

# UNITED STATES PATENT OFFICE

JOHN LEIGHTON, OF JERSEY CITY, NEW JERSEY.

## IMPROVEMENT IN THE MANUFACTURE OF STEEL.

Specification forming part of Letters Patent No. **152,132**, dated June 16, 1874; application filed April 4, 1874.

*To all whom it may concern:*

Be it known that I, JOHN LEIGHTON, of Jersey City, in the county of Hudson and State of New Jersey, have invented a certain Improvement in the Process of Making Steel, of which the following is a specification:

My improvement consists in the combination of a variety of irons as a base, in the chemicals used in working that base into steel, and in the economy in arranging and working the furnaces to reduce the cost of manufacture.

The combination of irons for the base is of Port Henry ore, forty pounds; Port Oram anthracite pig-iron, one hundred and sixty pounds; Stanhope anthracite pig-iron, one hundred and sixty pounds; and Baltimore charcoal pig-iron, one hundred pounds. Other ores and irons having respectively and substantially the same chemical constituents may be used in their stead. These are given as certain grades.

The chemicals combined with this base, in making steel, are, for a ton of iron, bay-salt, fifteen pounds; clay, fourteen pounds; manganese, five pounds; soda-ash, one pound; carbonate of soda, one pound; and borax, one pound, or their chemical equivalents; or substances that, when put together, make substantially this compound.

The economy in constructing and working is, first, in lining the furnace—a common puddle-furnace—with a Port Henry ore. This ore is put in the furnace cold, in lumps, and the economy consists as follows: First, it is much less labor and expense to put it in thus than to pulverize or melt it and plaster it in; second, the peculiar nature of this grade of ore, as well as the affinity between it and the chemicals named, allows me to use but two hundred pounds a day of ore in the furnace, against fifteen hundred pounds used of other ores, and used as a “hot” or pulverized “fix;” third, the effect of its use is further seen in the preservation of the bottom of the furnaces, the chemicals, with the ore, acting so favorably upon it that I only require slag or scoria, which is costless, instead of scrap, commonly used at considerable expense. The economy is further carried out in so arranging the draft of the furnace that I can use fine bi-

tuminous slack, with air-draft, in the place of a blast usually required. For this purpose I secure a draft through about one hundred feet of stack. This stack, or draft-tube, is made twenty inches in diameter, and of equal diameter from the furnace to the top. Some forty feet of the stack that I use is horizontal, and the balance is upright. I do not allow two furnaces to receive draft from one stack, but each furnace has its separate stack. In this way of using slack I greatly lessen the expense of melting and manufacturing steel.

I will now describe the process of making steel, as follows: The two hundred pounds of ore above named are put in the furnace in the morning, and is a charge for five heats, worked in one day, of about four hundred and twenty pounds each, or a little over one ton of metal. With each heat some forty pounds of this ore melts and unites with the iron, as before shown, and forms a part of the base of the steel. The metal put in the furnace for a heat in the space of one hour becomes thoroughly melted, and then is added, in the furnace, the chemicals, in proportion of one-fifth of the quantity before named for a ton of metal. The mass is constantly stirred up for one hour, when a fine puddle steel is made, and is in condition to be worked into blooms or bars, as the case may be. The steel produced by this process is of a quality superior to any otherwise produced in this country, or in England, at anything like the cost of this. To illustrate, I manufacture a muck-bar for sixty dollars, of better quality than an English bar is made for one hundred dollars, thus making a quality of steel not before made in this country, and forty per cent. cheaper than an English steel.

I am aware that the various grades of irons have been mixed by foundry-men and by steel-workers, and also that many chemicals have been used; but I do not know or believe that the combination of the one or the other has ever been made substantially as I have made them. The quantities of these various materials may be somewhat varied, and a similar result be produced. So, also, one or even two of the chemicals may be left out, being nearly equivalents of some of the others, and the ef-

fect, to all intents and purposes, be the same, and in a general way I claim them so; but, more particularly,

I claim—

1. In the process of manufacturing steel, the use of Port Henry ore, forty pounds; Port Oram anthracite pig-iron, one hundred and sixty pounds; Stanhope anthracite pig-iron, one hundred and sixty pounds; and Baltimore charcoal pig-iron, one hundred pounds, as the base of steel, substantially as specified.

2. The use of the following substances, in about the proportions named, for one ton of metal: Bay-salt, fifteen pounds; clay, fourteen pounds; manganese, five pounds; soda-ash, one pound; carbonate of soda, one pound; and borax, one pound, for the purposes specified.

3. The Port Henry ore as a part of the base of the steel, put in the furnace as a lining, in lumps, instead of being pulverized or melted

and plastered in as heretofore, for the purposes specified.

4. In making steel of the ingredients above named, the use of fine bituminous slack in the furnaces, with an air-draft, instead of a force-blast commonly required, for the purpose specified.

5. In combination with the ingredients above named, the use of slag or scoria, as specified, for the bottom of the furnace, instead of scrap-iron heretofore used.

6. The process of manufacturing puddle steel, consisting of the combined metal base, the chemicals used in working, and the arrangement of the furnaces, substantially as described.

JOHN LEIGHTON.

Witnesses:

HORACE HARRIS,  
R. B. YARD.