

UNITED STATES PATENT OFFICE.

WALTER RÜBEL, OF BERLIN, GERMANY.

METALLURGICAL PRODUCT.

1,033,352.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, WALTER RÜBEL, a citizen of the Empire of Germany, residing at Westend, Berlin, in the Empire of Germany, have invented a new and useful Metallurgical Product, of which the following is specification.

As is well known, the iron used for electrical purposes, more particularly the iron sheets, requires to have certain properties which can be united only with great difficulty, in order to increase as far as possible to a maximum the capacity and the useful effect of dynamos and electromotors. The magnetizability should be as high as possible and the losses of effect during the periodical magnetization should be as low as possible, consequently the hysteresis and the electrical conductivity of the iron should be slight so as to keep as low as possible the losses through the reversal of magnetism and through eddy currents. The alloys of iron hitherto used for the known practical purposes permit only a comparatively small number of alternations, which number lies between 50 and 100 per second. If with the material at present at disposal for dynamo sheets the number of 100 alternations per second were to be exceeded, too great losses of energy would be produced by the heating of the iron cores. Also the cooling of the iron cores would create too great difficulties. Endeavors have therefore been made for a long time to produce for the construction of dynamos and electromotors an iron material permitting alternation as rapid as possible without creating the above mentioned disadvantages. The essential point for these endeavors is, that the iron render possible an inlet and outlet as rapid as possible of the magnetism without heating.

My detailed experiments have shown, that the usefulness of the various sorts of iron for the purpose in consideration is very strongly reduced by an admixture of phosphorous, silicon and manganese, while slight contaminations through sulfur and carbon are not so injurious. Furthermore the presence of other metals, such as for example molybdenum, titanium, cobalt, nickel and chrome, is objectionable. In spite of all this the dynamo sheets at present in use contain slight quantities of manganese and silicon and phosphorus, because the injuriousness of these admixtures has hitherto

not been sufficiently recognized. For obtaining satisfactory dynamo sheets it is necessary, as already mentioned, to remove as completely as possible these contaminations, and this is the purpose of my invention. I have furthermore discovered, that dynamo sheets made from iron which has been perfectly freed from the contaminations recognized as injurious, can be still rendered considerably more useful by the admixture of a certain percentage of copper. Practical tests have shown, that one per cent. of copper will yield a very good effect. For certain purposes the admixture of copper may be increased up to three per cent.

For the manufacture of the new material ordinary pig-iron is used, that is a material containing phosphorus. The pig-iron is first nearly completely freed from phosphorus by the Thomas process. The iron free from phosphorus so obtained is then treated according to the Bessemer process in order to separate the silicon and the carbon. The purification of the iron can be driven so far that the iron is absolutely free from silicon. Of course every addition of spiegeleisen, which is usual in the ordinary Bessemer process for adjusting the percentage of carbon, must be entirely avoided, so as to obtain iron free from manganese. To the iron as pure as possible so obtained is then added the required quantity of copper, which owing to its great specific weight sinks in the molten iron and dissolves therein. After the introduction of the copper the blast should be continued only for five minutes at the most, so as to avoid all unnecessary oxidation of the copper. A part of the copper, however, does react upon the oxygen still contained in the bath, but the copper oxid formed in this manner will by reason of its low specific weight rise to the level of the molten alloy and can be easily removed before casting. After casting the bars are rolled into sheets, which by working are turned into dynamo sheets.

It is not absolutely necessary to produce the pure iron just in the order above described. The pig-iron may also be first treated in the Bessemer converter and then undergo the Thomas process, or it may be treated in electrical or Siemens furnaces suitable for carrying into effect both the acid and the basic processes. The essential point is, that an iron technically free from phosphorus, silicon and manganese be ob-

tained. The purer the iron is, the better will be the success attained.

Although in general the percentage of copper is obtained by the addition of a corresponding quantity of metallic copper, yet in some cases the employment of ores containing copper may be found useful for the process. Instead of the copper also other metals, such as for example lead, silver and bismuth or aluminium, may be used.

I claim:

1. A metallurgical product adapted for

electrical purposes which comprises iron substantially free from phosphorus, silicon and manganese, and containing copper. 15

2. A metallurgical product adapted for electrical purposes which comprises iron substantially free from phosphorus, silicon and manganese in combination with up to three per cent. of copper.

WALTER RÜBEL.

Witnesses:

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