D. R. BRYAN.

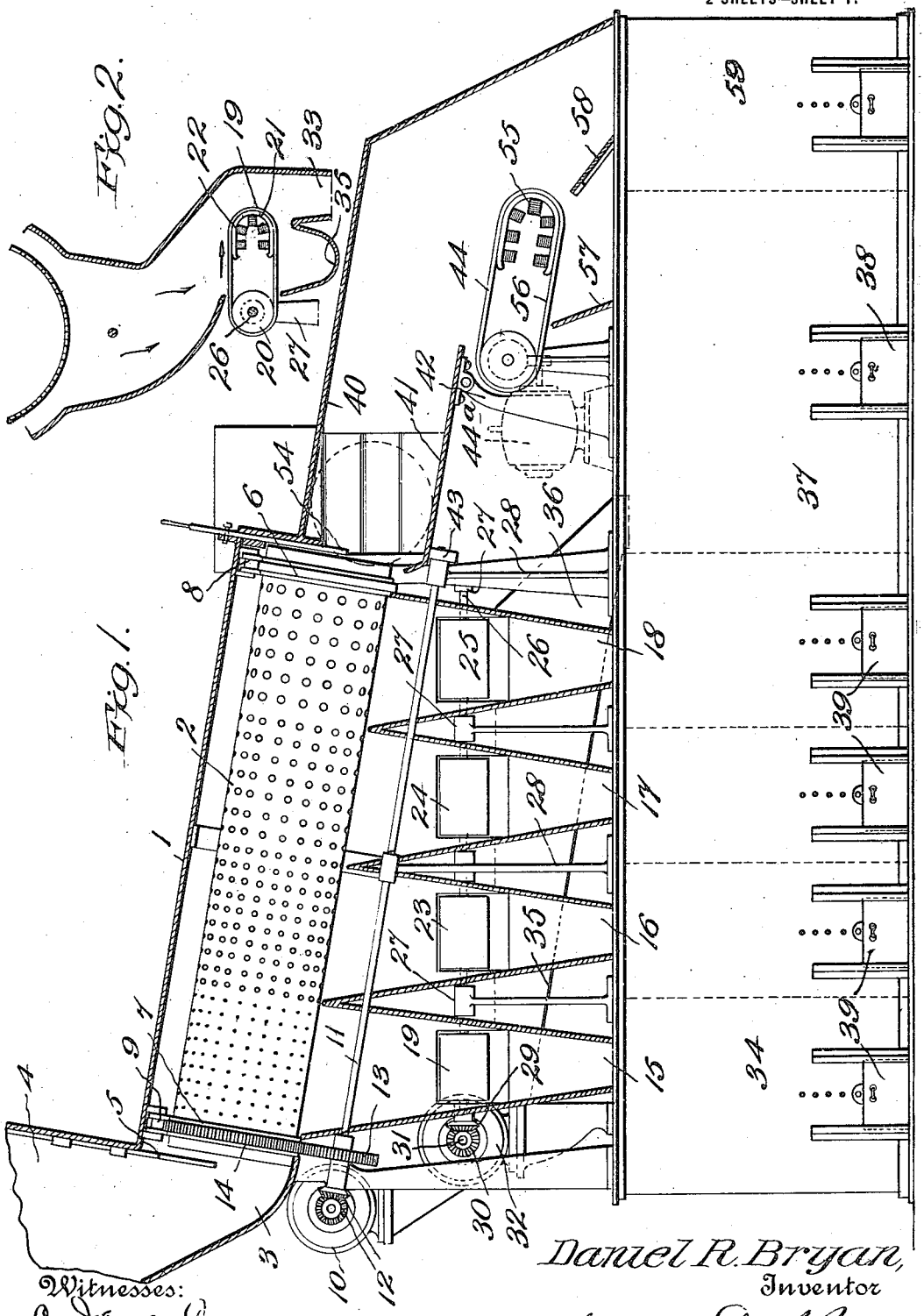
MAGNETIC SEPARATOR FOR SORTING HETEROGENEOUS MATERIAL.

APPLICATION FILED MAY 29, 1914.

1,284,872.

Patented Nov. 12, 1918.

2 SHEETS—SHEET 1.



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D. R. BRYAN.

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2 SHEETS—SHEET 2.

Fig. 3.

