

R. A. HADFIELD.
RAILWAY RAIL.
APPLICATION FILED AUG. 27, 1903.

911,237.

Patented Feb. 2, 1909

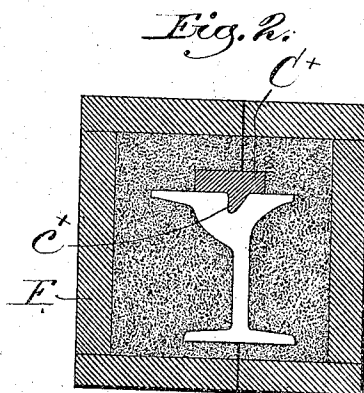
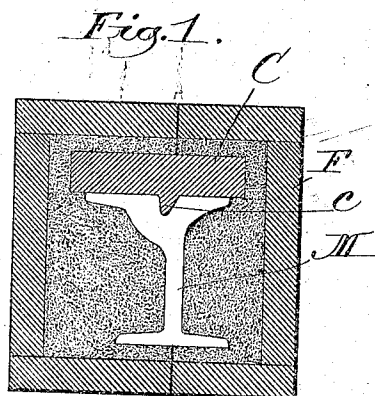
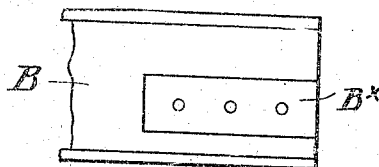


Fig. 3.



witnesses:

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UNITED STATES PATENT OFFICE.

ROBERT A. HADFIELD, OF SHEFFIELD, ENGLAND.

RAILWAY-RAIL.

No. 911,237.

Specification of Letters Patent.

Patented Feb. 2, 1909.

Application filed August 27, 1903. Serial No. 170,895.

To all, whom it may concern:

Be it known that I, ROBERT A. HADFIELD, a subject of the King of Great Britain, and resident of Sheffield, county of York, England, have invented an Improvement in Railway-Rails, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object a strong, durable and efficient rail for street, steam or electric railroads, possessing long life and great wear-resisting properties.

In the course of my experiments I have discovered that a rail cast as an integral body, and preferably wholly of manganese steel, and then suitably heat-treated and cooled, will have its wear-resisting qualities and its life greatly increased, the expensive step of rolling to shape being thereby obviated and the cost correspondingly reduced. By casting the rail, devices for connecting or fishing them together or to points, crossings, etc. may be made integral with the rail, so that the connection will be much more secure than is now possible.

In practice the rail is cast of Hadfield's manganese steel, such steel being, when properly heat-treated, hard, tough, and highly wear-resisting, and practically unmachineable, i. e., cutting or boring tools have practically no effect thereupon, a grinding operation being the only one practicable.

Figure 1 is a cross-section of a mold for casting a rail in accordance with one embodiment of my present invention, and Fig. 2 is a similar view showing a modification thereof. Fig. 3 is a side elevation of one end of the rail, showing a portion of softer metal cast in the main or body portion of the rail.

While in the drawing I have shown a mold for casting a street railroad rail it will be understood that my invention is not in any way restricted to the particular form or shape of rail.

In carrying out my invention the manganese steel, made in usual manner, is cast in suitable molds, and the mold may be horizontal, vertical, or inclined, as may be desired or found best suited for particular shapes. The fluid manganese steel is run into the mold from one or both ends thereof, or from the side, as may be most convenient.

In the construction of the molds they may be made by hand or machine, and if desired

the metal can be cast in green sand molds, and the portions forming the grooves for wheel flanges may be made of dry or green sand.

If desired those portions of the rail requiring special smoothness, such as the flange-groove, could be formed with chills having the desired shape.

Referring to Fig. 1, the flask F is filled with sand in which the main portion of the pattern M is formed, and a chill C is introduced in the mold, having a rib or core-piece *c* to form the groove, so that the groove and the tread portion of the rail cast in such mold will be smooth.

A combination of chill and sand is shown in Fig. 2, the chill *C*^x being narrower and having a rib or core *c*^x to form the groove, while only a portion of the tread, adjacent the chill, will be influenced thereby, the rest of the tread and the main portion of the rail being cast in sand. By this arrangement practically all grinding and fitting of the parts referred to will be obviated or largely reduced.

It will be obvious that if the mold be horizontal when casting the lower portion of the rail may be made of ordinary steel, preferably soft steel, and the head or portion of the rail subjected to wear made of manganese steel, one kind of steel being poured until the mold is filled to the required depth, and then filled with the other kind of steel.

In order that a manganese steel rail made in accordance with my invention shall possess the desired properties of hardness, toughness, and resistance to wear it must, after being cast, be heat-treated, and then subjected to the action of a cooling medium, preferably by immersion in water, if the casting be of manganese steel throughout, or if manganese steel be compounded with very soft steel, say about .20% carbon. Preferably the casting is first cooled down and then it is placed in a suitable heating furnace and gradually its temperature is raised to about 800° C. It is then heated as quickly as possible to from about 875° to 1050° C., and I have found a temperature of about 950° C. is best suited to effect by quenching the desired result. The rail while thus highly heated is quenched as rapidly as possible in a cooling medium, preferably water.

The treatment of a compound casting will be slightly changed if the ordinary steel there-

in should for any reason have to contain from .40% carbon, or higher, as in such case quenching would not be admissible. When using such ordinary steel the compound rail will be heated to the usual toughening temperature, about 950° to 1020° C. and allowed to cool in air, or made to cool quickly in the air by artificial means. By such treatment the manganese steel is toughened, though not to the extent secured by water quenching, and the ordinary steel in the compound rail is not spoiled.

When the rail made in accordance with my invention is to be drilled, or machined in certain portions, pieces of soft metal, such as cast iron or soft steel, may be cast in the body portion B, Fig. 3, at parts to be so manipulated, as at B*, Fig. 3.

My invention is not restricted to the precise details herein set forth, nor to any particular shape of rail, as the details may be varied by those skilled in the art, and the shape or configuration varied according to circumstances, without departing from the spirit and scope of my invention.

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

1. As an article of manufacture a railway rail having its body portion cast of homogeneous unmachineable manganese steel, said rail having cast therewith portions of softer metal at points where it is to be machined.

2. As a new article of manufacture, a manganese steel rail, produced by casting it in substantially the form in which it is to be used; thereupon cooling and then gradually raising the temperature of the rail; then toughening the rail by heating it rapidly up to a predetermined temperature, and then cooling it rapidly.

3. As a new article of manufacture, a manganese-steel rail, produced by casting it in substantially the form in which it is to be used; thereupon cooling and then gradually raising the temperature of the rail; then toughening the rail by heating it rapidly up to a predetermined temperature, and then immersing the rail in a cooling bath.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ROBERT A. HADFIELD.

Witnesses:

CHARLES AMES,
ENOS WILDER, JR.