J. W. & D. R. BRYAN.

METHOD OF SEPARATING AND RECOVERING DOMESTIC REFUSE.

APPLICATION FILED MAR. 21, 1916.

1,244,952.

Patented Oct. 30, 1917.

2 SHEETS—SHEET 1.

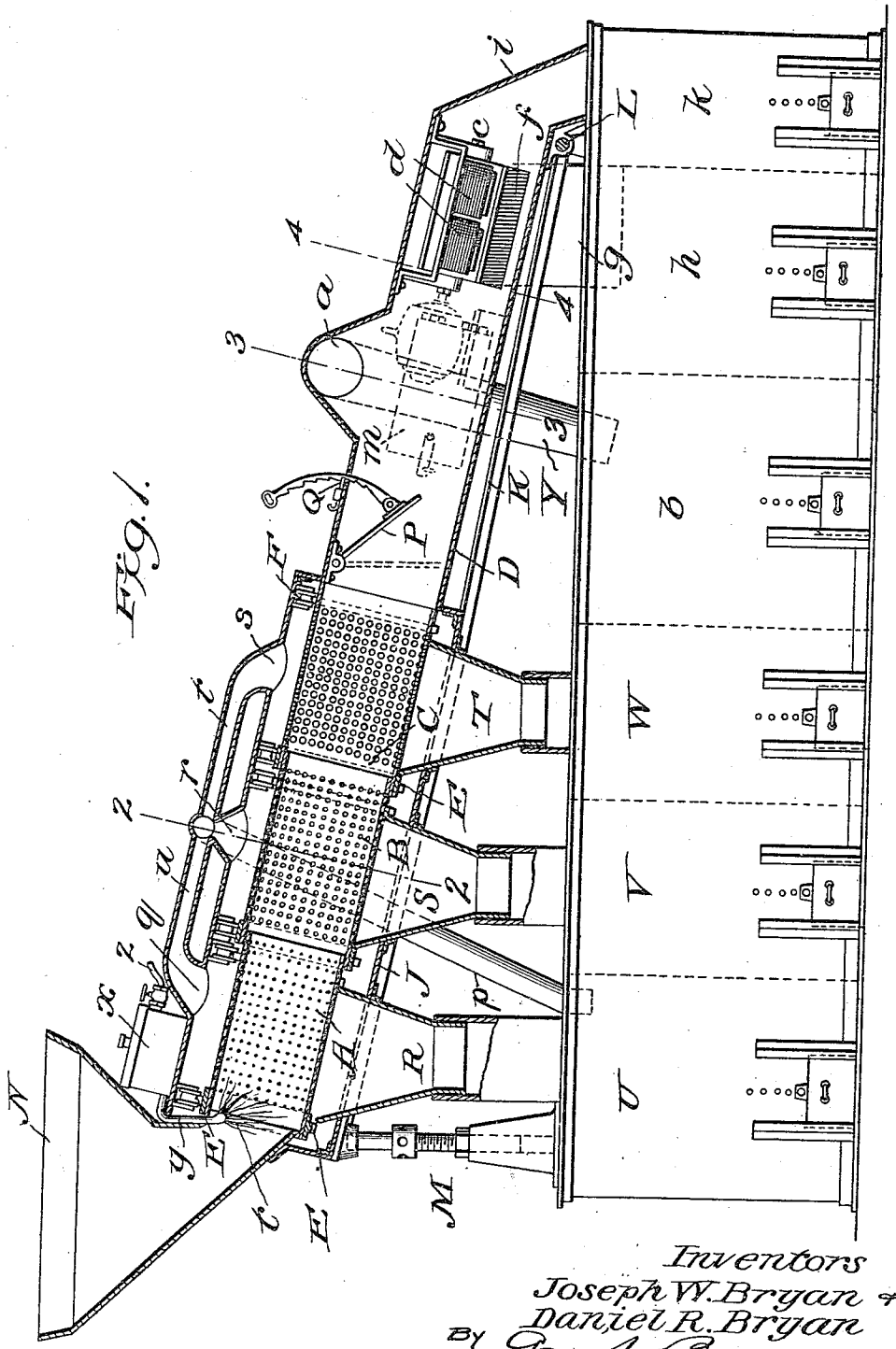


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

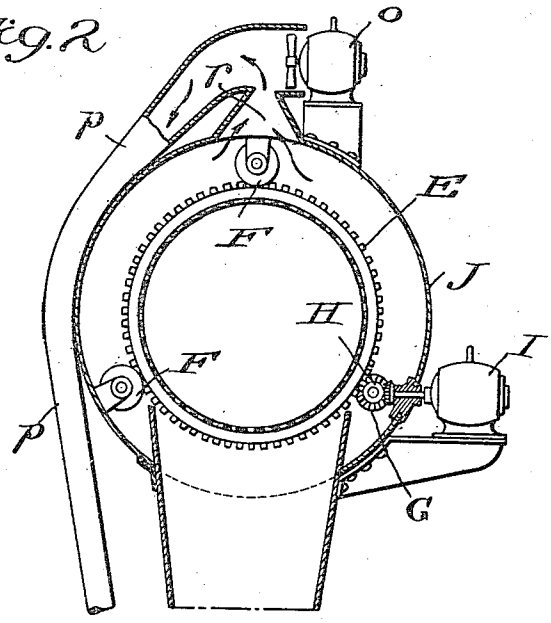


Fig. 3.

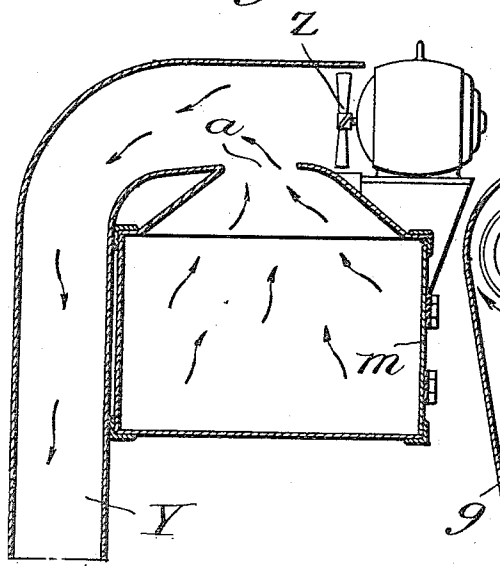
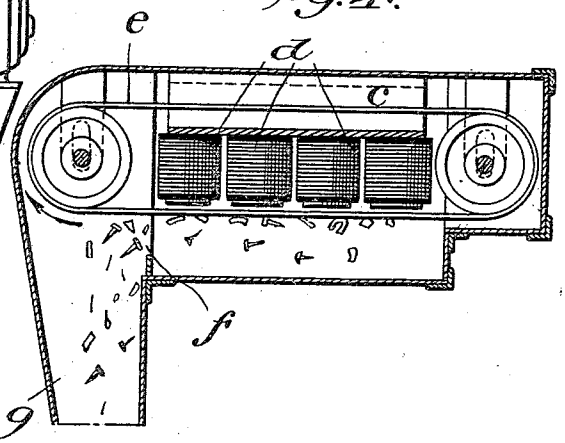


Fig. 4.



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UNITED STATES PATENT OFFICE.

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METHOD OF SEPARATING AND RECOVERING DOMESTIC REFUSE.

1,244,952. Specification of Letters Patent. Patented Oct. 30, 1917.

Application filed March 21, 1916. Serial No. 85,729.

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 Methods of 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 a method of separating and recovering domestic refuse containing pulverulent and fibrous material and magnetic particles and consists in the combinations of steps and order of procedure hereinafter described and particularly set forth in the accompanying claims.

The invention has for its purpose to provide a method for recovering the valuable constituents of domestic refuse and separating the same into divisions or groups of like material and wherein the several steps are carried out in one continuous operation.

The apparatus necessary to the carrying out of the present invention forms the basis of our Patent No. 1,099,420, dated June 9, 1914, and for which we have copending in the U. S. Patent Office an application for the reissue thereof bearing Serial No. 86696, and dated March 25th, 1916.

