

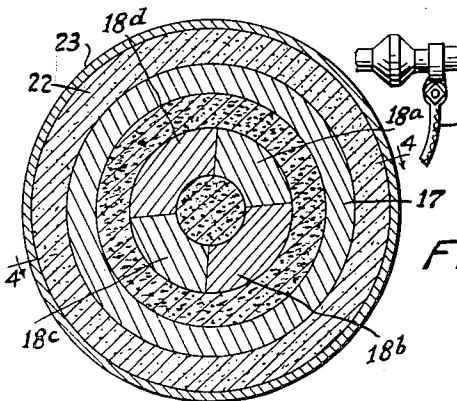
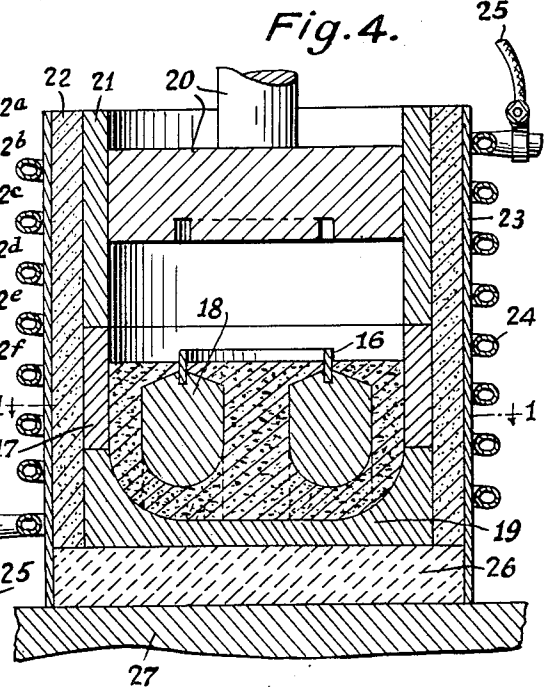
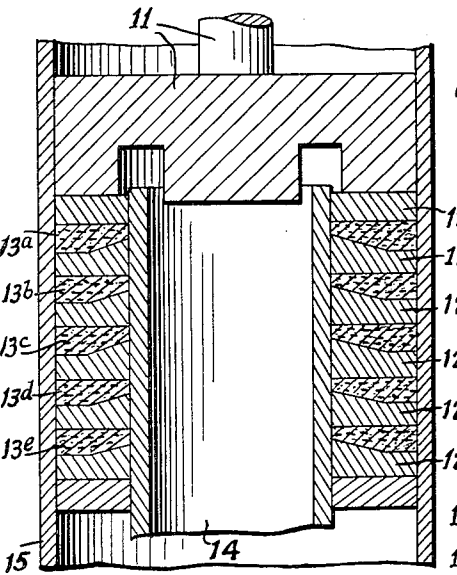
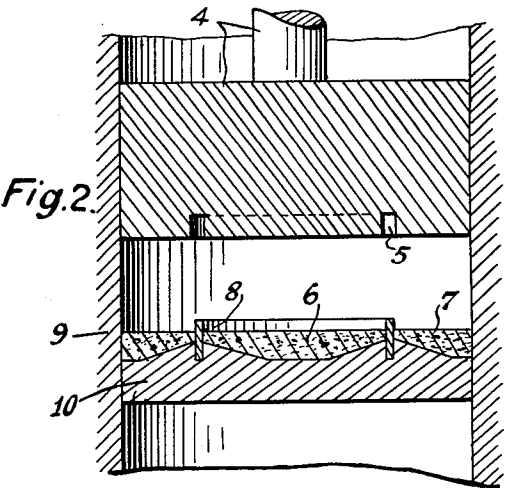
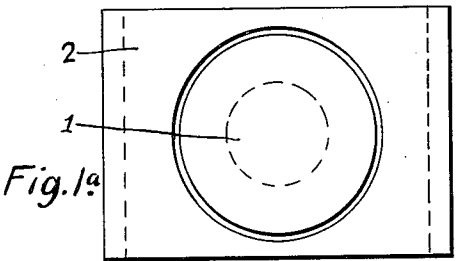
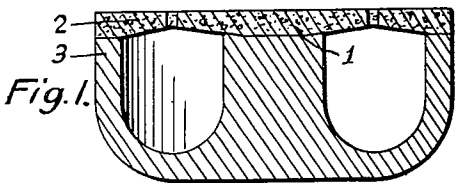
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IMPROVEMENTS IN OR RELATING TO MAGNETS

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## UNITED STATES PATENT OFFICE

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IMPROVEMENTS, IN OR RELATING TO  
MAGNETSAugust Rehmann, Dusseldorf, Germany, assignor  
to Deutsche Edelstahlwerke Aktiengesellschaft,  
Krefeld, GermanyApplication October 19, 1932, Serial No. 638,601  
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2 Claims. (Cl. 175—21)

The present invention relates to magnets, which at the present time are normally produced from steel alloys by rolling, forging, or casting. According to the invention the cores or pole pieces of magnets or both are produced by sintering a mass of finely powdered material, the invention also covering cases in which magnets are partly manufactured by sintering. The invention is especially applicable to the manufacture of magnets of elliptical type, for instance, magnets for loud speakers, which hitherto are difficult to produce. The magnetic qualities of magnets manufactured as above are highly increased.

