

UNITED STATES PATENT OFFICE.

JOHN WATSON SPENCER, OF NEWCASTLE-UPON-TYNE, ENGLAND.

MANUFACTURE OF STEEL.

No. 822,082.

Specification of Letters Patent.

Patented May 29, 1906.

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To all whom it may concern:

Be it known that I, JOHN WATSON SPENCER, steel manufacturer, a subject of the King of Great Britain, residing at Newburn, Newcastle-upon-Tyne, in the county of Northumberland, England, have invented certain new and useful Improvements in the Manufacture of Steel, of which the following is a specification.

The object of this invention is the manufacture of improved steel wherein valuable properties are obtained rendering such steel of greater utility for boiler-plates, ship-plates, and all classes of forgings, such as are made from so-called "mild" and "medium" hard steel.

According to my invention I add to all kinds of mild and medium hard steels containing carbon from .05 per cent. up to .25 per cent., a larger proportion of silicon than has hitherto been used commercially.

It is common knowledge that silicon has been and is used for such purposes as conferring solidity upon steel castings and ingots and in much larger proportions for the manufacture of the harder classes of steel, such as spring-steel and tool-steel.

It is the special object of my invention to utilize the valuable properties conferred upon mild and medium hard steels by the addition of proportions of silicon varying from .75 up to two per cent. By this means the tensile strength and elastic limit of the resulting steel are enormously increased without impairing its ductility, thus rendering it of much greater value for many purposes.

Not only does the steel made according to my invention possess improved strength and ductility, but it also possesses other marked physical properties of advantage which are shown by the bending and fatigue tests. For ship-plates the strength is so much increased that the thickness of the plates may be so much reduced as to make a great difference in the cost of construction and carrying-power of the vessels. For boiler-plates and forgings the strength is so much increased that an increased factor of safety may be obtained where it may not be considered expedient to reduce the weight.

My present invention consists, therefore, in utilizing this valuable property of silicon and applying it to obtain such results as are only at present attainable commercially by the use of nickel, which is much more ex-

pensive to add than silicon and which is attended by certain disadvantages not possessed by the silicon.

One of the great advantages in the use of silicon in such proportions as are hereinbefore specified for increasing the strength without loss of ductility is that plates and forgings may be obtained practically free from surface defects, a well-known difficulty in the use of nickel for such a purpose. The steel which has been improved by the addition of silicon is also easily welded, which renders it particularly suitable for plates.

Hitherto the special addition of such large proportions of silicon as are described in my invention has been of scientific interest only, and to the best of my knowledge no one has yet attempted to apply it commercially to improve the milder qualities of steel at present in use, and it is this which I particularly claim to have discovered.

In carrying out my invention I proceed to melt a charge of suitable materials, such as scrap and pig iron, either alone or as a mixture in a crucible, open hearth, or other furnace or Bessemer or other converter. After the charge has been decarbonized and refined to the desired extent I then introduce the desired proportion of silicon or silicon alloy either into the furnace or into the ladle, after which the mixture is cast into ingots or other desired form. In making my improved steel in this manner manganese may be added in the usual way, or in certain cases it may be dispensed with.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is—

The herein-described process consisting in melting a charge of iron normally containing from .05 per centum to .25 per centum of carbon and maintaining the charge in a melted condition, and introducing into the molten mass .75 per centum to two per centum of silicon to produce a modified steel for use in making plates, forging steels and the like.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN WATSON SPENCER.

Witnesses:

NED. V. BROWN,
A. H. DICKINSON.