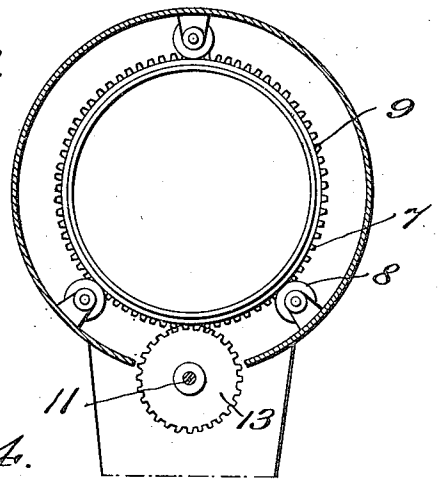


Fig. 4.

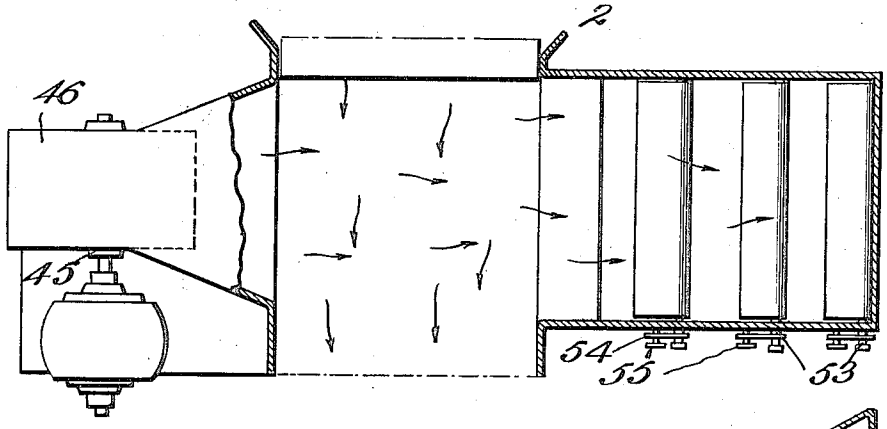
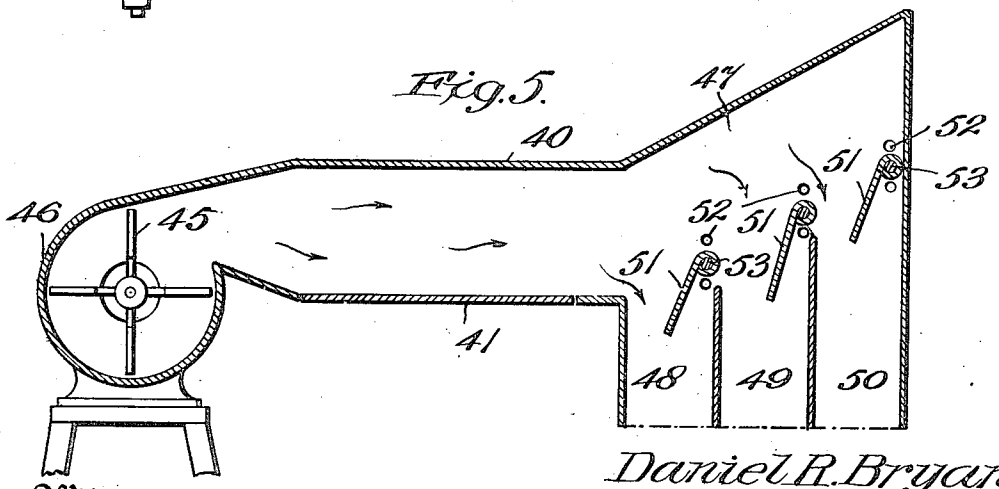


Fig. 5.



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UNITED STATES PATENT OFFICE.

DANIEL R. BRYAN, OF CHATHAM, NEW JERSEY.

MAGNETIC SEPARATOR FOR SORTING HETEROGENEOUS MATERIAL.

1,284,872. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed May 29, 1914. Serial No. 841,793.

To all whom it may concern:

Be it known that I, DANIEL R. BRYAN, a citizen of the United States, residing at Chatham, Morris county, New Jersey, have invented certain new and useful Improvements in Magnetic Separators for Sorting Heterogeneous Material, of which the following is a specification.

