

UNITED STATES PATENT OFFICE.

CHARLES TARBELL DUDLEY, OF GOLDEN, COLORADO, ASSIGNOR OF ONE-FOURTH TO WILLIAM W. DUDLEY, FRANK L. BROWNE, AND WILLIAM T. NORTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

TREATMENT OF STEEL INGOTS FOR FORGING.

SPECIFICATION forming part of Letters Patent No. 705,330, dated July 22, 1902.

Application filed February 10, 1902. Serial No. 93,341. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES TARBELL DUDLEY, a citizen of the United States, residing at Golden, in the county of Jefferson and State of Colorado, have invented certain new and useful Improvements in the Treatment of Steel Ingots for Forging; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the treatment of steel, and contemplates an improved process designed more especially for treating cast nickel-steel ingots, with the object of preventing therein the formation of streaks, working cracks, and other defects which would develop in the subsequent forging operation and impair the efficiency of the finished product.

My improved process, which is carried into effect in advance of the forging step, operates by reducing the size of the grains or crystals of the steel to prevent the formation of the defects above stated, which defects are largely the result of the separating or breaking apart of the coarse crystals during the operation of forging.

The process may be advantageously employed in treating various kinds of ingots, billets, and the like, although, as stated above, it is designed mainly for treating nickel-steel ingots which are cast to be forged into the heavy grades of forgings, such as ordnance, marine shafting, &c.

In practicing my improved process the cast ingot is allowed to cool below the critical temperature, (550° centigrade,) at which step the scrap is cut off, and, if desired, the ingot may be divided into billets. The ingot or billet is then placed in a suitable furnace and heated to a temperature between 750° centigrade and 850° centigrade, dependent upon the size of the ingot or billet, the larger the ingot or billet the higher the temperature required. This reheating temperature is maintained for

a period of time ranging from thirty to forty-five hours, depending upon the size of the ingot or billet, the larger the ingot or billet the longer the time required, after which the ingot or billet is allowed to cool and subsequently reheated for the forging step, or, preferably, the ingot or billet is directly brought to forging temperature and forged without the intermediate cooling. The subjecting of the ingot or billet to the stated reheating temperature for the described length of time results in a reduction of the size of the steel crystals, at the same time producing a perfectly homogeneous structure which can subsequently be safely forged without the formation of streaks and cracks and other defects which would impair the strength, utility, and appearance of the finished product.

The ingots of the kind which my improved process is especially adapted to treat have an approximate composition of from twenty-five to sixty hundredths per cent. of carbon, from one to four and one-half per cent. of nickel, below five hundredths per cent. of sulfur, and below six hundredths per cent. of phosphorus. My invention is, however, applicable to the treatment of ingots and billets of other compositions, and may be advantageously used in treating other than nickel-steel ingots and billets.

I claim as my invention—

The process of treating cast-steel ingots and the like previous to forging, which consists in cooling the cast ingot to a temperature below 550° centigrade, reheating the cooled ingot to a temperature between 750° centigrade and 850° centigrade, maintaining said reheating temperature for a period of from thirty to forty-five hours, and finally heating the ingot to forging temperature.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES TARBELL DUDLEY.

Witnesses:

A. H. COLLBRAN,

EUGENE H. DAWSON.