

(No Model.)

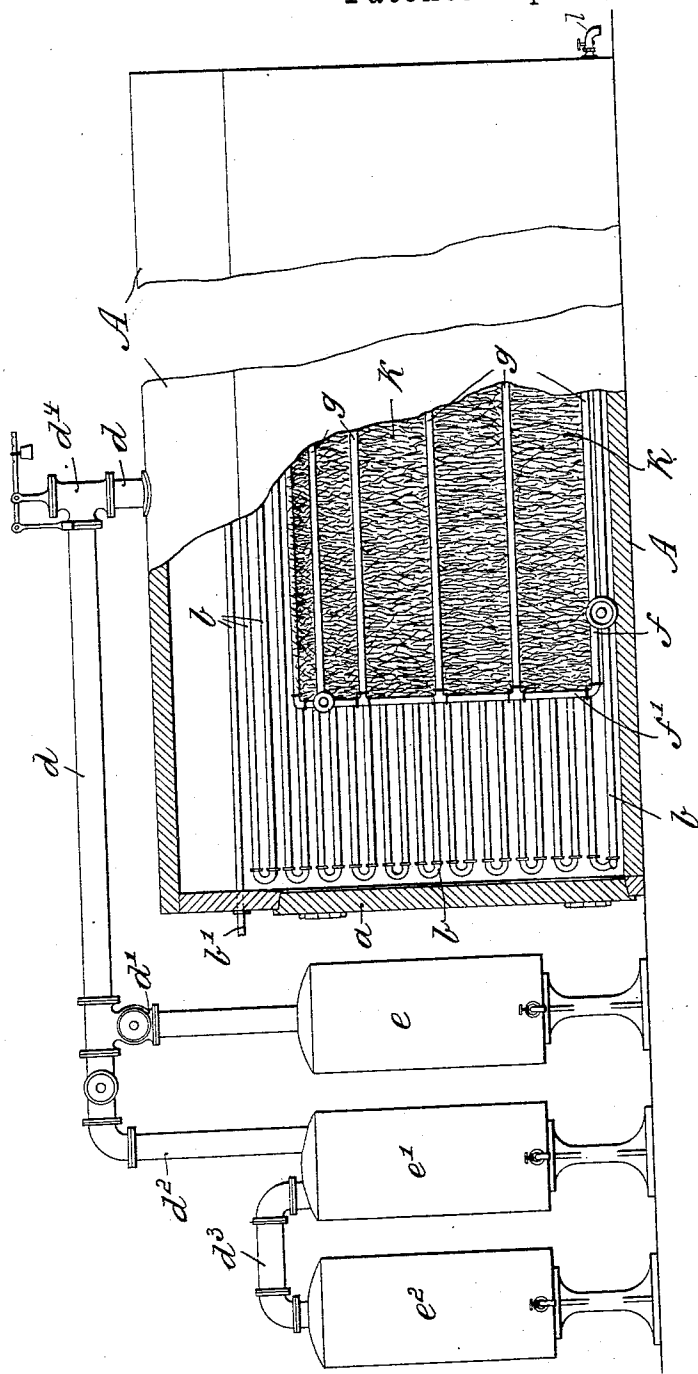
2 Sheets—Sheet 1.

W. S. RICHARDSON.
METHOD OF MAKING FERTILIZERS.

No. 580,224.

Patented Apr. 6, 1897.

Fig. 1.



