

P. BONVILLAIN.

HYDRAULIC SEPARATOR FOR TOWN REFUSE.

No. 566,888.

Patented Sept. 1, 1896.

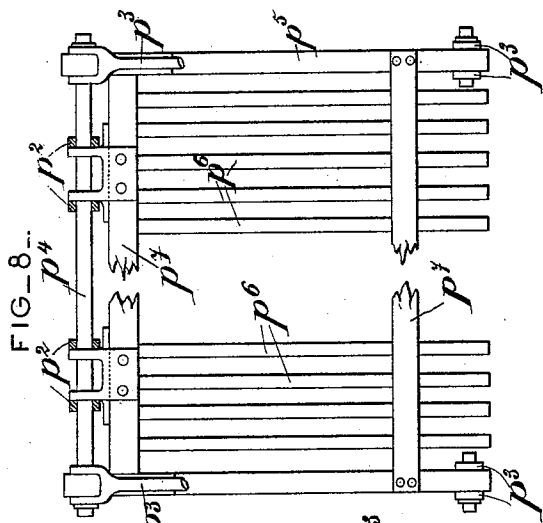


FIG-7--

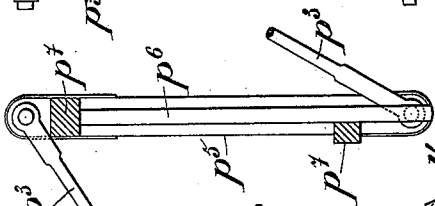


FIG-6--

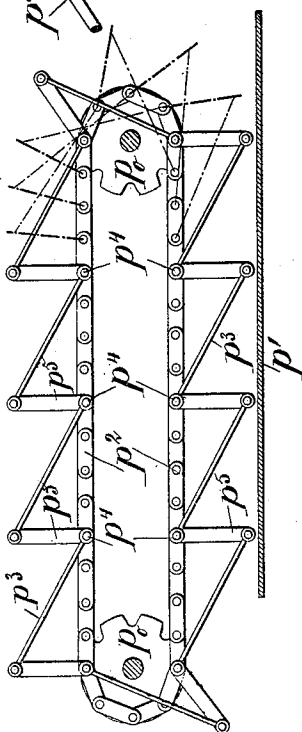
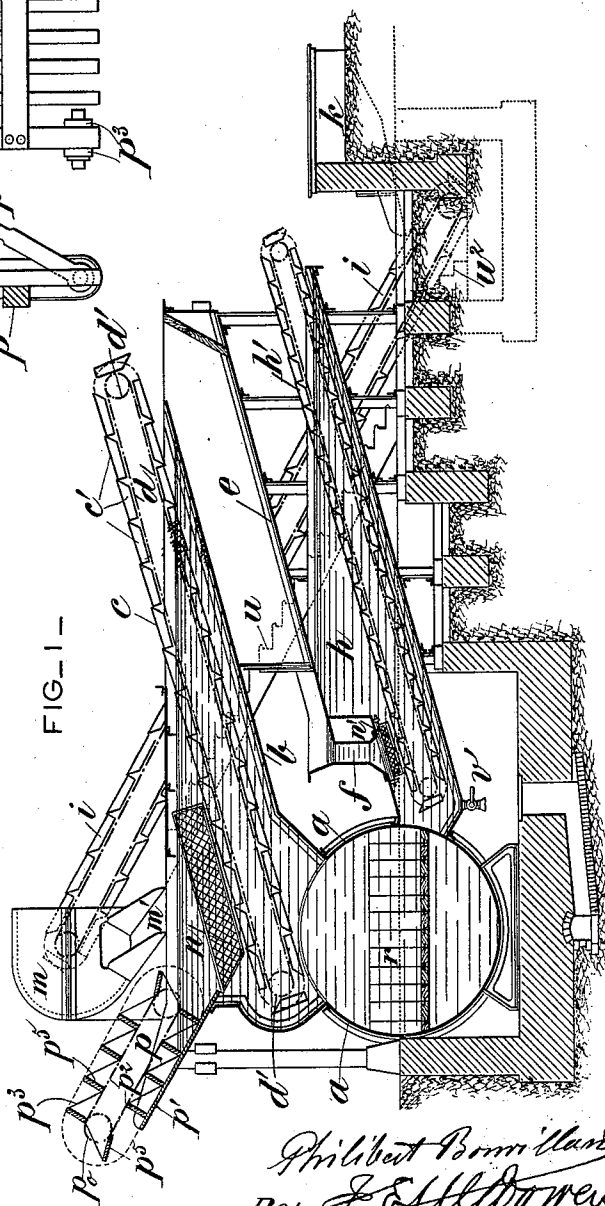


