

UNITED STATES PATENT OFFICE.

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COMPOSITION OF MATTER FOR THE PURIFICATION AND STRENGTHENING OF IRON AND CAST-STEEL.

SPECIFICATION forming part of Letters Patent No. 459,494, dated September 15, 1891.

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To all whom it may concern:

Be it known that I, CHARLES L. HARTSFELD, a citizen of the United States, and a resident of the city of Newport, in the county of Campbell and State of Kentucky, have invented a new and useful Composition of Matter for the Purification and Strengthening of Iron and Cast-Steel, of which the following is a specification.

My new composition of matter may be used in cupolas of any desired form, and is therefore adapted to be used in the ordinary cupolas. This composition of matter is a compound or alloy, and consists of the following ingredients, viz: metallic aluminium, oxide of aluminium, silica, fluoride of calcium, carbonate of lime, and oxide of copper.

The foregoing ingredients are preferably combined in the following proportions on the basis that the compound is composed of one hundred parts, viz: metallic aluminium, 7.3 per cent.; oxide of aluminium, 34.7 per cent.; silica, nineteen per cent.; fluoride of calcium, 9.3 per cent.; carbonate of lime, six per cent.; oxide of copper thereof, two per cent. Other chemical substances—viz., traces of zinc and tin and lead, and water, &c.—eighteen per cent., making a total of a little over ninety-seven per cent. The last-named item of eighteen per cent. is principally water. The ingredients of said item—viz., water and traces of zinc and tin and lead—are not a necessary part of the compound, but will usually be present in the compound unless the ingredients thereof are absolutely pure. Such absolute purity is difficult to obtain, adds greatly to the expense of the compound, and is not necessary to the successful use of the compound.

The mode in which my composition is used is by adding it to the charge of cast-iron, cast-steel, or malleable iron, as the case may be, in the cupola. To increase the strength of the said charge of metal in the cupola, the amount of my compound to be added will be varied according to the degree in which the strength of the said metal of the said charge is to be increased. For example, for every said charge of one thousand pounds, if the latter is to be increased ten per cent. in strength, I add thereto twelve pounds of my compound. If the said charge is to be in-

creased in strength twenty per cent., then fifteen pounds of my compound are to be added thereto. Should it be desired to increase the strength of said charge twenty-five per cent., then twenty pounds of my compound are to be added to said charge.

The method of adding the compound or alloy in the cupola is substantially as follows: The fire is started in the cupola after the usual bottom is made. Then a bed of coke is placed on top of the fire. A charge of this alloy of the desired amount necessary to impart a given strength to the iron castings, as heretofore specified, is now added, and above the alloy is added one thousand pounds of pig-iron and two per cent. of wrought-iron scrap. The above charges of alloy and iron are repeated to the extent of the iron it is desired to strengthen and run.

It is a well-known fact that carbonic, titanic, and iron oxides are present in greater or less quantities in all unreduced molten iron or steel. I have ascertained that aluminium alloy will reduce these detrimental oxides at a lower melting-point of the metal than heretofore. Any blow-holes due to gases cannot be formed while aluminium is present in the molten metal. The prevention of blow-holes in the metal to be cast imparts additional strength to said metal. My compound prevents the presence of blow-holes in the cast metal.

My compound imparts increased strength to the metal by securing a thorough chemical union and fluidity of the molten metal.

My said compound—viz., said aluminium alloy—will make hard iron softer with less shrinkage than is otherwise obtainable.

My compound will free the cast metal from hard spots and the aforementioned blow-holes. It will lower the point at which said metal melts about 250° Fahrenheit, and will raise the point at which the said metal chills about 250° Fahrenheit. It will purify the molten metal from carbonic oxide, titanic oxide, and iron oxides, &c. It will enable the founder to use more scrap-iron and cheaper pig-iron. It will reduce the percentage of defective castings and save vexatious loss. It will give tenacious and more homogeneous castings, and the latter will not oxidize (rust) so readily when exposed to moisture. It will increase

the tensile strength of cast metal from twenty to twenty-five per cent.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

5 The herein-described composition of matter for the purification and strengthening of iron and cast-steel, consisting of metallic alu-

minium, oxide of aluminium, oxide of copper, silica, fluoride of calcium, and carbonate of lime, in the proportions set forth.

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Attest:

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