It is particularly suitable for the purpose to complete the sintering of the pole-pieces themselves by a sintering process and then to effect the sintering of the pole-pieces with the magnet by a second process. The process may be varied in such a manner that pole-pieces of solid or laminated material are combined with the sintered body into a complete magnet. The combining of the pole-pieces with the sintered body may be effected during the sintering process or even after sintering, for instance, by shrinking on, welding or soldering.

The invention may be clearly understood and readily carried into effect with reference to the accompanying drawing in which:

Figure 1 is a longitudinal section of a magnet with sintered pole pieces.

Figure 1a is a plan view of the magnet shown in Fig. 1.

Figure 2 is a longitudinal section of a device for pressing and sintering of pole pieces.

Figure 3 is a part of a device in longitudinal section for the pressing and sintering of pole pieces.

Figure 4 is a longitudinal section of a high frequency electric furnace with a mould adapted to form magnets taken along line 4—4 of Fig. 4a.

Figure 4a is a detail sectional view of the Figure 4 showing the magnet with the moulding core 18, taken along line 1—1 of Fig. 4.

Referring first to Figure 1, 1 and 2 represent the sintered pole pieces, 3 indicates the cast body of the corresponding part of the magnet.

In Figure 2, 4 illustrates the pressing stamp with an annular groove 5, 6 the inner-pole and 7 the outer-pole, 8 an inserted annular rib, adapted to form the air gap, 9 and 10 represent the moulding members. The manufacture of pole pieces according to Figure 2 is carried out in the following manner. The mould 9, 10 as illustrated in the drawing is filled with powdered material and the mass is then tamped and com-

pressed by the tamper 4 and sintered in the mould by the application of heat.

In Figure 3, 11 represents the ram. 13a to 13e represent a group of outside pole rings of finely divided material, which are enclosed by moulding members 12a to 12f, 14 and 15. The manufacturing of the articles is the same as above described.

In Figure 4, 17, 18 and 19 are moulding members, 16 a ring adapted to shape the air gap, 20 the ram, 21 a cylinder, 22 a carbon mass, 23 a fused silica tube, 24 a coil of flattened copper pipe with electric connection 25 at either end of the coil, 26 a refractory block, 27 an iron sheet.

The Figure 4a illustrates a construction of the moulding core 18 and its arrangement in the magnet. As it is shown the core 18 is divided into several parts for instance 18a, 18b, 18c and 18d. Two of them 18b and 18d are larger than the other parts of the core as illustrated in the drawing and form holes at the bottom of the magnet. The cores 18b, 18d and the moulding part 19 are all of one piece. This construction is advantageous as the iron parts of the mould have to withstand a high pressure exercised by the ram 20 on the mould filled with the powder of magnetical material. The cores 18b and 18d can be removed after the magnet is sintered. Thereafter the cores 18a and 18c can be taken out through the holes at the bottom of the magnet. The process of producing the magnets can be carried out in the following manner. The mould constituted by 16, 17, 18 and 19 is partly filled with finely powdered material consisting for instance of cobalt, tungsten, chromium, molybdenum and iron with carbon particularly in the limits of 5-50% Co, 1-10% W, 10-90% Fe with 0.5-7% carbon.

Since the pole shoes should consist of iron or a material with high permeability, the whole mould is not completely filled with the material above mentioned but only the lower part. The upper part of the mould is then filled with finely divided iron. The whole mass is thereafter tamped and sintered by subjecting the mould to a heat-treatment, for instance by subjecting the mass to a pressure of about 3-4,000 pounds per square inch and high frequency eddy currents of electricity at a rate of 4-6 kilovolt-amperes. At the end of the process the current is turned off and the mould allowed to cool.

I claim:

1. Method of producing magnets by joining the pole pieces with the magnet-body comprising the forming and sintering of the pole pieces and sep-

arated therefrom the producing of the magnet body and the joining of the pole pieces with the magnet by heating the parts in a furnace and simultaneously pressing them together.

- 5 2. Method of producing magnets comprising the forming of the magnet body by tamping and compressing finely powdered material in a mould,

the forming of the pole pieces thereafter by filling up the same mould with a mass of finely powdered material, and by tamping and compressing this mass, sintering the whole mass by heating and by simultaneously compressing it in a furnace.

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