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UNITED STATES PATENT OFFICE.

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NONMAGNETIC STEEL WIRE.

No Drawing. Application filed April 21, 1921. Serial No. 463,149.

To all whom it may concern:

Be it known that I, PORTER H. BRACE, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Nonmagnetic Steel Wire, of which the following is a specification.

This invention relates to alloys, more particularly to an iron alloy which has high tensile strength and is substantially non-magnetic.

Materials of this kind are suitable for a variety of uses especially in delicate measuring instruments, such as electric meters and the like. Such apparatus usually includes a rotatable copper disk mounted between the poles of an electromagnet and revolving about a steel shaft. In order to prevent losses due to stray magnetization, it is desirable that the steel shaft be non-magnetic and also have a high tensile strength in order to allow a minimum weight of rotating parts.

My invention is designed to provide such a material, it being among the objects thereof to produce a steel alloy which is non-magnetic, has a high tensile strength, a high elastic limit, which is hard and is capable of withstanding cold working.

In practising my invention, I provide an alloy containing iron and carbon, and several alloying materials, such as manganese, nickel, chromium, and usually silicon and vanadium. Generally, the compositions of my new alloy ranges as follows:

	Per cent.
Manganese	10 –18
Nickel	5 –10
Chromium	2 – 8
Silicon	0.5– 5
Vanadium	0.1– 1
Carbon	0.5– 1.5

the remainder being iron and minor impurities.

The manganese and nickel added to the iron render the same non-magnetic. The nickel also tends to prevent oxidation of the alloy during working. The addition of chromium increases the strength of the steel and further prevents oxidation thereof.

I generally add silicon to the alloy as it greatly improves the forging characteristics of the same, retards oxidation, and increases the hardness, the strength and the elastic limit of the alloy. Vanadium renders the grain size of the alloy small and thus increases the strength thereof.

I have found that certain proportions of ingredients produce an alloy having high strength and low magnetic permeability. The composition of such an alloy is as follows:

	Per cent.
Manganese	15
Nickel	5
Chromium	2
Silicon	.75
Vanadium	.15
Carbon	1

the remainder being iron, and the minor impurities usually found in high grade alloy steels.

This alloy may be forged, rolled and drawn cold. Wire made therefrom has a tensile strength of 250,000 to 300,000 pounds per square inch and an elongation of 10 to 20% in ten inches of length. The magnetic mass susceptibility of the wire is below .004. This material, on account of its high tensile strength and low susceptibility, is especially suited for use in delicate electrical instruments where stray magnetic fluxes are capable of causing disturbances, and finds particular use in the shafts of electric meters.

Although I have specifically set forth a composition of an alloy which gives the desired results, it is to be understood that my invention is not limited to the percentages set forth specifically but the compositions of my new alloys may vary within wide limits within the scope of the claims appended hereto.

I claim as my invention:

1. A substantially non-magnetic ferrous alloy comprising 10 to 18 per cent of man-

ganese, 2 to 8 per cent of chromium and 5 to 10 per cent of nickel.

2. A substantially non-magnetic ferrous alloy comprising approximately 2 per cent of chromium, approximately 15 per cent of manganese and approximately 5 per cent of nickel.

3. An iron alloy comprising iron, carbon, minor impurities and the following ingredients in the proportions stated:

	Per cent.
Manganese	15
Nickel	5
Chromium	2
Silicon	0.75
Vanadium	0.15

In testimony whereof, I have hereunto subscribed my name this 11th day of April 1921.

PORTER H. BRACE.