

## **Specification of William Bradburn : treating excrementitious matters, &c.;**

### **Contributors**

Bradburn, William.

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A.D. 1866, 28th DECEMBER. N<sup>o</sup> 3401.

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SPECIFICATION

OF

WILLIAM BRADBURN.

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TREATING EXCREMENTITIOUS MATTERS, &c.

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LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

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Price 1s. 6d.

1867.









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A.D. 1866, 28th DECEMBER. N° 3401.

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**Treating Excrementitious Matters, &c.**

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**LETTERS PATENT** to William Bradburn, of Wednesfield, Wolverhampton, in the County of Stafford, Artificial Manure Manufacturer, for the Invention of "**IMPROVEMENTS IN TREATING EXCREMENTITIOUS MATTERS AND OTHER REFUSE MATTERS FOR THE PURPOSE OF OBTAINING VALUABLE PRODUCTS THEREFROM, AND IN APPARATUS TO BE EMPLOYED FOR THAT PURPOSE.**"

Sealed the 24th May 1867, and dated the 28th December 1866.

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**PROVISIONAL SPECIFICATION** left by the said William Bradburn at the Office of the Commissioners of Patents, with his Petition, on the 28th December 1866.

I, WILLIAM BRADBURN, of Wednesfield, Wolverhampton, in the County of Stafford, Artificial Manure Manufacturer, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN TREATING EXCREMENTITIOUS MATTERS AND OTHER REFUSE MATTERS FOR THE PURPOSE OF OBTAINING VALUABLE PRODUCTS THEREFROM, AND IN APPARATUS TO BE EMPLOYED FOR THAT PURPOSE,**" to be as follows:—

- 10 My Invention consists in drying or decomposing, in the manner hereinafter explained, excrementitious matters and other refuse matters by the application of heat thereto, and in collecting the volatile matters driven off, and in applying the products of such drying or decomposition either direct



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

to the manuring and irrigation of land or to the manufacture of artificial manures.

In applying my Invention to the treatment of night soil in towns or other places I fix a closed air-tight oven near to a fire-place in the dwelling containing the watercloset, which air-tight oven is heated by the heat of the said 5 fire-place. The watercloset has an additional receptacle made air-tight, with a valve, in which the night soil from the watercloset is collected, and from which it is emptied when necessary into the air-tight oven described by means of a lever or other mechanism. A pipe passes from the upper part of the said oven by which the moisture in the shape of steam, together with all the matters 10 volatilized, are conveyed to a series of condensers; these condensers consist of vessels standing in cold water. The vapours are conducted into and out of these condensers by pipes opening into the said condensers at top; three or four of these condensers are enough for general purposes, but I do not limit myself to any particular number. The moisture from the night soil is con- 15 densed in these cool condensers together with any other condensible matter. The uncondensed gases, should any be produced, may be allowed to escape into the air or into a chimney. Although it is not necessary to put anything in the condensers yet a little sulphuric acid, or sulphate of lime, or superphosphate of lime may be placed in the said condensers for the purpose of 20 condensing or absorbing condensible matter. The dried soil or ash is drawn out from the oven from time to time by means of an air pump or exhauster and this solid product, as well as the condensed product, may be used directly for fertilizing land or be used in the manufacture of artificial manure. Where convenient I prefer to separate the urine from the fœcal matter and convey it 25 to a tank or reservoir to be used in washing out the pan of the closet in place of water.

In applying my Invention to towns on a large scale I lay down a double set of pipes and carry all the steam or moisture from the ovens containing the refuse matters by means of one set and draw the ashes from the ovens by air 30 pumps or exhausters from the other set, by which means the expense of sewerage is saved.

In applying my Invention to the treatment of the refuse of farms I attach a brick oven to the furnace of a malt kiln or steam boiler or other furnace. The said brick oven has an iron bottom, under which the flue from the steam 35 boiler or other furnace passes. A series of metal pipes pass through the said oven and superheated steam from the boiler, or heated air from the furnace passes through the said pipes; the said pipes also pass through the flue under the metal bottom of the oven, so that the heated air or steam after



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

having given up its heat to the interior of the oven by passing several times through the pipes in the said flue becomes again heated and again circulates through the pipes in the oven; the contents of the oven are thus heated by the direct heat applied to its iron bottom as well as by the heat of the super-  
5 heated steam or hot air made to circulate through the pipes in the said oven.

