UNITED STATES PATENT OFFICE.

BENJAMIN F. LAWTON, OF TROY, NEW YORK.

IMPROVEMENT IN JOURNAL-BOX ALLOYS.

Specification forming part of Letters Patent No. **13,466**, dated August 21, 1855.

To all whom it may concern:

Be it known that I, BENJAMIN F. LAWTON, M. D., of the city of Troy, in the county of Rensselaer and State of New York, have invented a certain new and useful Compound Box Metal or Alloy, particularly designed for locomotive crank-boxes and piston-rings, but which may be used on other bearing-surfaces of the moving parts of machinery, which possesses superior advantages—for while it lessens the friction and tendency to abrasion of the rubbing-surfaces in a degree greater than the metals in ordinary use for similar purpose, it possesses a very compact fine grain and has a remarkably smooth surface—of which the following is a specification.

My improved compound box metal or alloy consists of cast-steel, nickel, copper, and tin, prepared and admixed in various proportions, according to the requisite degrees of toughness, hardness, or other quality that may be desired to make it a superior box metal or alloy. In preparing this box metal or alloy I employ cast-steel, which may be easily collected from waste pieces or scraps in large machine-shops and other manufacturing establishments. Old files may also be used. I use the common metallic nickel as it is usually obtained in market; but the oxide of nickel may be substituted therefor by taking a quantity sufficient to make it equal. I employ the copper as it is usually sent to market in pigs or slabs; but old copper may be used by making proper allowance for oxidation. I use common commercial tin, which is usually sufficiently pure.

This compound box metal or alloy I in general compose of a mixture of cast-steel, twenty parts; nickel, eight parts; tin, twelve parts; and copper, sixty parts; or in such other proportions of the same metals as will insure a superior box metal or alloy. Thus a box metal or alloy may be carefully prepared and combined, while in a molten state, for any of the above-named purposes. If proper care is taken in melting and admixing, the loss will not exceed two per cent. of all the metals used. The cost of making said box metal will be less than the usual price of good bronze metal, but will vary according to the proportions of each metal entering into the combination and the care taken while preparing, melting, and commingling each metal, and in the various operations of forming said box metal or alloy. For greater convenience and economy in preparing this box metal or alloy I prefer to employ a reverberatory furnace of peculiar construction, which you will see fully described by reference to my specification for an improved reverberatory furnace placed on file in the Patent Office December 20, 1854; also, in my amended specification for an alloy or box metal. It may also be prepared by means of pots, crucibles, or by common reverberatory or wind furnaces.

The furnace which I recommend for preparing, commingling, and combining this box metal or alloy is fully shown in the drawings accompanying the above-mentioned specifications. This furnace may have as many inclined melting-hearths and concave receiving-hearths as there are metals to be melted and mixed to form the box metal or alloy; but in the present example I have used three inclined melting-hearths and three concave receiving-hearths, upon which the metals are placed, melted, and received. Then the molten metals are all drawn into the first concave receiving-hearth, commingled, and combined while in a molten state.

It is obvious that the temperature of the several melting and receiving hearths will be lower as they are removed from the fire-chamber. Therefore those metals which are the most difficult of fusion must be placed on the melting-hearth the nearest the fire-chamber, and those which are more fusible and liable to volatilize should be placed on the melting-hearth most remote from the fire-grate. The metals on the inclined melting-hearths, and also those that are in the concave receptacles or receiving-hearths, which receive the molten metal that flows from the inclined melting-hearths, should be admixed with fluxes to facilitate their fusion and to protect each metal against the oxidizing action of any undecomposed air that passes from the fire-grate with the heat and flames. The fluxes may be those in common use for similar metallurgic purposes—such as pulverized glasses, oyster-shells, fluor-spar, limestone, clays, potash, or other alkali; also sands, granular mineral coal, or charcoal will be found useful to protect the molten metals from oxidization and evaporation, and particularly assisting in the reduction of the metals and the elevation of each to the requisite temperature of heat for making a superior mixture of each molecule forming the above box metal or alloy. The cast-steel should be broken into small parcels and laid upon the first inclined melting-hearth in small charges well protected by fluxes. When it melts it will run down into the first concave receptacle, where it can remain until other charges are melted. Wrought-iron or malleable iron will make a very good substitute for the cast-steel. The copper is placed upon the second inclined melting-hearth, or in the second concave receptacle, and should be admixed with fluxes while melting and after it is fused until required for commingling purposes. Nickel may be placed in small cavities made expressly for that purpose in the second inclined melting-hearth, with little channels leading into the second concave receptacle. Care should be taken to cover it with pulverized glasses or those fluxes used in protecting the copper, as it easily oxidizes when exposed to the air while very hot or in a molten state. Tin I place in either the first or third concave receptacles and treat in like manner. Some of the above metals require very intense heat in order to fuse them, which can be accomplished by following the above arrangement in from three to four hours, taking one thousand pounds at a single heat. When the requisite quantities of each molten metal have been accumulated in the several concave receiving-hearths the third receiving-hearth is tapped and the molten tin allowed to run from it through a channel, H, into the first receiving-hearth, which is constructed deeper and larger than either of the others. The cast-steel here mixes with the tin, and then the second receiving-hearth is tapped, and the molten copper and nickel which it contains allowed to run through the channel H into the first receiving-hearth to commingle with the other molten metals therein. The molten metals may now be well stirred, so as to mix and combine the several kinds of metals thoroughly together. Then a small ladle may be introduced and a little of the combined metals taken out, cooled, and examined in order to ascertain whether all the molecules are properly admixed and combined; if not, whatever may be the defect, it can be easily remedied, so there will be no difficulty in always making a uniform box metal or alloy with proper care. Thus a metal may be made answering all of the above-named purposes at a very great saving of labor, fuel, metals, and other incidental expenses attending the mixing similar metals by the old methods. When the whole has been completed and finished, then the metal may be drawn off or ladled out into molds prepared in various forms for making locomotive crank-boxes, piston-rings, and other journal-boxes, and the bearing-surfaces of the moving parts of machinery. The boxes, journals, or bearings thus formed should be bored, planed, turned, or otherwise polished and finished in such a manner as to render its acting surface smooth. When finished up it has an excellent polish and appears greasy to the touch. Besides being sufficiently hard and strong, it possesses very peculiar and highly valuable properties as an anti-friction alloy. Therefore,

I claim—

The aforesaid box metal or alloy as an improved material for the purposes of forming locomotive crank-boxes, piston-rings, journals, boxes, axles, and other rubbing-surfaces of the moving parts of machinery.

BENJAMIN F. LAWTON, M. D.

Witnesses:
GEO. H. SHELTON,
ALEX. H. BROWN.