

S. BRÜCK.
 APPARATUS FOR MAGNETICALLY SEPARATING MATERIALS.
 APPLICATION FILED MAY 17, 1911.

1,056,318.

Patented Mar. 18, 1913.

Fig. 1.

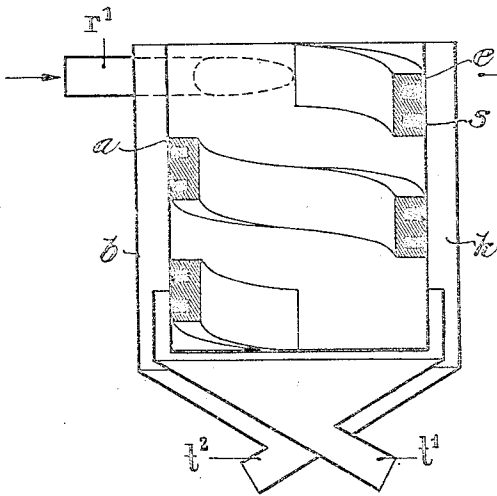


Fig. 2.

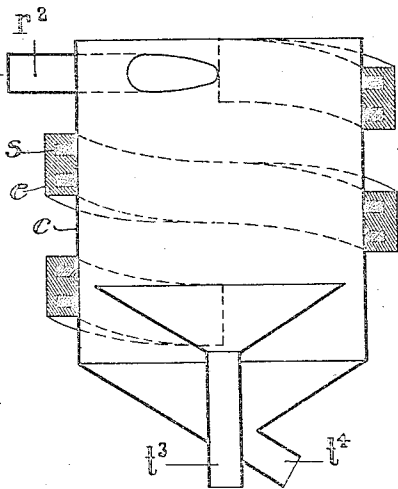


Fig. 3.

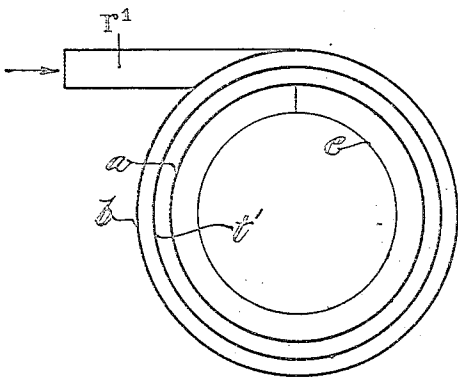
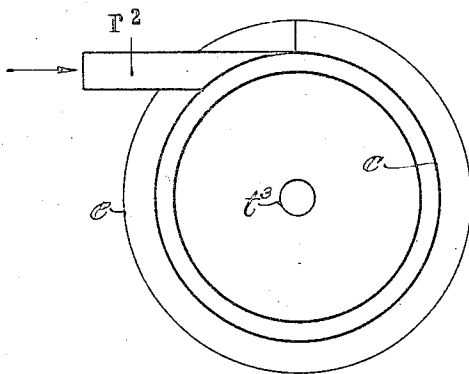


Fig. 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAGNETICALLY SEPARATING MATERIALS.

1,056,818.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, STEPHAN BRÜCK, a subject of the German Emperor, and residing at Berlin, Germany, have invented certain new and useful improvements in Apparatus for Magnetically Separating Materials, of which the following is a specification.

My invention relates to apparatus for magnetically separating fine-grained magnetic and non-magnetic materials or highly and slightly magnetic materials.

My invention which utilizes the attractive force of a magnetic field not only as such, but equally makes use of the dynamic nature of the same, substantially differs from known processes in the following respects: In known devices the material to be dressed is passed through a magnetic field which, with regard to the direction in which the material is to be moved, gradually increases in strength and becomes weaker. At a certain place it has a maximum strength of field and exercises its greatest attractive force at one definite place; that is to say the material to be dressed must traverse a fairly sharply marked zone of separation. The magnetic separation proper of the material therefore occurs comparatively very rapidly. Consequently, on the one hand those magnetic parts of the material to be dressed which are nearest the field are very rapidly attracted and carry along with them a quantity of non-magnetic parts. On the other hand, the magnetic parts more removed from the field cannot arrive in due time within such range of the field that they are attracted by the magnet. Again, the attracted magnetic parts are positioned very firmly, because the displacement of a magnetic body from a magnetic field of great intensity into one of less intensity requires a certain expenditure of force. Consequently the non-magnetic parts carried along by the magnetic parts are securely held and can be removed from this position only with difficulty. Consequently, when the material to be dressed has left the separation zone there is no possibility of the parts not properly separated arriving within range of the separating magnetic force. The attempt has been made to overcome this difficulty by passing the material through a magnetic field, uniform in longitudinal direction, whereby the material is pushed in a dense layer past the magnet by the weight of the new introduced