The steam and vapours are conveyed by a pipe from the oven to a series of condensers of the kind herein-before described, the said condensers being situated by preference at the highest point of the farm. In the first and last of the condensers I prefer to put sulphuric acid supplied and discharged in a  
10 small continuous stream, or sulphate of lime or superphosphate of lime may be placed in the condensers. The condensed matters in the condensers are distributed on the farm by means of hose or mixed with water from a stream and employed to irrigate the land, or they may be applied to the land in any other convenient manner. The brick oven may be charged with the waste or refuse  
15 matters produced on the farm, and the ash or dried contents of the said oven withdrawn every day or every other day, the said ash being applied direct to the land or used otherwise.

In applying my Invention to the manufacture of artificial manures I attach an oven to the ordinary boilers of the manufactory, the said oven having pipes  
20 passing through it, heated in the manner herein-before described, I charge the said oven with all the refuse animal and vegetable matters obtainable. The gases or volatile matter driven off by the heat is conducted by pipes to a series of condensers, of the kind herein-before explained, each of the said condensers containing sulphuric acid or sulphate of lime, or superphosphate  
25 of lime. In these condensers nearly the whole of the volatilized matters are condensed, the uncondensed gases or vapours being conducted into the sulphur burners of the sulphuric acid works, and are made to pass through nitre ovens, chambers, and columns charged with coke. In this way all the valuable portions of the uncondensed gases or vapours from the refuse  
30 matters will be taken up and all nuisance prevented. The liquid obtained is used in the manufacture of superphosphate of lime in lieu of water. The ash or dried contents of the oven may be used as herein-before described. Any uncondensed gases produced in the treatment of night soil and farm refuse may, where convenient, be burned in the sulphur burners of sulphuric  
35 acid works. When the ovens used for treating night soil are large, I prefer to employ agitators for stirring the contents, which agitators may be worked by hand or driven by steam, or other motive power.



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*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said William Bradburn in the Great Seal Patent Office on the 27th June 1867.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM BRADBURN**, of Wednesfield, Wolverhampton, in the County of Stafford, 5 Artificial Manure Manufacturer, send greeting.

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-eighth day of December, in the year of our Lord One thousand eight hundred and sixty-six, in the thirtieth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, 10 the said William Bradburn, Her special licence that I, the said William Bradburn, my executors, administrators, and assigns, or such others as I, the said William Bradburn, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time, and at all times thereafter during the term therein expressed, should and lawfully might make, use, 15 exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**IMPROVEMENTS IN TREATING EXCREMENTITIOUS MATTERS AND OTHER REFUSE MATTERS FOR THE PURPOSE OF OBTAINING VALUABLE PRODUCTS THEREFROM, AND IN APPARATUS TO BE EMPLOYED FOR THAT PURPOSE,**" upon the condition (amongst others) that I, the 20 said William Bradburn, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the 25 date of the said Letters Patent.

**NOW KNOW YE**, that I, the said William Bradburn, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say:— 30

My Invention consists in drying or decomposing in the manner herein-after explained excrementitious matters and other refuse matters by the application of heat thereto, and in collecting the volatile matters driven off, and in applying the products of such drying or decomposition either direct to the manuring and irrigation of land, or to the manufacture of artificial manures. 35

In applying my Invention to the treatment of night soil in towns or other places I fix a closed air-tight oven near to a fire-place in the dwelling containing the watercloset, which air-tight oven is heated by the heat of the said



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

- fire-place. The watercloset has an additional receptacle made air-tight, with a valve, in which the night soil from the watercloset is collected, and from which it is emptied, when necessary, into the air-tight oven described by means of a lever or other mechanism. A pipe passes from the upper part of
- 5 the said oven by which the moisture in the shape of steam, together with all the matters volatilized, are conveyed to a series of condensers; these condensers consist of vessels standing in cold water. The vapours are conducted into and out of these condensers by pipes opening into the said condensers at top; three or four of these condensers are enough for general purposes, but I
- 10 do not limit myself to any particular number. The moisture from the night soil is condensed in these cool condensers, together with any other condensable matter. The uncondensed gases, should any be formed, may be allowed to escape into the air or into a chimney. The dried soil or ash is drawn out from the oven from time to time by means of an air pump or exhauster, and
- 15 this solid product, as well as the condensed product, may be used directly for fertilizing land or be used in the manufacture of artificial manure. Where convenient I prefer to separate the urine from the fœcal matter, and convey it to a tank or reservoir to be used in washing out the pan of the closet in place of water.
- 20 In applying my Invention to towns on a large scale I lay down a double set of pipes, and carry all the steam or moisture from the ovens containing the refuse matters by means of one set, and draw the ashes from the ovens by air pumps or exhausters by the other set, by which means the expense of sewerage is saved.
- 25 In applying my Invention to the treatment of the refuse of farms or other similar refuse matter I attach a brick or other oven to the furnace of a malt kiln or steam boiler or other furnace; the said oven has an iron bottom under which the flue from the steam boiler or other furnace passes. A series of metal pipes pass through the said oven, and superheated steam from the boiler
- 30 or heated air from the furnace passes through the said pipes; the said pipes also pass through the flue under the metal bottom of the oven, so that the heated air or steam after having given up its heat to the interior of the oven by passing several times through the pipes in the said flue becomes again heated, and again circulates through the pipes in the oven. The contents of
- 35 the oven are thus heated by the direct heat applied to its iron bottom, as well as by the heat of the superheated steam or hot air made to circulate through the pipes in the oven. The steam and vapours are conveyed by a pipe from the oven to a series of condensers of the kind herein-before described, the said condensers being situated by preference at the highest point of the farm.