FIG-1--



Witnesses:-
W. C. Pinkney
St. E. Bower

Philbert Bonvillain
By J. E. Bower
Atty.

(No Model.)

6 Sheets—Sheet 2

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FIG. 5

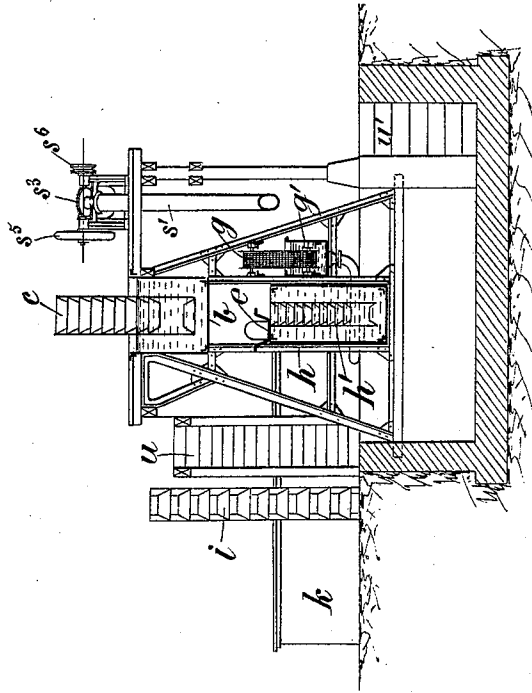
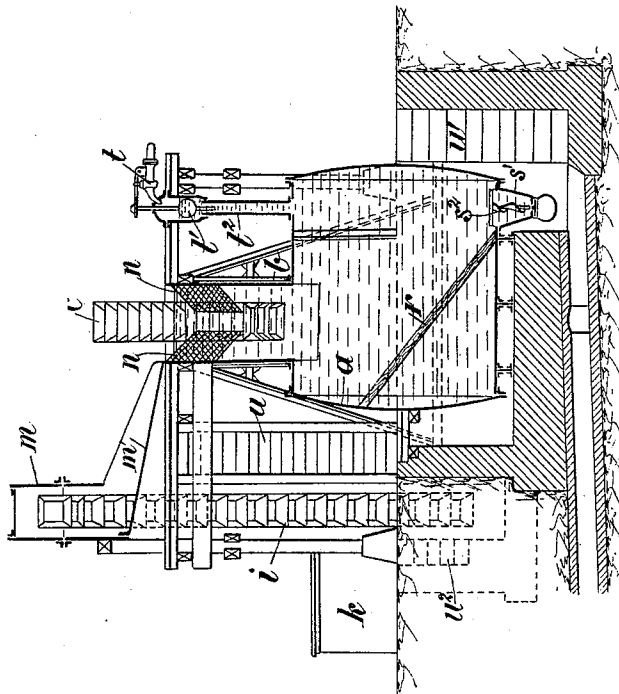


FIG-2-



Witnesses:-
W. C. Pinckney
W. E. Bower

Philbert Bonwillam
By: J. E. W. Wren
Atty.

(No Model.)

