

UNITED STATES PATENT OFFICE.

JAMES BURNS, OF VERONA, PENNSYLVANIA.

ART OF PRODUCING STEEL.

SPECIFICATION forming part of Letters Patent No. 610,701, dated September 13, 1898.

Application filed January 15, 1898. Serial No. 666,825. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES BURNS, a citizen of the United States, residing at Verona, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in the Art of Producing Steel; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to improvements in the art of producing steel.

My improvement may be used in the production of any grade of steel. It does not change in any material degree the chemical analyses of the steel, the materials which I add not being used for the purpose of increasing the quantity of either carbon or silicon in the product. It does, however, produce a denser metal, free from blow-holes, honeycomb, or piped ends, and at the same time the tensile strength of the steel is greatly increased and possesses the further characteristic that it can be used constantly in tools without heating.

In the practice of my invention or discovery I have found that an addition of ground or powdered gritty sandstone and slippery-elm, as hereinafter set forth, to steel immediately prior to pouring or tapping the same enables the steel to be poured without agitation or bubbling, producing a solid ingot or bar entirely free from honeycomb or pipe usually produced at the ends of the ingot or bar. This product is uniformly dense, having a close grain and a marked increase in tensile strength.

In the practice of my invention or discovery I take ordinary grindstone—i. e., any sandstone containing sufficient grit suitable to be used as an ordinary grindstone. Chemical analysis shows the stone to consist chiefly of silica and alumina, combined as a silicate of alumina, which analysis is about ninety-five (95) per cent. of the whole, the silica analyzing seventy (70) per cent. and the alumina analyzing twenty-five (25) per cent., with traces of lime, magnesia, alkalies, copper, and arsenic. I, however, attribute the results which I have obtained to the combination of the silicate of alumina combined with slippery-elm, as hereinafter specified. Com-

minutely as follows, namely: by taking hardened chilled iron or steel and grinding the same upon said grindstone until a quantity of said stone by contact with said chilled iron or steel is reduced to a finely-powdered state. I add to this powdered stone a quantity of slippery-elm, prepared in either of the following forms, namely: the elm may be used in its ordinary commercial form, providing it is still green and contains sap, or I take it when in this form, macerate or boil, evaporate the water and reduce to a viscid mass, or the same may be calcined or reduced to wood-ash, then steeped in water contained in a vessel having one or more small openings through which the water or liquid is slowly withdrawn. The water or liquid is evaporated, forming, as in the second instance, a viscid mass. The slippery-elm so prepared is then combined with said powdered stone in about the proportions hereinafter specified and thoroughly mixed with the molten metal at the time hereinafter specified.

In the practice of my invention or discovery I have found that a very high grade of steel is obtained by the following formula, to wit: about three (3) ounces of ground or powdered stone with about three (3) ounces of slippery-elm stirred or mixed with about ninety-five (95) pounds of crucible steel at or about the time of pouring the same. I do not wish to limit myself to this exact formula, as it may be varied somewhat and good results be secured. I have found, however, that these proportions added to the mentioned weight of ordinary crucible steel, as above specified, produces an extremely-high grade of tool-steel capable of long-continued use in lathes without heating. I have also discovered that the ingredients above mentioned in about the proportions specified produce an extremely uniform dense open-hearth steel free from blow-holes, honeycomb, or piped ends and with increased tensile strength.

I have discovered that sand or silica used in the manufacture of glass, although almost pure silica, will not answer the purpose subserved by the gritty sandstone or grindstone which I use.

Having described my invention or discovery, what I claim, and desire to secure by Letters Patent, is—

The herein-described improvement in the art of producing steel, which consists of adding to every ninety-five (95) pounds of ordinary steel when in a liquid condition and
5 prior to pouring the same, about three (3) ounces each of ground or powdered silicate of alumina and slippery-elm, substantially as herein set forth.

In testimony that I, JAMES BURNS, claim the foregoing I have hereunto affixed my signature in the presence of two subscribing witnesses.

JAMES BURNS. [L. s.]

Witnesses:

H. J. GRAHAM,
C. A. WILLIAMS.