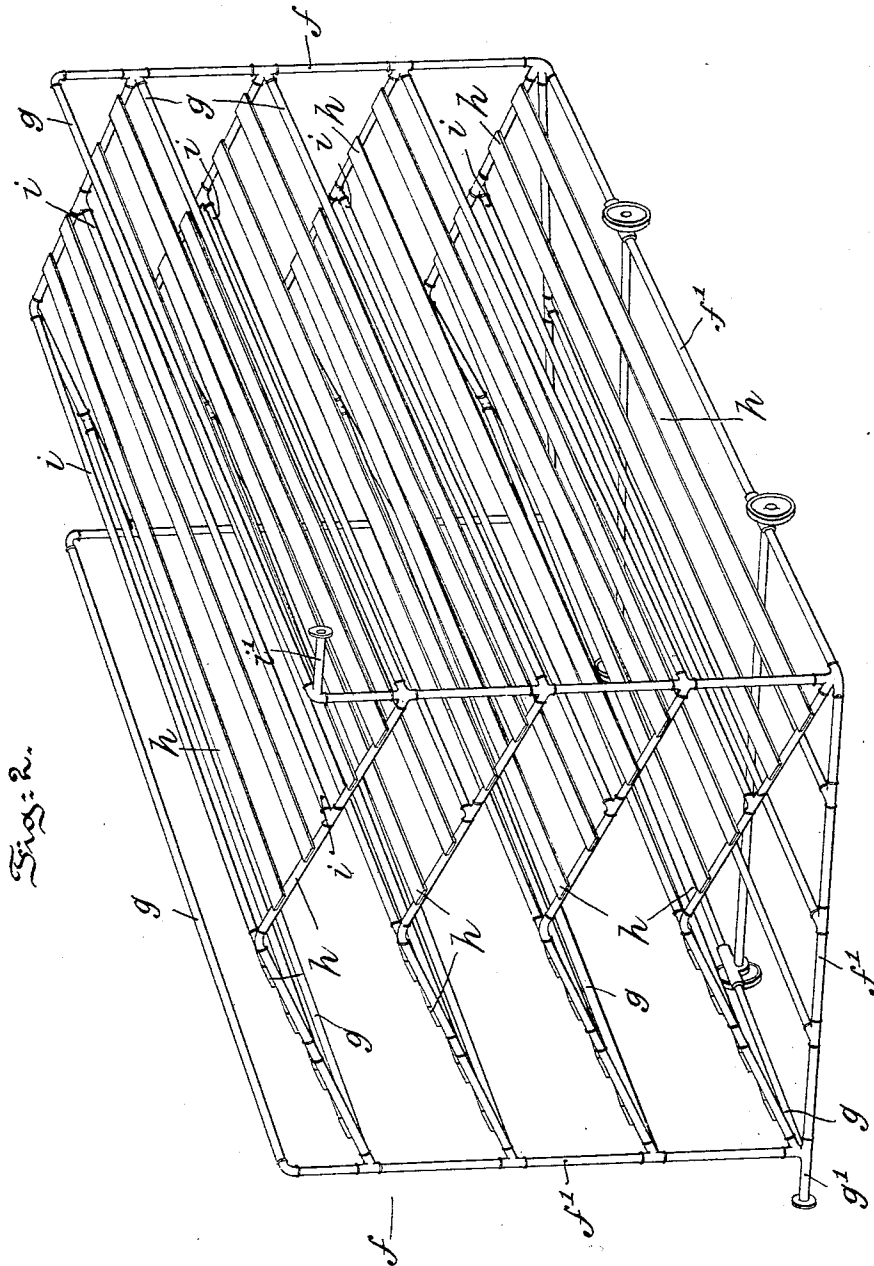
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2 Sheets—Sheet 2.

No. 580,224.

Patented Apr. 6, 1897.



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UNITED STATES PATENT OFFICE.

WINFIELD S. RICHARDSON, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE
NATIONAL WASTE UTILIZATION COMPANY, OF SAME PLACE.

METHOD OF MAKING FERTILIZERS.

SPECIFICATION forming part of Letters Patent No. 580,224, dated April 6, 1897.

Application filed February 7, 1896. Serial No. 578,337. (No specimens.)

To all whom it may concern:

Be it known that I, WINFIELD S. RICHARDSON, a citizen of the United States, residing at the city of Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in the Method of Manufacturing Fertilizers, of which the following is a specification.

My invention has relation to the method of converting hair or the refuse of skin-dressers, such as fleshings and hair from tanneries, into a fertilizing substance or agent by dry distillation.

