J. W. & D. R. BRYAN.

APPARATUS FOR SEPARATING AND RECOVERING DOMESTIC REFUSE.

APPLICATION FILED MAR. 21, 1916.

1,250,554.

Patented Dec. 18, 1917.

2 SHEETS—SHEET 1.

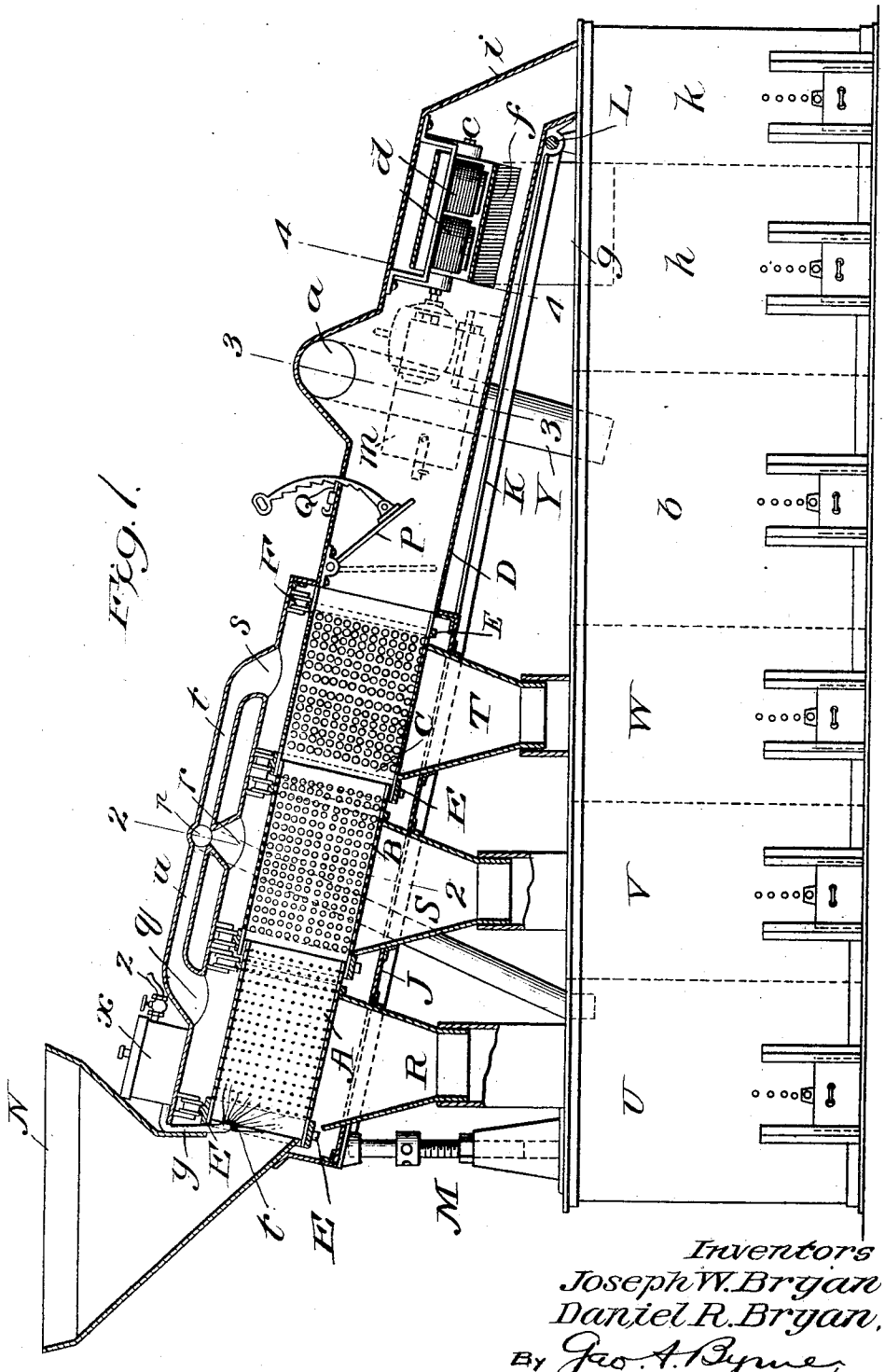


Fig. 1.

Inventors
Joseph W. Bryan &
Daniel R. Bryan,
By Jno. A. Byrne,
Attorney

J. W. & D. R. BRYAN.

APPARATUS FOR SEPARATING AND RECOVERING DOMESTIC REFUSE.

APPLICATION FILED MAR. 21, 1916.

1,250,554.

Patented Dec. 18, 1917.

2 SHEETS—SHEET 2.

Fig. 2.

