UNITED STATES PATENT OFFICE.

JAMES CHURCHWARD, OF MOUNT VERNON, NEW YORK, ASSIGNOR TO CHURCHWARD INTERNATIONAL STEEL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

ALLOYED STEEL.

1,181,570. Specification of Letters Patent. Patented May 2, 1916.

No Drawing. Application filed March 18, 1911. Serial No. 615,304.

To all whom it may concern:

Be it known that I, JAMES CHURCHWARD, a subject of the King of England, residing at Mount Vernon, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Alloyed Steel, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to alloys containing iron or steel.

One of the objects of the invention is to provide an article of the kind described which shall be highly capable of withstanding shock, impact and vibration.

Another object is to provide an article which shall possess desirable properties for general manufacturing purposes.

Other objects will be in part obvious and in part pointed out hereinafter.

The alloy represented by the composition given below has been found to possess many excellent qualities which make it suitable for a wide variety of uses. The proportions of its constituents in per cent. by weight are as follows:

Steel, approximately	93.40%
Nickel, approximately	3.50%
Chromium, approximately	2.00%
Vanadium, approximately	0.35%
Manganese, approximately	0.50%
Silicon, approximately	0.25%

The steel preferably contains approximately 0.10 to 1.00% carbon.

In manufacturing the alloy the metals mentioned may be used as such or in the form of ferro-alloys thereof. When the latter are added to a bath of molten steel the whole of the alloy melts at the same time and chemical union of the various elements takes place almost simultaneously throughout the mass.

Silicon is preferably mixed with the other ingredients in the form of the metal itself. In carrying out the admixture the silicon is best added in a molten state to a stream of molten fluid consisting of a combination of the other ingredients, or the silicon may be added in solid form, if it be broken into sufficiently small pieces. Care must be taken in carrying out this addition of silicon to prevent an undue cooling of the stream of metal, for if the heat of the stream be sufficiently deadened lumps of uncombined silicon will be formed in the resulting mass.

The effect of the presence of vanadium has been carefully studied and it has been found that when used in small quantities it serves to drive out occluded gases from the molten metal and when present in amounts up to 0.75% it also gives elasticity to the molecules. This elasticity of the metal strengthens adhesion and imparts throughout a quality which offers great resistance to impact, shock and vibrations.

The presence of silicon exercises the beneficial action of producing a steel having great homogeneity and fineness of grain.

The alloys made in accordance with the formula given possess many desirable properties. They are particularly useful when used as deck plates, for war vessels, and may be used as armor plate. They also possess peculiar properties which suit them for use as shafting and in general where it is necessary to provide a metal capable of withstanding impact, shock and vibration. The alloys are extremely tough and possess great durability and wearing qualities.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

As an article of manufacture, an alloy steel composed of the following materials in approximately the proportions indicated.

Steel, approximately	93.40%
Nickel, approximately	3.50%
Chromium, approximately	2.00%
Vanadium, approximately	0.35%
Manganese, approximately	0.50%
Silicon, approximately	0.25%

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

JAMES CHURCHWARD.

Witnesses:
J. THOMSON,
L. A. WATSON.