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

The condensed matters in the condensers are distributed on the farm by means of hose, or mixed with water from a stream, and employed to irrigate the land; or they may be applied to the land in any other convenient manner. The oven may be charged with the waste or refuse matters produced on the farm, and the ash or dried contents of the said oven withdrawn every 5 day or every other day, the said ash being applied to the land or otherwise used.

In applying my Invention to the manufacture of artificial manures I attach an oven to the ordinary boilers of the manufactory, the said oven having pipes passing through it heated in the manner herein-before described. 10 I charge the said oven with all the refuse animal and vegetable matters obtainable. The gases or volatile matter driven off by the heat is conducted by pipes to a series of condensers of the kind herein-before explained. In these condensers nearly the whole of the volatilized matters are condensed, the uncondensed gases or vapours being conducted into the sulphur burners 15 of the sulphuric acid works. In this way all the valuable portions of the uncondensed gases or vapours from the refuse matters will be taken up, and all nuisance prevented. The liquid obtained is used in the manufacture of superphosphate of lime in lieu of water. The ash or dried contents of the oven may be used as herein-before described. Any uncondensed gases pro- 20 duced in the treatment of night soil and farm refuse may, where convenient, be burned in the sulphur burners of sulphuric acid works. When the ovens used for treating night soil are large I prefer to employ agitators for stirring the contents, which agitators may be worked by hand or driven by steam or other motive power. 25

Having explained the nature of my Invention, I will proceed to describe, with reference to the accompanying Drawings, the manner in which the same is to be performed:—

Figure 1 represents in vertical section, and Figure 2 in elevation the apparatus which I employ for the treatment of night soil in towns and other 30 places. The same letters of reference indicate the same part in both Figures. *a* is a closed air-tight oven situated near the fire-place *b*, and heated by the waste heat of the said fire-place; the said fire-place *b* may be one of the ordinary fire-places of the house or other building; the waste heat passes from the fire-place *b* along the flue *c* to the chimney *d*. *e* is a damper by which the 35 draught through the flue *c* may be regulated; *f* is the pan of the watercloset, and *g* the seat. The soil from the pan *f* passes into a receptacle *h*, from which it may be allowed to fall into the lower receptacle or reservoir *i*, and stored therein prior to its introduction into the oven *a*. *k* is a hopper containing



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

chloride of lime or other disinfectant, and in the neck of the said hopper are two horizontal slides  $l, l^2$ , worked by connecting rods and levers, as represented in Figure 1, from the jointed lid or cover  $m$  of the seat  $g$ . Each time the cover  $m$  is raised a portion of the disinfectant from the hopper  $k$  is allowed to  
5 fall by the pressing back of the slide  $l^2$  on to the slide  $l$ , and on the shutting down of the lid  $m$  the slide  $l^2$  is brought back to its original position, closing the bottom of the hopper  $k$ , while the slide  $l$  being withdrawn the disinfectant resting upon it falls down the spout  $n$  on to the soil in the receptacle  $h$ . By pressing down the lever  $p$  the valve  $q$  is raised and the soil allowed to pass  
10 from the receptacle  $h$  into the receptacle  $i$ . When sufficient soil has accumulated in the receptacle  $i$  the soil is allowed to fall into the oven  $a$  by depressing the lever  $r$  and raising the valve  $s$ . The stem of the valve  $s$  works through the hollow stem of the valve  $q$ , and the latter stem works through a stuffing box, as represented at the top of the receptacle  $h$ . The escape of  
15 offensive odours from the receptacles is thus prevented. By means of the partition  $t$  the urine is kept separate from the fœcal matter, and is discharged down the pipe  $u$  to a reservoir, from whence it may be pumped up and used in washing out the pan  $f$  of the closet in place of water, and thus be utilized. Sufficient soil having accumulated in the closed oven  $a$  heat is applied thereto  
20 from the fire-place  $b$ . By the action of the heat on the soil in the oven the moisture in the shape of steam, together with all the other matters capable of being volatilized by heat, are driven off from the said soil and are conveyed along the pipe  $v$  into the condensers  $w$ ; the said condensers  $w$  are immersed in cold water contained in the tank  $x$ . The steam and condensable matters are  
25 condensed in the condensers  $w$ , while any uncondensed gases, should any such be produced, may escape into the air or into a chimney by the pipe  $y$ ; the condensers  $w$  are connected together by means of pipes  $z$ , as will be understood by reference to the Drawing. The liquid matter condensed in the condensers  $w$  passes from the said condensers by means of small pipes into a  
30 tank or reservoir, from which it may be drawn as required. The uncondensed gases passing from the pipe  $y$  may be utilized in the manner herein-after described with reference to Figures 3 and 4. The dried soil or ash in the oven  $a$  may be drawn out from time to time through the pipe  $2$  by means of an air pump or exhauster. If required, access to the oven  $a$  may be obtained  
35 by means of the door  $3$ . Any effluvia from the receptacle  $i$  pass by a pipe into the pipe  $v$ , and thence to the condensers  $w$ .