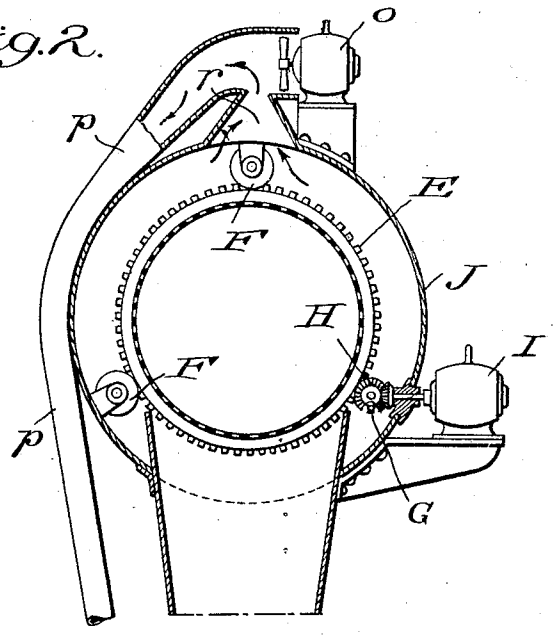


Fig. 3.

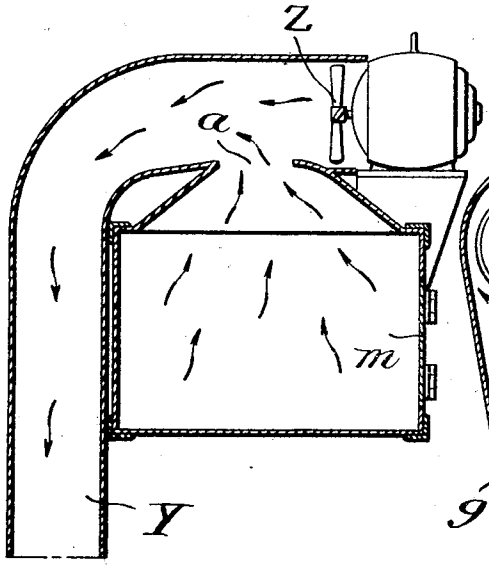
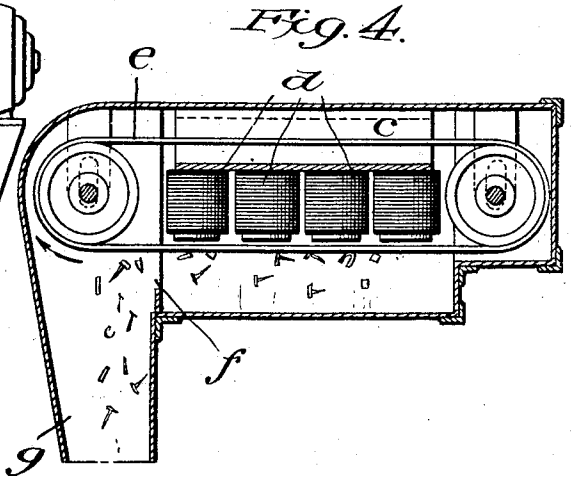


Fig. 4.



Inventors
Joseph W. Bryan &
Daniel R. Bryan,
By Geo. A. Byrne
Attorney.

UNITED STATES PATENT OFFICE.

JOSEPH W. BRYAN, OF NEW YORK, N. Y., AND DANIEL R. BRYAN, OF CHATHAM, NEW JERSEY; SAID JOSEPH W. BRYAN ASSIGNOR TO SAID DANIEL R. BRYAN.

APPARATUS FOR SEPARATING AND RECOVERING DOMESTIC REFUSE.

1,250,554. Specification of Letters Patent. Patented Dec. 18, 1917.

Application filed March 21, 1916. Serial No. 85,730.

To all whom it may concern:

Be it known that we, JOSEPH W. BRYAN, of the city of New York, county of New York, and State of New York, and DANIEL R. BRYAN, of Chatham, county of Essex, State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Apparatus for Separating and Recovering Domestic Refuse; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an apparatus for separating and recovering domestic refuse, and aims to provide improvements therein.

The invention provides a means especially adapted to sorting and delivering to appropriate receptacles heterogeneous material such as that which makes up the refuse of cities and consisting mainly of ashes, cinders, paper, rags, glass articles, metallic substances, etc. It provides a means of simple and durable construction, which will not be clogged up by the service to which it is put and which operates efficiently to perform its intended functions. Other features of improvement will be hereinafter set forth.

An embodiment of the invention is set forth in the accompanying drawing, wherein Figure 1 shows a longitudinal vertical section (with parts in elevation); and Figs. 2, 3 and 4, transverse sections on the lines 2—2, 3—3, and 4—4 respectively of Fig. 1.

In said drawings A, B and C, designate a series of rotatable screens, adapted to empty one into another, and D a chute preferably rectangular in cross sections, into which the material passes after being acted upon by the screens.