The principal objects of my invention are, first, to provide a simple and economical method by dry distillation of converting hair, fleshings from skin-dressers, and similar refuse from tanneries into a fertilizing component or agent without loss of the nitrogenous matter thereof, which is fixed therein in the form of ammoniates, nor of grease and other valuable by-products contained therein, which are condensed and the ammoniated product reduced to a comminuted or powdered state or condition for use, and, second, to provide a method for converting hair, fleshings, or similar refuse into a fertilizing component or agent by dry distillation, which consists in mounting the stock upon a truck within a closed or sealed oven or muffle and subjecting the same to the influence of a dry heat of a temperature adapted to cause said stock to readily crumble while mounted on the truck in the muffle or oven under the influence of the said heat circulating through the stock from the truck and in which it is subsequently reduced to a comminuted or powdered state or condition and the by-products in vapor or liquid form being liberated from said matter during treatment, which brings said matter to its partially-carbonized state or condition, whereas the nitrogenous substances formed during the said operation are combined and fixed in the resultant product in the form of ammoniates.

My invention, stated in general terms, consists of the method of converting hair, fleshings, or similar refuse matter into a fertilizing component or agent by dry distillation in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is a front elevation, partly sectioned, illustrating the construction and arrangement of the muffle or oven, the internal steam-pipes thereof, the truck adapted to be introduced therein, and the condensing apparatus adapted to collect the vaporized by-products, and such an apparatus as has been found in practice well adapted for the conduct of the method of my invention; and Fig. 2 is a perspective view of the truck of the apparatus for supporting the refuse matter for treating the same within the muffle or oven, but as shown removed therefrom.

Referring to the drawings, A represents a closed oven or muffle provided with a hermetically closed or sealed door *a*. This muffle or oven is heated by a system of pipes *b*, arranged on the floor, sides, and end of the same and connected, as at *b'*, with a suitable pipe (not shown) leading from a source of superheated-steam supply. From the roof of the muffle A extends an outlet-pipe *d*, connected, as at *d'*, *d²*, and *d³*, with a series of condensing or collecting chambers *e*, *e'*, and *e²*. The outlet-pipe *d* is provided with a regulating stop-cock *d⁴*, controlling the outlet from the muffle or oven. Within the muffle A is adapted to be introduced, through the door *a*, a truck *f*, the frame *f'* of which consists of lattice or similar open-work interlaced with steam-pipes *g*. Within the framework *f'* is arranged a series of peaked, angular, or other shelves *h*, also of lattice or open-work interlaced with steam-pipes *i*. Upon these shelves *h* is loosely mounted the hair, refuse, or the like *k*. The steam-pipes *g* and *i* are provided with suitable connections *g'* and *i'*, whereby the same may be connected in any suitable manner (not shown) to the pipes *b* of the muffle or oven A when the truck is mounted in the muffle or oven. By this arrangement the stock *k* is completely heated by a dry heat from the superheated steam of the pipes *b*, *g*, and *i*, and brought to a condition to readily crumble, due to the complete circulation of heat imparted thereto, result-

ing in the driving off in the operation of certain by-products, such as grease, in liquid or vapor form, and in the formation of nitrogenous products which are combined and fixed in the partially-carbonized residue of the stock in the form of ammoniates. The vapors are collected in the condensers *e*, *e'*, and *e''*, while any excess of moisture that may drip to the floor of the muffle or oven can be removed through the discharge-pipe cock *l*, as illustrated in Fig. 1 of the drawings.

Hitherto the processes generally employed for the treatment or cutting of hair for the manufacture of fertilizing substances or materials consisted of certain steps, as herein-after fully explained.

In the first process there was added to hair which, by weight, amounted to about twelve hundred pounds about three hundred pounds of phosphate-rock and from eight to ten hundred pounds of sulfuric acid at 60° Baumé. These materials were mixed and then mounted in a large open leaden pan and boiled from eight to twelve hours. Besides the cost of conducting this process, arising from the use of phosphate-rock and acid, the principal disadvantages lay in the stench arising from the boiling compound and the extreme care with which the acid mixture had to be handled to obtain any results.

A second process consisted in introducing suitable quantities of hair and acid in a digester or agitator in which live steam was admitted, and the mixture then agitated until the hair was digested or cut. This process was unsatisfactory by reason of its cost, stench arising therefrom, and danger of manipulation thereof.