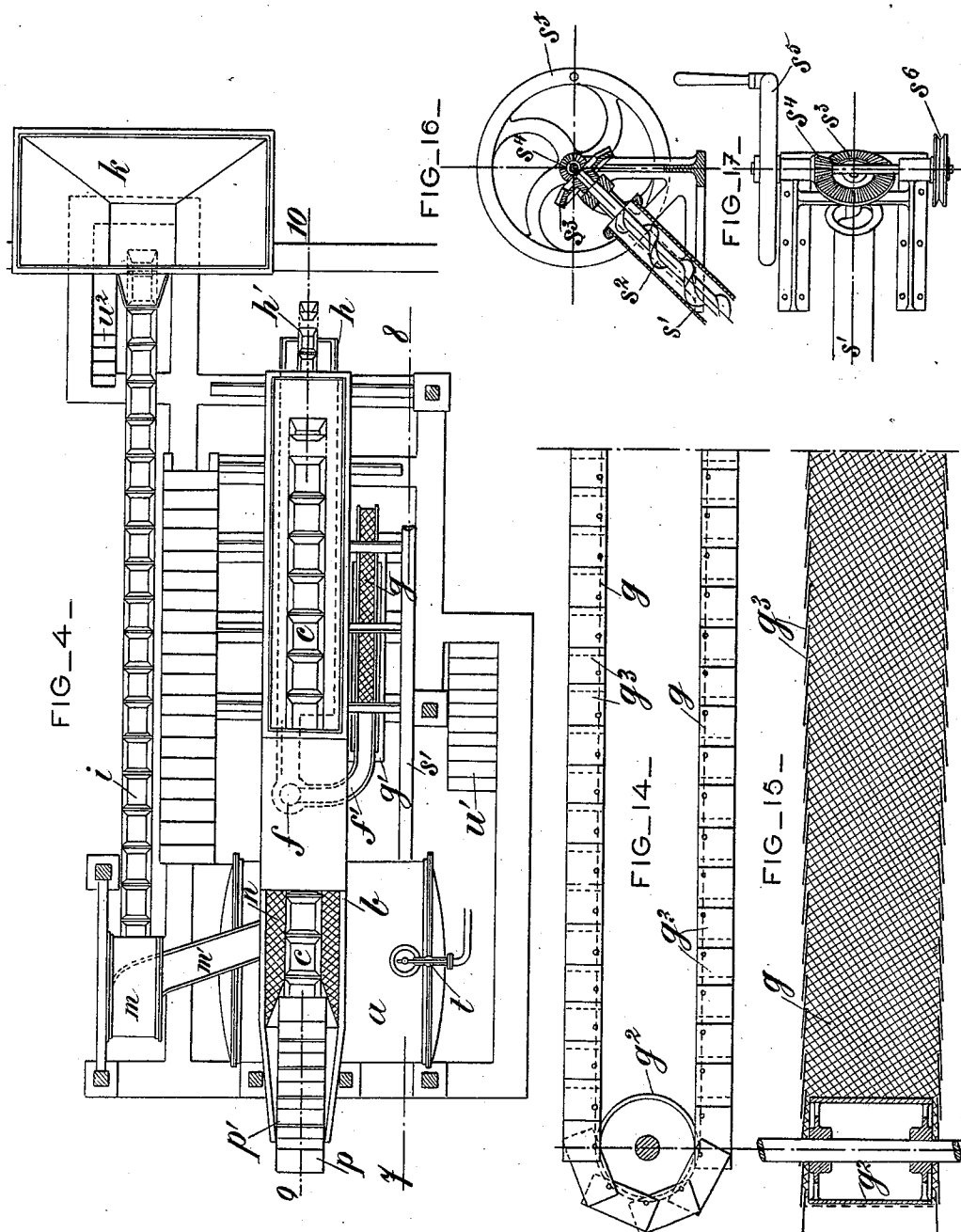
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Witnesses:-
H. C. Pinckney.
W. E. Bowler.

Philip Bonvillain
By J. H. Bowen
ATTY.

(No Model.)

