 15 seconds, the part being suspended in such a way that the solution can attack all portions of the surface which it is desired to color. The metal is then withdrawn from the solution and immediately wiped lightly with a clean flannel cloth, using long, even strokes from end to end of the part. The wiped part is then again placed in boiling water for about one minute. It is then removed from the water and quickly submerged again into the bluing solution for about 20 seconds. It is removed from the solution and immediately wiped as before with long, even strokes and returned to boiling water for about one minute. On removal from the water, the part is buffed and returned to the boiling water for about a minute. On final removal from the water, grease or oil is applied to the surface.

If a highly brilliant polish is desired, the metal is buffed twice; that is, it is buffed after the first and second application of solution and the subsequent immersion in water. It should always be placed in the boiling water for a minute or so after buffing.

It is highly desirable that the water bath be kept at about 212° F. for the best results.

If a dull black finish is desired, buffing is dispensed with and the part is merely wiped instead of buffed after the final boiling step, grease or oil being applied as stated above.

Care should be taken not to have any copper in contact with the bluing solution. We found that satisfactory results may be obtained if both the solution tank and the water tank are made of stainless steel, welded but not soldered.

The above formula and process have been found to be a great improvement over previously known formulas and procedures, especially with regard to cost and time. Thus, according to prior practice, from 8 to 10 coats or applications of the coloring solution are required to give satisfactory results, whereas, according to our invention, excellent results may be obtained with from 2 to 4 applications.

In order to prevent sedimentation, and ultimate fouling of the coloring solution, a small quantity of gum, such as tragacanth or arabic, may be added, causing all oxides to adhere to the metal.

Variations coming within the spirit of our invention may suggest themselves to those skilled in the art, and hence we do not wish to be limited to the specific embodiments shown herein or uses mentioned, except to the extent indicated in the appended claims, which are to be interpreted as broadly as the state of the art will permit.

We claim:

1. A composition of matter for the coloring of metal, comprising a dilute aqueous solution of mercury bichloride and potassium chlorate, acidified with nitric acid.

2. A composition of matter for the coloring of metal, consisting of:

| | | |
|---|---|---|
| Mercury bichloride | pound | 1 |
| Potassium chlorate | do | 1 |
| Dilute nitric acid (6 normal) | cc | 150 |
| Distilled water, sufficient to make | gallons | 1½ |

3. A method of coloring a ferrous metal article, comprising heating said article in hot water, dipping said article in a solution of mercury bichloride and potassium chlorate acidified with nitric acid, wiping said article, and finally immersing in hot water.

4. A method of coloring a ferrous metal article, comprising heating said article in hot water, dipping said article in a solution of mercury bichloride and potassium chlorate acidified with nitric acid, wiping said article, immersing in hot water, repeating said steps until the desired color is obtained, buffing the article to obtain a polish, and finally immersing again in hot water.

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