The present invention relates to magnetic separators for sorting heterogeneous material and consists in the combinations, and arrangements of elements hereinafter described and particularly set forth in the accompanying claims.

The invention has for its purpose to provide a separating apparatus which will recover all the magnetic particles held in suspension in the dust incident to the agitating or initial stage in the operation, and which in the present practice of separation is carried away with the dust and discarded.

The invention further contemplates an apparatus embodying the above feature as an integral element, in distinction from an auxiliary part; one wherein the complete mechanism constitutes a single and self-contained unit; and one in which the material under treatment is acted on in one continuous and unbroken operation.

The construction of apparatus is essentially the same as that disclosed in United States Reissue Patent No. 14,266, issued to me and to J. W. Bryan on March 6th, 1917, and U. S. Patent No. 1,139,484, issued to me on May 18th, 1915, respectively, and on which the present disclosure constitutes an improvement in the respects noted.

The invention is shown by way of illustration in the accompanying drawings wherein:

Figure 1 is a longitudinal vertical sectional view with parts in elevation.

Fig. 2 is a transverse sectional view taken through the initial separating mechanism, or sorting screen.

Fig. 3 is a transverse sectional view through the screen and showing the operating mechanism thereof.

Fig. 4 is a top plan view, partly in section, of the mechanism comprising the second separating stage; and

Fig. 5 is a longitudinal sectional view of the same.

Referring to the construction in detail, 1 designates a casing having mounted to rotate therein a revoluble screen or perforated cylinder 2 which receives the material *en masse* through the throat 3 of the hopper 4 and which throat is provided with a regulating gate or sliding valve 5. The screen 2 is journaled at either end by means of trunnion rings 6 and 7 engaging with rollers 8 and 9 respectively, and is connected to be driven from a motor 10 driving the shaft 11, by the miter gear 12, and a pinion 13 on said shaft meshing with the pinion 14 secured to the trunnion ring 7.

The rotatable screen 2 is disposed in a longitudinally inclined direction and has the openings thereof graduated from the receiving end to the discharging end thereof and said openings constitute a plurality of discharging stages having associated therewith the several funnels 15, 16, 17 and 18 respectively. By this provision, the material delivered to the screen for initial separation has its finer or undersized particles removed and sorted into independent receivers, whence it may be subsequently treated and its valuable constituent recovered.

Each receiving hopper of the series (15 to 18) is provided with a magnetic separator consisting of an endless belt 19 disposed in the path of the falling material as indicated by the arrows in Fig. 2, and which is mounted to travel on a pulley 20 and the frame or casing 21 of the magnet 22 adapted to be constantly energized from a suitable source. The several belts 19, 23, 24 and 25 are connected to be driven simultaneously from the shaft 26, that is suitably journaled in the bearings 27 of the standards 28, and has a beveled gear 29 meshing with the beveled gear 30 on the armature shaft 31 of the motor 32.

Immediately beneath the belt, the receiver is divided to receive the non-magnetizable or extraneous material through the passage 33, whence it enters the accumulating receptacle 34, and the magnetizable particles are delivered into the trough 35 having its bottom inclined to deliver the collected mass to the receiver 36, whence it is delivered into the accumulating receptacle 37. The trough 35 is constructed to receive the magnetizable particles from the several magnetic separators and to deliver the same into the single receptacle 37, to which access is had by the gate 38, while the non-magnetizable substances from the separators are de-

livered into their several respective chambers 34. And access is had to said chambers through the several gates 39.

From its stage of initial separation, the oversized material passes from the screen 2 to a second separator or segregator where it is subjected to a further separating treatment before being finally acted upon. The segregator consists of a casing 40, whose chamber is open to receive the material from the discharging end of the screen, and which has its bottom wall hingedly mounted on the standard 42, and adapted to be agitated by a cam 43 on the shaft 11 driven from the motor 10. Said bottom wall 41 is inclined to the end that the material deposited thereon will feed by gravity onto the conveyer belt 44 and whose function will be presently described. A fan 45 is mounted within the casing 46 forming an extension of the casing 40 and is adapted to deliver a continuous blast or current of air transversely of the bottom wall 41 and carry off the lighter particles of material deposited thereon. The air blast also acts to transversely distribute or spread out the material over the bottom wall, deflecting the material laterally more or less, according to size and weight of the particles, and to remove the non-magnetic material mechanically retained by attracted magnetic material. The material thus removed is carried in suspension into the chamber 47, whence it passes through a series of chutes 48, 49, 50 controlled by the several doors 51 after the manner of that described in my former U. S. Patent No. 1,139,484, heretofore referred to. This feature of the apparatus and its manner of operation is identical with that above identified except that in the present case the several doors 51 are adapted to be adjustably mounted by means of the series of apertures 52 designed to receive the hinge or supporting rods 53 of said doors. Each door is further provided with means for securing the same in its angularly adjusted position consisting of an arm 54 carrying a screw 55 that engages with the side of the casing 47 after the manner illustrated in Fig. 4. The doors controlling the several passageways into the chambers 48, 49, 50 may, therefore, be positioned for varying the extent of inlet opening in the passages or completely closing the same, in accordance with the condition and nature of the material under treatment.