6 Sheets—Sheet 4.

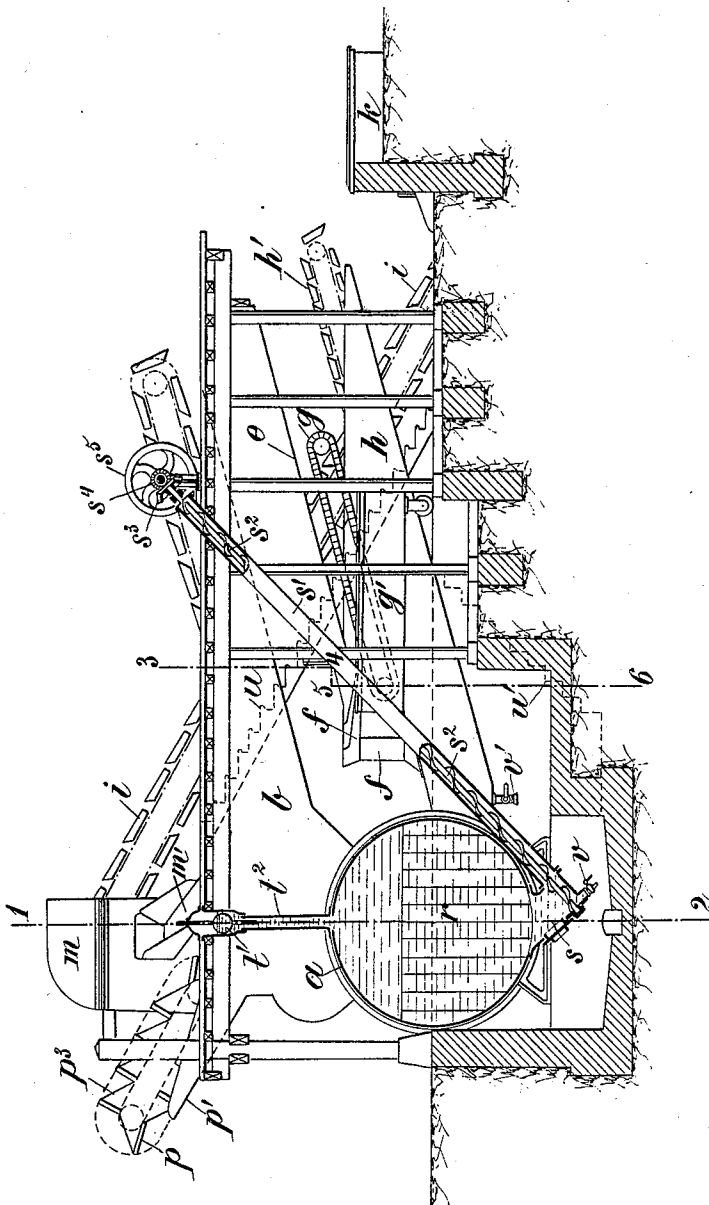
P. BONVILLAIN.

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Patented Sept. 1, 1896.

FIG-5-



Witnesses:

W. C. Pinckney

W. C. Bowen

Philip Bonvillain
By: J. E. Dorren

P. BONVILLAIN.

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FIG. 10—

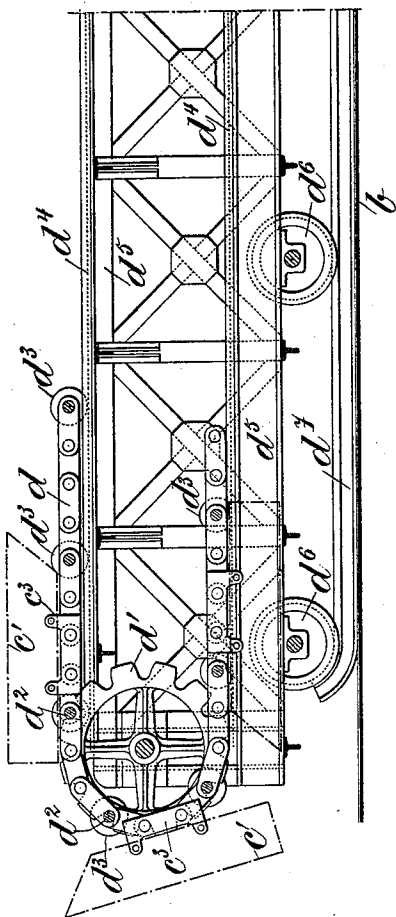


FIG. 11—

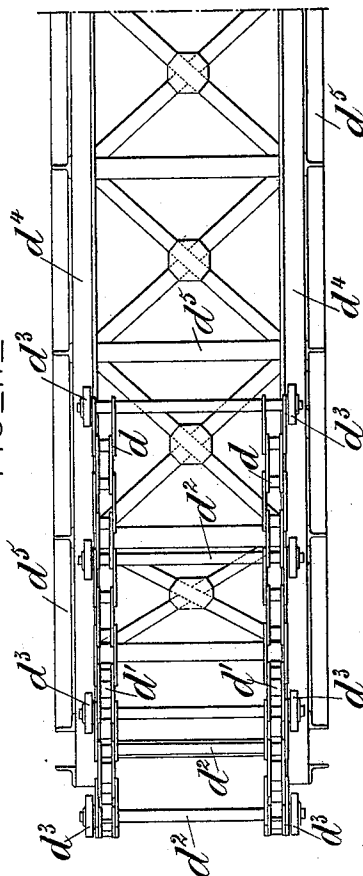


FIG. 9—

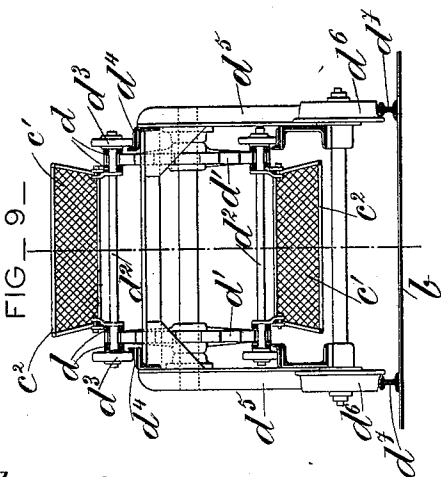


FIG. 12—

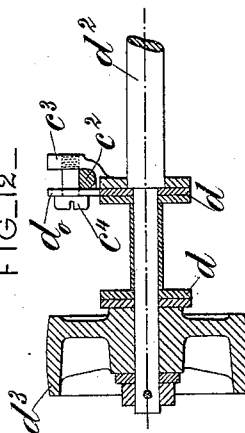
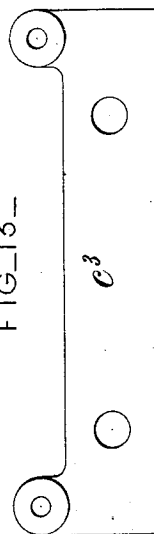


FIG. 13—



Witnesses:

W. C. Pinckney

W. E. Bower

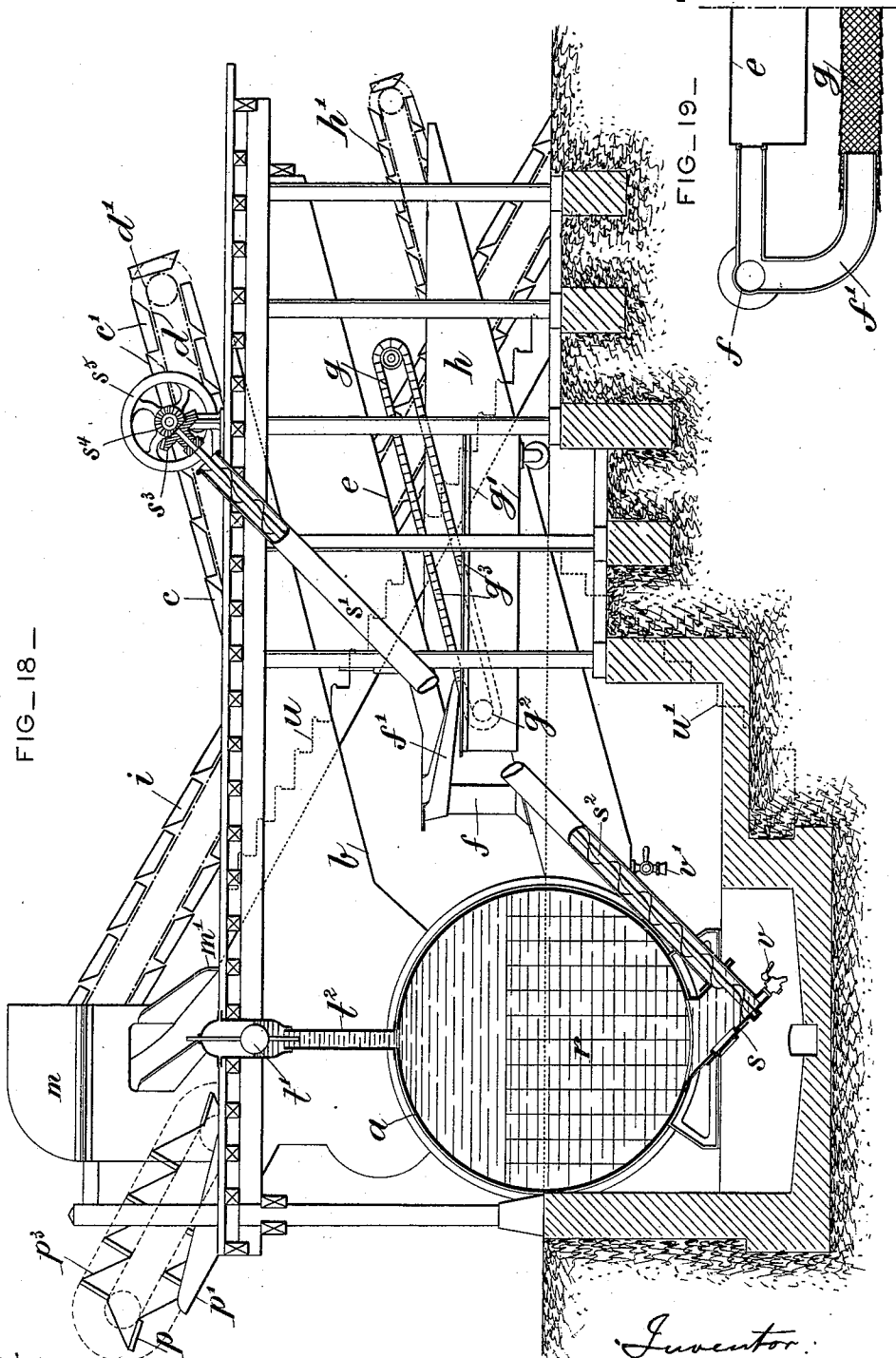
Philip Bonvillain
BY J. E. Bower
ATTY.

P. BONVILLAIN.

HYDRAULIC SEPARATOR FOR TOWN REFUSE.

No. 566,888.

Patented Sept. 1, 1896.



Witnesses:—
W. C. Pinckney
C. Holloway

Inventor:
Philibert Bonvillain
By J. E. D. D. D. D. D.
attorney.

UNITED STATES PATENT OFFICE.

PHILIBERT BONVILLAIN, OF NEUILLY, FRANCE.

HYDRAULIC SEPARATOR FOR TOWN REFUSE.

SPECIFICATION forming part of Letters Patent No. 566,888, dated September 1, 1896.

Application filed August 12, 1895. Serial No. 559,026. (No model.) Patented in France October 23, 1894, No. 242,296.

To all whom it may concern:

Be it known that I, PHILIBERT BONVILLAIN, engineer, a citizen of the Republic of France, residing at Neuilly, in the Seine Department, France, have invented a new Hydraulic Separator of Town Refuse, (for which I have obtained Letters Patent in France, No. 242,296, dated October 23, 1894,) of which the following is a full description.

10 My invention consists of a hydraulic separator designed to automatically separate from each other the vegetable and inert matters and the dirt and ashes contained in town refuses.

15 In large towns the refuse has generally only a very small commercial value because it contains too much mineral matters. The contents of the said refuse are usually composed as follows: first, of animal and vegetable matters, the density of which is less than that of water for the greater part; second, of vegetable matters slightly heavier than water; third, of mineral matters always heavier than water.

25 The animal and vegetable matters contain fertilizing elements of great agricultural value; but, in order to give it a commercial value, it must be separated from the mineral matters at a very low cost. This is what is done in both a simple and complete manner by my hydraulic separator, which makes use of the different densities of the components of the refuse to effect the separation in question. For this purpose the town refuse is fed into a tank full of water, when the animal and vegetable matters lighter than the liquid float on the surface of the latter and are taken off by means of a revolving rake. The matter heavier than the water sinks and meets with a conveying-elevator having buckets made of wire-netting, which carries off the said matters and allows small matters, such as ashes and dust, to fall to the bottom of the tank.