The screens may be mounted in any suitable manner and suitable means are provided for rotating them. As here shown, each of the screens is provided with a circular rack E, running in grooved rollers F, and meshing with a gear G connected through bevel gears H to the shaft of an electric motor I.

The screens are preferably so proportioned that the delivery end of one fits within the receiving end of another, as for instance the delivery end of the screen A fits within the receiving end of the screen B, thereby avoiding the formation of an obstruction by the ends of the screen. The screens are also preferably adapted to rotate at different relative speeds, and also to have the relative speeds varied. The screens will ordinarily rotate at different relative speeds, owing to the fact that they are of different diameters and being rotated by independent electric motors, variation in the relative speeds of rotation may be produced by increasing or diminishing the speed of operation of one or more of the motors. The first screen where the smallest particles are sifted out, should preferably receive the greatest speed of rotation; therefore it may be rotated at the fastest speed, and the succeeding screens at successively lesser speeds.

A casing J is preferably arranged around the hoppers to confine the clouds of dust and fine particles produced by the screening operation. The dust is preferably removed from the casing and for this purpose suitable means may be provided. As here shown, an electrically driven fan *o* is provided, which produces a current of air in a conduit *p*, which acts by inspiration, through orifices *q r* and *s*, over each of the screens and branch conduits *t* and *u* to draw the dust-laden air from the casing J into the conduit *p* and carry it away, as to a bin or receptacle U hereinafter referred to.

The screens A, B and C and the chute D are preferably mounted upon a frame K arranged at a suitable incline so that the material may move through the apparatus under the influence of gravity. The frame K is furthermore preferably mounted at one end upon a pivoted bearing L and supported at its other end upon lifting means, such as a jack M, by which the inclination of the parts may be adjusted to the frictional resistance of the material operated on, which may vary from various causes, as for instance the humidity of the air and the proportions and nature of its ingredients.

A hopper N is preferably provided, into which the material to be sorted is dumped and which delivers the same to the series of screens. Material passing from the hopper into the screen A is agitated and the screen being provided with small perforations, is partially sifted and has such particles as ashes and other fine particles removed therefrom. From the screen A the material passes to the screen B where it is again agitated and further sifted. The screen B is

provided with larger perforations than the screen A, and such parts of the material as small cinders may be removed. From the screen B the material may pass to another screen C where it undergoes further agitation and sifting. The screens C having larger perforations than the screen B operates to remove the larger particles from the mass. From the screen C the material passes into the chute D, and a swinging door P adapted to be held in adjusted positions by means of a rack and dog Q may be provided for regulating the passage of the material through the chute.

The sifted material which is separated by the several screens falls into a series of funnels, R, S and T, arranged beneath the screens, and is delivered into separate bins or compartments U, V and W, where it may be collected. As the material passes into the chute D it is preferably first acted upon by a vacuum which draws the oversized material through the outlet opening of the screen. This vacuum may be, and preferably is, produced by the inspiration of a current of air, set in motion in a conduit Y by an electrically driven fan Z, flowing past an orifice *a* in the upper part of the chute D (Fig. 3). The effect of this vacuum is to suck up light particles such as paper and rags and deliver them into a compartment or bin *b* into which the conduit Y empties and leave the residue of material as a substantially thin layer or stratum whereby it is conditioned to have the metallic particles exposed for removal.

From the point where it is acted upon by the vacuum the material passes to a point where it is acted upon by an electro-magnetic separator, *c*, the action of which is to separate metallic particles such as iron and the like from the mass. As shown (see Fig. 4) the electro-magnetic separator *c* preferably comprises a series of electro-magnets *d*, in front of which moves a belt, *e*, preferably of non-magnetic material, such as an ordinary canvas belt. Pieces of iron attracted by the electro-magnets will be carried to one side by the belt *e* through an opening *f* in the side of the chute D and dropped into a conduit *g* after being moved beyond the zone of influence of the magnets. From the conduit *g* the metallic particles are delivered into a bin or receptacle *h*.

The initial removal of the finer and non-magnetic particles from the material exposes the magnetic particles to substantially the full strength of the magnetic field and thereby insures the removal and recovery of all the magnetizable metal constituents of the refuse. On the other hand, the presence of these fine particles with the metallic particles would prevent the removal of such magnetic particles as were not directly exposed to be magnetically attracted. It is therefore necessary that the material as a whole should be first agitated by pneumatic action and the mass leveled or spread out and substantially all of the lighter particles removed before the residue in the form of a disintegrated stratum is delivered to the magnetic separator.