A gate or valve 54 is located on the casing 1 adjacent to the discharge end of the screen 2 and has for its purpose to regulate the passage of material therethrough and to shut off the air blast of the fan 45 from passing into the rotary screen for obvious reasons.

The belt 44 and its motor 44^a of the final separating stage is constructed and works after the manner of the magnetic separators associated with the rotary screen. The magnetizable particles in the material delivered to the belt 44 from the agitator 41 are caused to adhere to the belt, through the magnet 55 until it reaches the point 56 when it is acted on by gravity alone and falls into the accumulating receptacle 37. A guard or partitioning plate 57 is associated with the belt to direct said material and a similar partition or deflector 58 is disposed immediately beneath the lower end of the belt and has for its purpose to receive and direct into the accumulating receptacle 59 the final residue of the mass treated.

While I have disclosed herein a preferred construction of apparatus for the purpose stated, it is to be understood that I am not limited to the precise arrangement shown but may, on the other hand, adopt such alterations or modifications, within the scope of the claims, as will better suit the invention to the end in view.

What I claim is—

1. In combination, an inclined support, means for passing material to be sorted thereover, means for passing a current of air against the material on the support transversely of the line of movement to distribute said material and remove the lighter portions, and a magnetic separator adapted to receive the material in distributed condition from the support.

2. In combination, an inclined support for receiving material to be sorted, means for agitating the support to effect the passage of material thereover, means for passing a current of air against the material on the support transversely of the line of movement to distribute said material and remove the lighter portions, and a magnetic separator adapted to receive the material in distributed condition from the support.

3. In combination, means for preliminarily sizing material to be sorted, an inclined support arranged to receive the material from said means, means for agitating the support to effect a passage of material thereover, means for passing a current of air against the material on the support transversely of the line of movement to distribute said material and remove the lighter portions, and a magnetic separator adapted to receive the material in distributed condition from the support.

4. In combination, a support, means for passing material to be sorted thereover, means for passing a fluid blast across the material on said support substantially horizontally and transversely of its travel to distribute said material and remove the lighter portions, and a magnetic separator adapted to receive the material in distributed condition from the support, substantially as set forth.

5. In combination, a support for material, means for delivering a fluid current over the material on the support at an angle to its direction of travel to remove the lighter material and distribute the remainder as a stratum, and a magnetic separator adapted to receive the material as stratified.

6. In an apparatus for sorting heterogeneous material, the combination of an extended supporting and transporting surface, adjacent means forming an extended magnetic field approximate to and substantially parallel to the plane of said surface, means for projecting a fluid current directly substantially horizontally through the material in transit to the supporting surface and upon the material supported by said surface at an angle to the direction of travel thereof.

7. In combination, means for preliminarily sizing material to be sorted, an extended supporting and transporting surface located adjacent said means and adapted to receive the initially sized material; subjacent means forming an extended magnetic field adapted to receive the material from said surface, and means for projecting a fluid current through the material in transit to the supporting surface and substantially in the plane of said surface and upon the material supported by said surface at an angle to the direction of travel.

8. In combination, a support for receiving and conveying material for separation, means for delivering the material thereto, means for creating a fluid current to act on the moving material for removing the lighter particles therefrom and distributing the residue in a direction transverse to its direction of travel to form a stratum, and a magnetic separator adapted to receive the stratum of material to remove the magnetic particles therefrom.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this 27th day of May, 1914.

DANIEL R. BRYAN.

Witnesses:
R. Z. McCOLLOCH,
C. JAMES CRONIN.