40 In order to recover vegetable matters heavier than water and of important value, as manure, the vegetable and mineral matters heavier than water are fed into an upwardly-flowing stream of water strong enough

to throw up the lightest vegetable matters, 50 but not strong enough to prevent the heavier bodies from falling onto a conveying-elevator, which delivers them out of the apparatus.

In the accompanying drawings, Figure 1 is a longitudinal section of the separator on the 55 line 9 10 of Fig. 4. Figs. 2 and 3 are cross-sections of the same on the line 1 2 and the lines 3 4 5 6, respectively, of Fig. 5. Fig. 4 is a plan view. Fig. 5 is a section on the line 7 8 of Fig. 4. Fig. 6 is a general view of 60 the mechanical rake. Figs. 7 and 8 are detail views of the rake. Figs. 9, 10, and 11 are respectively a cross-section, a longitudinal section, and a plan view, of the conveying-elevator. Fig. 12, 13, 14, 15, 16, 17, and 19 are 65 detail views. Fig. 18 is a general view, in side elevation, of the structure as a whole.

The hydraulic separator comprises a tank *a*, integral with a hopper *b*, located above it. In the said hopper is arranged a conveying- 70 elevator *c*, the buckets *c'* of which are made of wire-netting and fixed to the links of a double Galle chain *d*, (see Figs. 4 and 5,) passing over pinions *d'*. Some of the regularly-spaced links of the chains *d* are crossed by 75 spindles *d''*, on which they are pivoted, and the said spindles carry at their ends rollers *d'''*, which run on rails *d''''*, Figs. 9 and 10. In this way the rails *d''''* carry the buckets *c'*, the friction on the spindles of the pinions *d'* being 80 thus reduced.

Each frame *c''* of the buckets *c'* is held between a projection *d''''* of a link of the chain *d* and a piece *c'''*, fixed on the said link. The frame is also held in its seat or housing by 85 screws *c''''*, Figs. 12 and 13.

Conveying-elevator *c* is supported by a beam *d''''*, mounted on wheel *d''''''*, movable on rails *d''''''*, fixed on the bottom of the hopper *b*, and can easily be removed for repairs. Under the said hopper *b* is located a box *e*, having 90 an inclined bottom which leads to a vertical pipe *f*, provided at its upper part with an inclined nozzle *f'*, ending above a conveyer *g*, made of wire-netting and passing over drums 95 *g''*, which carry the said conveyer forward like a belt above a reservoir or tank *g'*. The conveyer *g* is provided with sides *g'''*, made of

metal sheet and hinged together so as to allow the wire-netting to roll around the drums g^2 , Figs. 14 and 15.

The pipe f communicates at its lower part with a tank h , in which is arranged a conveying-elevator h' , similar to the conveying-elevator c hereinbefore described.

A third conveying-elevator i , of the same construction as the said elevators c and h' , but having buckets made of metal sheet, is disposed in front of a hopper k , and ends at its upper part into a closed hopper m , which leads to the tank b and opens above screens n , made of wire-netting and inclined in such a way that any body falling between the said screens is necessarily led into the conveyer c . Similar screens n' are arranged under the pipe f above the conveying-elevator h .

A mechanical rake p moves along on incline p' , forming part of the tank b . The said rake p (see Figs. 7, 8, and 9) consists of a double Galle chain p^2 , passing over sprocket-wheels p^0 . Some of the equally-spaced links of the double chain p^2 are pivoted on spindles p^4 , which are also used as pivots for the frames p^5 of the rakes, which rakes are made of open-work, and are composed of rods p^6 , fixed to cross-pieces p^7 of the frames p^5 , being held in position by connecting-rods p^3 , pivoted on the spindles p^4 .

