UNITED STATES PATENT OFFICE.

WALTER K. MARVIN, OF NEW YORK, N. Y.

IMPROVEMENT IN THE MANUFACTURE OF STEEL FOR SAFES.

Specification forming part of Letters Patent No. **53,640**, dated April 3, 1866

To all whom it may concern:

Be it known that I, WALTER K. MARVIN, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Manufacture of Iron and Steel; and I hereby declare the following to be a full, clear, and exact description of the same.

The object of my improvement is the production of a metal possessing the properties which shall render it adapted to the manufacture of safes and to many other uses in the arts in which a very hard yet tough metal is desirable. As to safes, aside from a filling of permanent fire-proof qualities, it should be burglar-proof, not only with respect to the lock, but principally to the walls, which should be made to resist the drill and hammer.

Cast or chilled iron in the use of safes has proved to be entirely worthless for that purpose. It can never be chilled hard enough to resist a good steel drill, and will invariably crack when exposed to fire. Of course wrought iron is too easily drilled to admit of its being used as a material for safe-box, while steel is very expensive, and, when used in large plates, difficult to be tempered to that degree of hardness as to defy the action of ordinary drills.

Experiments costly and numerous have led to the discovery of a composition or alloy which offers to an eminent degree the properties I have sought to attain. This metal, which combines the toughness of iron and the hardness of steel, is an alloy of cast-iron, wrought-iron, and chromium, compounded in the proportions and in the manner hereinafter described.

To enable others to make and use my invention, I shall now proceed to describe the manner in which it is or may be carried into effect.

In the first place I obtain chrome ore, which consists of oxide of chromium and oxide of iron, silica, and alumina, in the proportions of about the following, which is that from Chester county, Pennsylvania:

Protoxide of iron	35.14
Oxide of chromium	51.56
Alumina	9.72
Silica	2.90
	99.32

This ore I pulverize and mix with reducing and fluxing materials, in about the following proportions: two hundred pounds pulverized chrome ore, thirty-three pounds pulverized charcoal, seventy-five pounds silica, thirty-three pounds quick lime, fifty-six pounds carbonate of soda.

This mixture is put into an ordinary crucible generally used for melting steel, covered with a lid, and submitted to a heat of about the same degree required for making low steel from wrought-iron for two and a half or three hours, when the oxide of chromium and oxide of iron will have been reduced to the metallic state. On allowing the crucible to cool, or on emptying the liquid mass into any proper receptacle, it will be found in the form of a "nugget" at the bottom of the flux or slag.

In the second I place twenty-five pounds charcoal pig-iron, broken into lumps of six to eight pounds each, into a crucible with twenty-five pounds wrought-iron scraps, to which from one and one-fourth pounds to two and one-half pounds of the chrome nugget are added. The whole is melted together at a temperature required for melting steel in the ordinary steel-furnaces. This operation will require about three hours.

To make a burglar-proof safe-box of about three hundred pounds weight, for example, the above melted metal of six crucibles or batches is poured into the ordinary ladle employed by iron-founders generally, and the mold is filled from this ladle. By employing several men to take the pots out of the furnaces and successively pour the metal into the mold, so as to maintain an uninterrupted stream entering the orifice of the mold, the ladle may be dispensed with and the casting effected directly from the pots.

There are no peculiarities in the mold. They may be made in loam or sand, as is generally practiced, or iron molds may be employed. When these latter are used instead of sand or loam, they should be treated precisely as is practiced for casting ingots of steel in iron molds—that is to say, the inside of the mold should be smoked over a pitch fire, so as to cover it with a substance resembling lamp-black, and heated to from 500° to 600° Fahrenheit, or thereabout, to prevent the chilling of the metal as it is poured into the mold, and thus incur the liability of injuring the casting.

The quality of wrought or scrap iron is not material. Satisfactory results have been ob-

tained from the punchings of boiler-plates and cuttings from box-iron employed by manufacturers of fire-safes for braces and ribs of the outer work of the safe. These punchings and cuttings command only a low price when sold for scrap-iron, as they are not employed in making steel except for the lower and inferior qualities of steel; but for the purposes here set forth they are utilized.

The above is the mode which has been practiced; but a similar result may be effected by first reducing the chrome ore in the cupola-furnace by mixing it with cast-iron and then proceeding as has been already described.

Another variation in the mode of procedure may be effected by adding the finely-divided chrome ore directly to the pig-iron and scrap wrought-iron in the crucible, in proportion to the richness of the ore in chromium. In such cases powdered charcoal should be added in quantity sufficient to combine with the oxygen of the ore. In this case there is no other variation in process from that already described.

From a series of experiments I have ascertained that the proportions of ingredients described produce a very fine-grained alloy which is exceedingly hard and will resist concussion—in other words, one which is not easily broken by a sledge or other means employed for such purposes, and which cannot be perforated or cut by the ordinary drill or cutting-instruments.

Having thus described my said invention and the manner in which the same is or may be carried into effect, I claim—

1. As a new metal or alloy, the composition herein described, the same consisting of chromium, cast-iron, and wrought-iron, compounded in the manner and proportions hereinbefore set forth.

2. The construction of safe-boxes, vault-doors, and other burglar-proof structures by casting the same of the metal hereinbefore described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

WALTER K. MARVIN.

Witnesses:
JOS. L. COOMBS,
EDM. F. BROWN.