In applying this part of my Invention to towns on a large scale I lay down a double set of pipes, and connect the ovens of the houses or buildings similar to the oven  $a$  represented in the Drawing, with the said double set of pipes. By



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*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

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means of one set of the pipes described I convey all the steam or gases from the ovens *a* to condensers of the kind herein-before described, and by the other set of pipes I draw the dried soil or ash from the ovens by air pumps or exhausters, the expense of sewerage is thereby saved.

Figure 3 represents, partly in cross section and partly in elevation, the apparatus which I use either for treating stable or farm refuse or night soil, or for treating refuse animal and vegetable matter for the manufacture of artificial manure.

Figure 4 represents a longitudinal section of the oven of the apparatus and parts connected with it on a larger scale. The same letters of reference indicate the same parts in both Figures.

*a* is an oven attached to the furnace of the steam boiler *b*. The said oven *a* has an iron bottom *c* supported in the manner represented in Figure 3, under which iron bottom the flues *d* in communication with the furnace of the steam boiler *b* pass. This iron bottom *c* is heated by the heated air passing along the flues *d* from the steam boiler furnace, which heat is transmitted through the said iron bottom to the oven *a*; in the body of the oven *a* a series of endless metal pipes *e* is situated, the said pipes being connected with and receiving superheated steam from the steam boiler *b*. The greater part of the pipes *e* are situated within the oven, but some of the horizontal pipes of the series are situated in the flues *d* and immediately under the iron bottom *c*. By this means the steam passing through the pipes *e* in the oven *a* after having given up its heat to the interior of the oven by passing several times through the horizontal pipes in the flues *d* becomes again heated and again circulates through the pipes in the oven, and gives out its heat to the said oven. The contents of the oven *a* are thus heated by the direct heat applied to its iron bottom *c* as well as by the heat of the superheated steam made to circulate through the pipes in the said oven. The outsides of the pipes *e* and inside of the oven *a* may be coated or covered with the clay known in commerce as "canister;" they are thereby protected from the injurious action of the night soil. Instead of employing superheated steam to assist in heating the contents of the oven, heated air from the furnace of the boiler may be made to pass through the pipes represented, the cold air being reheated by passing along the pipes in the flues, as described with respect to steam; and instead of employing the furnace of a steam boiler to heat the oven, any other furnace or a brick kiln may be attached to the oven for the purpose of heating the same. When stable refuse or the refuse of farms or other similar refuse is to be treated in the oven *a* the said refuse is fed thereto through the openings *f* in the roof of the oven; these openings are closed air-tight by blocks or



