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MAGNETIZABLE MATERIAL.

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My invention relates to magnetizable material. It aims to provide an improved magnetizable material adaptable to various uses, wherein a metal or material of reduced or low coercive force and increased or high electric resistibility is desired.

Numerous alloys are known, which after a suitable heat treatment have a high permeability at low magnetizing forces. The alloys of this character may be used for instance in connection with electrical signal transmitting lines (telephone and telegraph lines) coiled around the conductors of the said lines, or as cores for the loading coils of such lines, and may be used also in connection with transformers, telephones, shields for shielded galvanometers and the like.

The alloys heretofore known and used for this purpose generally have a comparatively low specific resistance and rather high coercive force, which causes considerable eddy current and hysteresis losses when the alloys are influenced by alternating currents, so that they are really unsuitable in many instances. It has been tried to increase the specific resistance of the metals by adding other substances, such for instance as chrome and the like. However, it has been found that the addition of substances of such character has generally impaired the magnetic properties of said metal. Especially has it been found that the addition of manganese to iron causes the magnetic properties of the metal to be badly decreased, and that iron in addition to the few percents of manganese is made nearly unmagnetic.

I have found by numerous experiments that this bad influence of the manganese can be and is entirely removed and leads to very suitable results, if the alloy in addition to the iron contains nickel as a third component.

I have discovered that most favorable results are obtained with manganese, iron and nickel in alloys having iron contents up to 60% and manganese contents up to 20%. With these alloys, not only the specific resistance is increased proportional to the manganese contents, but moreover these alloys have very low coercive force (of a range such as .04 gauss) which, as far as I know, could not be obtained at all with other ferromagnetic alloys. On the other hand the permeability with weak and medium fields comes up to considerable values, disregarding the high manganese contents.

To prove this, the following list shows the values of the initial permeability, coercive force and specific resistance of a series of alloys of different manganese contents, which I have found by careful testing and measuring. However, these results are not final as they may still be altered by using materials of higher purity. The low coercive force leads to a decrease of the hysteresis losses, whereas the high specific resistance decreases the eddy current losses.

It may be mentioned that small additions of manganese and other flux powders to metallic alloys up to 1%, are frequently used and have been applied as well for magnetizable materials, but they have generally been used only for deoxidizing the melting or molten material and improving its malleability. They have not been proposed however for improving the magnetic properties.

List of values.

Composition of alloys.	Initial permeability.	Coercive force.	Specific resistance.
(1) 78% Ni 22% Fe 0% Mn	4000	.17	.20
(2) 78% Ni 17% Fe 5% Mn	10500	.125	.39
(3) 78% Ni 2% Fe 20% Mn	2200	.06	.60
(4) 76% Ni 22% Fe 2% Mn	7600	.09	.25
(5) 72% Ni 22% Fe 6% Mn	4900	.11	.45
(6) 64% Ni 22% Fe 14% Mn	3400	.065	.80
(7) 40% Ni 60% Fe 0% Mn	2030	.445	.64
(8) 40% Ni 58% Fe 2% Mn	2500	.35	.73
(9) 40% Ni 56% Fe 4% Mn	2220	.38	.78

Nos. 1 and 7 are alloys containing only nickel and iron. These have been given to show the influence of the addition of manganese to permeability, coercive force and specific resistance.

Although I have given in the list (under Nos. 2–6 and 8–9) a plurality of compositions according to my invention, it is understood that my invention is not limited to these special alloys but that other alloys being in the scope of the claim are suitable as well.

Having now fully described and ascertained the nature of my invention what I claim is:

Magnetizable material consisting of a basic alloy of iron and nickel, wherein the nickel contents amount to at least 40 percent and to which alloy, manganese from 2 to 20 percent is added.

In testimony whereof I have affixed my signature.

ERNST GUMLICH.