At the lower part of the tank a , in which is placed an incline r , is arranged a box s , which receives a large pipe s' , inclosing an Archimedean screw s^2 , the spindle of which carries a miter-wheel s^3 , actuated by a pinion s^4 . A fly-wheel and a handle s^5 , mounted on the axle of the pinion s^4 , allows of revolving by hand the Archimedean screw s^2 , which may quite as well be moved by rope-gearing, which might be controlled by a grooved pulley s^6 , mounted on the spindle of pinion s^4 , Figs. 16 and 17. In order to regulate the level of water in hopper b , a float-gage t' is located at the upper part of a pipe t^2 , which receives the feed-water.

When the level of the water falls, the float t' descends and opens the cock t and causes the water to fill the tank a . Then the level rises, and also the float-gage t' with it, and when the said level is high enough the rising gage closes the tap t . In this way the level of the water is always kept within suitable bounds.

Steps u u' u^2 allow access to the different parts of the apparatus and facilitate the supervision of the same. Corks v and v' are arranged for emptying the tank a and the tank h .

The various movable parts of the hydraulic separator may be driven by hand or, better, by power. When steam-power is used, the latter is transmitted by pulleys and belts or chains from the engine to the movable parts of the apparatus. The refuse is thrown into the hopper k , which delivers it onto the conveyer i , which delivers it into the closed hopper m , from which the refuse slides on the incline m' and falls into the tank b . The bodies

or matters lighter than water, whether composed of animal or of vegetable matters, float and are caught by the rakes p , which drag them upon the incline p' and then throw them out of the apparatus. The heaviest bodies fall between the screens n onto the conveyer c , the buckets of which let the ashes and small dusty matters escape and fall to the bottom of the tank a , from which they are taken off by the Archimedean screw s^2 . The matter which remains in the buckets is carried off into the hopper e , from which it slides into the pipe f , in which, water-level being lower than it is in tank h , an upward current strong enough to carry out animal and vegetable matters slightly heavier than water is produced in the said pipe and delivers such matters into the nozzle f' and into the conveyer g , which carries them out and lets the water escape into the tank g' . Mineral bodies much heavier than water fall into the conveyer h' , and, guided by the screens n' , are taken off by the said conveyer. The whole of the refuse is thus sorted into three portions: animal and vegetable matters, good for agricultural purposes; ashes and dusty matters, also good for manure, and mineral bodies without value.

Having thus described my invention, what I claim is—

1. In a hydraulic separator for town refuse the combination with a water-tank a , hopper b , placed above it for receiving the refuse, and a tank e having inclined bottom and placed below hopper b and adapted to receive particles heavier than water, of a water-tank h located beneath tank e and connected to the extended bottom of the same by a vertical pipe f having at its upper end an inclined discharge-nozzle, conveyers i , c , h' , g , spiral conveyer s^2 and rake p , the whole operating substantially as and for the purpose described.

2. In a hydraulic separator for town refuse, the combination with a water-tank a having a hopper b placed above it, of a conveyer-elevator having buckets i , for conveying the refuse from the receiving-tank k to a closed tank m , having an inclined plane m' upon which the refuse falls and by which it is guided into the hopper b ; a tank e having an inclined bottom, placed under the hopper b ; a tank h placed under the tank e ; a pipe f connecting the extended bottom of the tank e with the lower end of the pipe f and adapted to receive an upward flow of water and terminated at its upper end by an inclined discharging-spout; a conveying-elevator h' having wire-netting buckets, placed on the bottom of the tank h ; a tank g' fixed on the side of the water-tank h ; a wire-netting conveyer-elevator g placed in the tank g' , its lower end under the nozzle of inclined spout f' ; a rack conveyer p ; and an inclined pipe s' extending from the bottom of the water-tank a and carrying a spiral conveyer s^2 , substantially as set forth.

3. In a hydraulic separator for town refuse, the combination with a tank *a* and hopper *b* for receiving the refuse, of a tank *e* and a water-tank *h* below the same, both having inclined bottoms, automatic means for regulating the elevation of the water within hopper *b*, a tube *f*, connecting said tanks and carrying an upwardly-flowing current of water and

terminating in an inclined spout *f*, substantially as set forth.

10

In witness whereof I have hereunto set my hand in presence of two witnesses.

PHILIBERT BONVILLAIN.

Witnesses:

A. JULIEN,
A. POUQUÉ.