material. The disadvantage of this device lies in the fact that, as a rule, separation takes place on the inlet point only, and even there only on the outer layer of the material because no loosening of the material is produced, whereby further separation may be caused. The attracted parts are magnetically induced and retained in their relative position with respect to the magnet, so that the entire charge while sliding downward will retain the position fixed at the moment of entrance. In fact, the density of the material is increased by the steadily growing weight of the ore during its downward slide, and thus the non-magnetic parts are entirely deprived of the influence of the separating force.

The present invention proposes to remove these disadvantages. To this end, the material is passed through a constant magnetic field of uniform strength in the longitudinal direction by means of an external force, such as water, compressed air and the like, in such manner that the separating forces are effective throughout the entire distance traversed by the material. If the material is conveyed past the magnet by water or compressed air the single particles will not be densely positioned, on the contrary, they can freely move on their entire path and are at all times subjected to the unobstructed influence of the separating forces. To this must be added the fact that the separation is as in all preparations considerably augmented through the action of the water or the air-current.

Two forms of apparatus are represented by way of example in the accompanying drawing, wherein:—

Figures 1 and 2 are vertical sections showing two forms of apparatus. Figs. 3 and 4 are plan views of Figs. 1 and 2 respectively.

Referring to Figs. 1 and 3, the electro-magnet, which comprises an iron core *e* and a winding *s* and whose field is directed outward, runs in spiral turns round the inner wall of a cylindrical vessel *a* coaxially mounted in a second cylindrical vessel *b*. The material to be dressed is spirally supplied in any suitable manner, *e. g.* by the same being tangentially introduced from above into the chamber or space *k* between the two cylinders by a pipe *r'* so that the direction of the material which is being supplied as nearly as possible coincides with the direction of the magnetic winding. The

introduced material obtains a rotatory motion from which a spiral motion results owing to the downwardly directed channel.

In the operation of the device, the non-magnetic parts are driven by the centrifugal force, due to the rotary motion against the wall of the outer vessel and are conducted downwardly along the same, while the magnetic parts are conducted downwardly along the wall of the inner vessel. The separated material is collected in two suitably arranged, coaxial funnels or hoppers, the magnetic material passing into the hopper t^1 and the non-magnetic material into the hopper t^2 , and conducted away separately.

Referring to Figs. 2 and 4, the electromagnet, whose field is directed inward, is wound spirally about the outside wall of a cylindrical vessel c . The spiral motion of the material to be dressed is here also obtained by suitably supplying the material as described with reference to Fig. 1. Owing to the formation of eddies due to the material being fed in tangentially by a pipe r the non-magnetic parts travel toward the middle of the vessel in circles which constantly become smaller and are conducted away through the hopper t^2 , while the magnetic parts are guided along the wall of the vessel parallel to the magnetic force to the hopper t^1 .

In order to separate from one another materials which are attracted with varying forces by the same magnetic field, the material to be dressed is passed in succession through a series of apparatuses of one of the hereindescribed forms, the magnets of the individual apparatuses being energized to various degrees in order first to separate the more magnetic and subsequently the less magnetic materials.

I claim:—

In an electromagnetic separator, in combination, a cylindrical vessel, a fixed spiral electro-magnet extending downwardly along a wall of said vessel which wall is stationary, means at the upper end of the vessel for projecting the material freely suspended in fluid thereto in a spiral direction, and separate discharging means for the magnetic and non-magnetic materials, the magnet being proportioned in strength to deflect the magnetic material without substantial retardation into the appropriate discharging means.

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

STEPHAN BRÜCK.

Witnesses:

WOLDEMAR HAUPT,
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