After passing the electro-magnetic separator such parts of the mass as remain, and consisting mainly of bottles and particles of glass, will be delivered through a conduit *i* at the end of the chute D, into a bin or receptacle *k* where they are collected and further separation may be made if desired. Each of the bins or receptacles U, V, W, *b*, *h* and *k* is preferably provided with a door, through which the contents may be removed.

m is a door in the chute D through which access may be had to the interior thereof.

Means are provided for antiseptically treating the entire mass of refuse as it leaves the hopper. This means may comprise a tank *x* adapted to contain a suitable disinfectant *t*, a pipe *y* adapted to spray the disinfectant over the refuse as it enters the first screen. A pipe *z* is also preferably provided through which compressed air from a suitable source, may be admitted to the tank to force the disinfectant out through the pipe *y* over the material to be sprayed.

A similar apparatus necessary to the separating and recovering of the ingredients of domestic refuse forms the basis of Patent No. 1,099,420 dated June 9, 1914, and for which a reissue patent was issued to us March 6th, 1917, No. 14266. In the reissue patent, however, the magnetic separator forms no element of the claims while in the present case the claims are directed to several elements including the magnetic separator as a magnetic separating apparatus.

While we have illustrated and described one embodiment of the invention, the invention is not to be understood as limited thereto, as many changes and modifications may be made therein without departing from the spirit of the invention.

What we claim is:—

1. In an apparatus for separating and recovering the ingredients of domestic refuse, the combination of means for removing and sorting the undersized particles, means for subjecting the material to the action of a fluid current immediately after the removal of the undersized particles, for removing the larger lighter particles of the oversized material and leaving the residue as a stratum, a separator adapted to finally act on the stratum to remove the magnetic particles therefrom, and means for delivering the stratified material to the separator.

2. In an apparatus for separating and recovering the ingredients of domestic refuse,

the combination of means for removing and sorting the undersized particles, means for subjecting the material, during the removal of the undersized particles, to a fluid current for extracting the fine particles, means for subjecting the material, immediately after the removal of the undersized particles, to a fluid current for the removal of the larger lighter particles of the oversized material, and leaving the residue as a stratum, a magnetic separator adapted to act on the stratum of material to remove the magnetic particles and means for delivering the stratified material to the magnetic separator.

3. In an apparatus for sorting and recovering the ingredients of domestic refuse, the combination of an agitator for removing and sorting the undersized material; means for subjecting the remainder of the material to a fluid current for recovering the larger lighter particles and leaving the residue as a substantially thin layer or stratum; an electro-magnet adapted to remove the metallic particles from the stratum and a separating means adapted to carry the material through the influence of the fluid means and deliver the same as stratified to the magnetic separating means.

4. In an apparatus for sorting and recovering the ingredients of domestic refuse, the combination of an agitator for removing and sorting the undersized material; means for subjecting the material during agitation to a fluid current for extracting the finer particles; means for subjecting the remainder of the material to penumatic action to recover the larger lighter particles, and leaving the residue as a substantially thin layer or stratum; an electro-magnet for removing the metallic particles from the stratum, and means adapted to carry the material through the influence of the fluid means and deliver the same as stratified to the electro-magnet.

5. In an apparatus for separating and recovering ingredients of domestic refuse, the combination of means for preliminarily sorting and removing the undersized particles of material to be sorted; means for subjecting the residue of the material to penumatic action for removing the larger lighter particles, and leaving the residue of the material as a substantially horizontal disintegrated stratum; and a magnetic separator adapted to act on the stratum to remove the magnetic particles, and means adapted to carry the material through the influence of the pneumatic means and deliver the same as stratified to the magnetic separator.

6. In combination, an agitating means, means coöperative therewith for primarily separating material to be sorted, means for creating a fluid current for drawing the oversized material away from said agitating means, and for removing the larger lighter particles from the mass and leaving the residue as a disintegrated stratum, a magnetic separator adapted to act on the stratum of material to remove the metallic particles therefrom, and means for delivering the stratified material to the separator.

7. In combination, an agitating means, means for creating a fluid current for simultaneously drawing material away from said agitating means and for removing the larger lighter particles from the mass and leaving the residue as a disintegrated stratum, a magnetic separator adapted to act on the stratum of material to remove the metallic particles therefrom, and means for receiving the material from said agitating means and delivering the same as stratified to the separator.

8. In an apparatus for separating and recovering the ingredients of domestic refuse the combination of means for removing and sorting the undersized material, means for subjecting the remainder of the material to the action of an air blast directed substantially horizontally and transversely thereof for removing the larger lighter particles and leaving the residue as a stratum, a magnetic separator adapted to finally act on the stratum to remove the magnetic particles therefrom, and means for delivering the stratified material to the magnetic separator.

In testimony whereof, we have affixed our signatures, in presence of two witnesses.

JOSEPH W. BRYAN.
DANIEL R. BRYAN.

Witnesses:
OSCAR CARLBERG,
GERTRUDE H. WOODS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."