The apparatus employed is disclosed in the accompanying drawings 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 section, 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 screen 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 electromagnetic 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 electromagnetic separator *c* preferably comprises a series of electromagnets *d* in front of which moves a belt *e*, preferably of non-magnetic material, such as 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*.

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.

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. The method of separating and recovering the ingredients of domestic refuse, which consists of primarily separating by gravity the undersized particles thereof, then subjecting the oversized material to a fluid current to break up and spread out the mass and to remove the lighter particles and leave the residue as a distributed stratum to have the metallic particles exposed for removal, and then collecting substantially all of the magnetizable particles from the stratum by magnetic attraction.

2. The method of separating and recovering the ingredients of domestic refuse, which consists of primarily separating by gravity the undersized particles thereof, then subjecting the oversized material to pneumatic action to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum, then collecting substantially all of the magnetizable particles from the stratum by magnetic attraction, and finally collecting the residue of material.

3. The method of separating and recovering the ingredients of domestic refuse, which consists in initially removing and grading the undersized particles thereof, then subjecting the oversized material to pneumatic action to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum, and then collecting substantially all the magnetizable particles from the stratum by magnetic attraction.

4. The method of separating and recovering the ingredients of domestic refuse, which consists in initially removing and grading the undersized particles thereof by simul-

taneous agitation and pneumatic action, then subjecting the oversized material to pneumatic action to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum, and then collecting substantially all the magnetizable particles from the stratum by magnetic attraction.

5. The method of separating and recovering the ingredients of domestic refuse, which consists of preliminarily sizing the material, then directing the oversized material onto an extended supporting and transporting surface, then subjecting the material to a fluid current to break up and spread out the mass and remove the lighter particles, and leave the residue in a distributed condition on the support, and then collecting substantially all of the magnetizable particles from the residue by magnetic attraction.

6. The method of separating and recovering the ingredients of domestic refuse, which consists of preliminarily sizing the material, then directing the oversized material onto an extended supporting and transporting surface, then subjecting the material to a fluid current to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum on the support, then collecting substantially all the magnetizable particles from the stratum by magnetic attraction, and finally collecting the residue of material.

7. The method of separating and recovering the ingredients of domestic refuse, which consists in preliminarily sizing the material, then directing the oversized material onto a supporting surface, then subjecting the material to a fluid current to act on the moving material longitudinally of its line of movement to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum on the support, and then collecting substantially all of the magnetizable particles from the stratum by magnetic attraction.

8. The method of separating and recovering the ingredients of domestic refuse, which consists of initially removing and grading the undersized particles thereof, then directing the oversized material onto an inclined supporting surface, then subjecting the material to a fluid current to break up and spread out the mass and leave the residue as a distributed stratum on the support, then collecting substantially all the magnetizable particles from the stratum by magnetic attraction and finally collecting the residue of material.

9. The method of separating and recovering the ingredients of domestic refuse, which consists in primarily separating by gravity and pneumatic action both the light fine particles and the heavy fine particles from the mass, then directing the oversized material onto a supporting surface, then subjecting the material to a fluid current to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum on the support, then collecting substantially all of the magnetizable particles from the stratum by magnetic attraction, and finally collecting the residue of the material.

10. The method of separating and recovering the ingredients of domestic refuse, which consists in preliminarily sizing the material by simultaneous agitation and pneumatic action, then subjecting the oversized material to a fluid current for simultaneously drawing the oversized material away from the preliminary sizing means and for acting on the mass to break up and spread out the same, and remove the lighter particles and leave the residue as a distributed stratum, and finally collecting substantially all the magnetizable particles from the stratum by magnetic attraction.

11. The method of separating and recovering the ingredients of domestic refuse, which consists in preliminarily sizing the material by simultaneous agitation and pneumatic action, then directing the oversized material onto an inclined supporting surface, then subjecting the material to a fluid current to act on the moving material longitudinally of its line of movement to break up and spread out the mass and remove the lighter particles and leave the residue as a distributed stratum on the support, and then collecting substantially all of the magnetizable particles from the stratum by magnetic attraction.

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."