The third and most generally employed process consisted in mixing together in a mixer or agitator about fifteen hundred pounds of hair, five hundred pounds of phosphate-rock, and from one thousand to twelve hundred pounds of sulfuric acid at about 60° Baumé, and after the mass had been thoroughly agitated and mixed it was introduced into a closed bin and left until the hair was disintegrated or cut. Besides the cost and danger of manipulation of this process it required from two days to as many weeks to thoroughly digest the hair and bring the same to a condition for use as a fertilizing substance.

A fourth process has been proposed wherein waste wool, hair, silk, and like fibrous materials have been held heated in a vessel in the presence of a non-oxidizing gas, such as nitrogen, dry steam, or carbonic acid. This process is defective in that the material to be treated is combined during said treatment with either nitrogen, carbonic acid, or dry steam, which combination, instead of facilitating the formation of nitrogenous compounds and the fixing of the same in the treated product in the form of ammoniates, causes the valuable products to pass out of the chamber in the form of ammonia. Be-

sides this defect the process is rendered expensive and dangerous by the use of such gases as nitrogen, carbonic acid, or dry steam.

The method of my invention is called a "dry method," and consists in heating in a closed oven or muffle without the introduction of acids, gases, or other agents by a dry heat, preferably from superheated steam-pipes, the hair, fleshings, or similar matter until cut, the by-products thereof, such as grease, &c., being driven off in vapor or liquid form, collected, and condensed and the nitrogenous substances formed during the treatment of the said hair, fleshings, or similar matter being combined and fixed in the residual product in the form of ammoniates, and which product is reduced in a drug or other suitable mill to a comminuted or powdered condition for use. According to the method of my invention the valuable products are saved in commercially-useful forms, and the process is in consequence much more economical than any hitherto practiced.

The simplicity of the method, its freedom from stench, and the fact that no phosphate-rock, sulfuric acid, gas, or other agent is used are additional advantages of the same over what has previously been accomplished in the production of a fertilizing component or agent.

A further important characteristic feature of the invention is the fixing in the resultant compound of nitrogenous matter inherently in the stock during the process of treatment in the form of ammoniates to enhance the value of the said product for use as a fertilizing component or agent. By the old or generally-practiced processes of treating such stock there remained about two and one-half per cent. to three per cent. of nitrogen equivalent to ammonia therein, the other inherent nitrogen of the same being lost.

According to my invention, instead of losing more than one-half of the nitrogen it is recovered, that is, the inherent nitrogen of the stock is actually fixed in the finished product, as analytical test has demonstrated, giving a resultant product containing from twelve to sixteen per cent. of nitrogen, equivalent to ammonia. This is explained in the following manner: In the dry method of treatment of hair-stock or nitrogenous refuse it is heated from 150° to 160° centigrade, whereby certain nitrogenous vapors are given off and fixed in the stock in the form of ammoniates, which do not pass off, when the stock is further heated to a temperature ranging between 450° and 500°, or even more or less, as practice of the said invention has fully demonstrated.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of converting hair, fleshings or similar refuse matter into a fertilizing component or agent, by dry distillation, which consists in subjecting the refuse matter to

the influence of a dry heat of a temperature
necessary to make available the nitrogenous
matter therein and the fixing of the same, as
ammoniates, in the resultant product, liber-
5 ating during said treatment the by-products
in vapor or liquid form, and reducing said re-
sultant product to a comminuted state or con-
dition, substantially as and for the purposes
specified.

10 2. The method of converting hair, fleshings
or similar refuse matter into a fertilizing com-
ponent or agent, by dry distillation, which
consists in heating said matter by dry heat of
a temperature necessary to make available the
inherent nitrogenous matter thereof and the 15
fixing of the same, as ammoniates, in the re-
sultant product, liberating and condensing
the by-products and reducing the residual
product to a comminuted state or condition,
substantially as and for the purposes specified. 20

In testimony whereof I have hereunto set
my signature in the presence of two subscrib-
ing witnesses.

WINFIELD S. RICHARDSON.

Witnesses:

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RICHARD C. MAXWELL.