UNITED STATES PATENT OFFICE.

JOSEPH T. TORRENCE, OF CHICAGO, ILLINOIS.

MANUFACTURE OF STEEL NAILS.

SPECIFICATION forming part of Letters Patent No. 288,138, dated November 6, 1883.

Application filed October 25, 1882. (No specimens.)

To all whom it may concern:

Be it known that I, JOSEPH T. TORRENCE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Manufacture of Steel Nails; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the manufacture of nail-plate and nails from steel or the homogeneous ferric substances known as "steel." It has long been considered desirable to substitute a steel or homogeneous ferric nail for the iron nail in common use, on account of the well-known superior tenacity and toughness of the former metal. Although any mechanic could by hand make a steel nail of approximately the same form as an ordinary iron nail, steel nails similar in form to the ordinary iron nail, and cut and formed by machinery in the same manner as iron nails, have never been made, that I am aware of, on a commercial scale, possessing at the same time the requisite rigidity and flexibility for general use prior to my invention. For a long time the manufacture of such cut steel nails upon a commercial scale has seemed impracticable from the fact that the hardness of the steel would injure the cutting tools or knives were the nails to be stamped or cut out to an extent that would not admit of profitable manufacture, and also because the steel would be either too hard or too soft to uniformly meet the requisites of a steel nail. Inasmuch as cut steel nails have not heretofore been successfully produced, iron nails continue in universal use, notwithstanding the present cheap manufacture of steel (or the homogeneous ferric products known as "steel") by well-known processes, such as the Bessemer and the Siemens-Martin process. The reason for this is that, as steels are commercially made of a rather high degree of hardness, the cutting tools or knives such as are employed to cut wrought-iron nails would be destroyed if applied to steel in this condition. I have discovered by repeated and long-continued experiments that, if steel be made of a degree of hardness within certain limits and formed into nail-plate, nails may be cut therefrom with great facility and without unusual injury to the cutting-tools, and finished and headed in the way used in making iron nails, thus forming cut steel nails adapted in every way for use in the common arts, and possessing flexibility far beyond that of even the best hand-made wrought-iron nail, coupled with a rigidity and tenacity far surpassing that of the best nail in the market. If these limits of hardness of the steel be departed from on the one hand, the nails cannot be readily cut without destroying the knives, or be properly headed, and will be brittle, and if on the other hand, the nails will not have the rigidity and tenacity requisite for general use.

To manufacture the steel by the Bessemer, Siemens-Martin, or any other suitable process, the steel is prepared of a degree of carbonization not to exceed about seventeen one-hundredths, and of not less than about twelve one-hundredths of one per cent., and formed either into blooms, and from these into nail-plate, or else directly into nail-plate from the ingots; or the ingots and blooms may be rolled into long strips resembling hoop-iron and the nails cut from these. It is obvious that a high steel may be decarbonized or low steel recarbonized to the requisite degree of carbonization. I have found that the great and increasing quantity of waste steel now in the market, consisting, chiefly, of rail ends, is exceedingly well adapted to receive the proper treatment to prepare it for making my improved cut steel nails, and that they can be produced from such waste substance with great advantage and economy.

It will be unnecessary more accurately to describe the mode of producing the steel or of rolling it into nail-plate and the subsequent cutting and forming of the nails, as I use therefor the common modes, which are well known to those skilled in the art.

My experiments have shown that with steel of the degree of carbonization specified (preferably about fourteen to sixteen hundredths) a nail formed as described is capable of being bent even to a spiral form without fracture, and also preserves a rigidity and tenacity far superior to that of the best cut nail hitherto in the market, inasmuch as it can be driven readily to the head into seasoned oak or into a knot, where the iron nail will enter but little beyond its point before breaking, and can also be pulled out of hard wood, where an iron nail would break in the attempt. My experiments

have also shown that the tensile strength of nails thus manufactured, of the qualities specified, in comparison with that of iron nails, is more than ten to four, and that their rapidity of oxidation is only about one-fifth that of iron nails. The nail, moreover, presents a neat and clean-cut appearance, far excelling that of the wrought-iron nail, and it is also homogeneous throughout, there being no split at the end or elsewhere, as there is in nearly every wrought-iron nail. Further than this, owing to its superior strength and quality, it may be made lighter for a given grade of work than the iron nail. For example, a steel nail thus made two and a half inches long—which is the length of an iron eight-penny nail, which runs about one hundred to the pound—may contain so much less metal as to weigh no more than a seven-penny iron nail, and still have even greater strength than the latter, thus giving a greater number to the pound. Of course the nails may be of any size, from a large spike down to the smallest tack.

Heretofore it has been proposed to manufacture nails from homogeneous metal—that is, the iron, steel, or semi-steel made by the well-known Bessemer and Simens-Martin process, as set forth, for instance, in the English Patent No. 2,960 of 1874; but for want of knowledge of or the failure to give the requisite limits to the degree of carbonization of the metal, as above stated by me, I am not aware that it has ever before been practically accomplished. In view of said patent, I distinctly limit myself to the special improvements herein set forth, by which, as I have demonstrated by experiment, cut steel nails of greatly improved and admirable quality can be practically produced.

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

1. The method of making a cut nail from steel or the homogeneous ferric substance known as "steel," which consists in first forming the steel of a degree of carbonization of from about twelve to seventeen one-hundredths, then forming the product into nail-plate, and finally cutting it into nails, substantially as described.

2. As a new article of manufacture, steel nail-plate of a degree of carbonization of from about twelve to seventeen one-hundredths, substantially as described.

3. As an improved manufacture, a cut steel nail of a degree of carbonization of from about twelve to seventeen one-hundredths, and of the character and having the properties herein described.

JOSEPH T. TORRENCE.

In presence of—
EPHRAIM BANNING,
THOMAS A. BANNING.