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

lids  $f^1$ . When night soil is to be treated in the oven the said night soil is supplied thereto by the apparatus represented in Figure 3. The said apparatus consists of an exhauster  $h$ , having a pipe  $i$  opening into its top and passing to the receptacle containing the night soil, and a second pipe  $k$  5 connected with an air pump. At the bottom of the exhauster  $h$  is a delivery pipe  $l$  opening into the oven  $a$ . When it is wished to charge the oven  $a$  with night soil the stop-cocks  $i^2$  and  $l^2$  are closed, and the stop-cock  $k^2$  is opened. The stop-cock  $x^2$  is also closed. By working the air pump connected with the pipe  $x$  a partial vacuum is produced in the exhauster  $h$ . By afterwards 10 closing the stop-cock  $k^2$  and opening the stop-cock  $i^2$  the night soil is drawn into the exhauster  $h$ , from whence it can be delivered by opening the stop-cock  $l^2$  into the oven  $a$ ; the stop-cocks  $l^2$  and  $i^2$  are again closed, and the operations described are repeated until the oven has been charged with the necessary quantity of night soil; by the action of the heat conveyed to the 15 oven  $a$  in the manner herein-before explained upon the contents of the oven the moisture in the form of steam and the other matters volatilized pass by the pipes  $m$  and  $n$  to the series of condensers  $p$  of the kind herein-before described and represented in Figure 1, and are thereby condensed. The pipe  $n$  conveying the volatilized matters to the condensers  $p$  is surrounded by 20 a pipe  $q$ , through which pipe  $q$  cold water passes to supply the cistern or tank  $r$  in which the condensers  $p$  are situated. The condensable matters passing through the pipe  $n$  are thus partly condensed on their way to the condensers  $p$ . The water from the tank or cistern  $r$  is discharged by the pipe  $s$ . In the condensers  $p$  nearly the whole of the volatilized matters are 25 condensed, the uncondensable gases or vapours being allowed to escape into the air, but when the apparatus Figures 3 and 4 is used in the neighbourhood of sulphuric acid works I conduct the said uncondensable gases or vapour by means of the pipe  $t$  into a closed or air-tight tank 1, into which tank sulphuric acid trickles down the pipe 2. The said sulphuric acid condenses nearly the 30 whole of the uncondensable vapours conveyed into the said tank. Any uncondensed gas escapes from the tank 1 along the pipe 3, and is delivered into the burner of a sulphuric acid chamber, where any sulphur it may contain is utilized and made into sulphuric acid; or the uncondensed gas may be delivered by the pipe 3 into a stack or chimney. The liquid matter condensed 35 in the condensers  $p$  passes from the said condensers by means of small pipes opening into the lower part of each condenser, and conveying the condensed matter into a common tank or reservoir. The said condensed matter may be employed instead of water for moistening bone ash or mineral phosphates in the manufacture of artificial manures. I remove or draw the ash or dried



*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

contents of the oven from the said oven by the use of the apparatus represented principally in Figure 3, and constructed as follows:—Along the bottom plate *c* of the oven I place two or more pipes *u* perforated with holes (see Figure 4), and I connect the said pipes by means of the pipe *v* with an exhaustor *w* connected by the pipe *x* with the air pump, already described as 5 connected with the night soil exhaustor *h*; by closing the stop-cock *k*<sup>2</sup> of the pipe *k*, and opening the stop-cocks *x*<sup>2</sup>, and working the air pump, a partial vacuum is produced in the exhaustor *w*, and by closing the stop-cocks *x*<sup>2</sup> and *m*<sup>2</sup>, and opening the stop-cock *v*<sup>2</sup> the ash or dried contents of the oven *a* is forced along the pipes *u* and *v* into the exhaustor *w*, from whence it may be 10 delivered into carts placed under the said exhaustor. When night soil is being supplied to the oven the stop-cock *x*<sup>2</sup> of the ash lifter is closed. By the use of the stop-cocks *k*<sup>2</sup> and *x*<sup>2</sup> the same air pump connected with the pipe *x* may be employed both to fill the oven with night soil and to empty the ash therefrom. 15

When the apparatus, Figures 3 and 4, is used on a farm the condensed matter in the condensers may be delivered on the farm by means of hose or mixed with water, and employed to irrigate the land, and the ash from the oven may be applied direct to the land or be otherwise used.

Having now described the nature of my Invention, and the manner in 20 which the same is to be performed, I wish it to be understood that I do not limit myself to the precise details herein described and illustrated in the Drawings, as the same may be varied without departing from the nature of my Invention; but I claim as my Invention,—

Firstly, treating excrementitious matters and other refuse matters for 25 obtaining valuable products therefrom by the application of heat thereto for the purpose of drying or decomposing the same, and condensing, collecting, and employing the products of such drying or decomposition to the manuring and irrigation of land, or to the manufacture of artificial manure, substantially as herein-before described and illustrated in the accompanying 30 Drawings.

Secondly, the arrangement or combination of the parts of apparatus herein-before described and illustrated in Figures 1 and 2 of the accompanying Drawings for collecting and drying or decomposing night soil, and for 35 collecting the fixed and condensable products of such drying or decomposition.

Thirdly, the arrangement or combination of the parts of apparatus herein-before described and illustrated in Figures 3 and 4 of the accompanying Drawings for drying or decomposing night soil, stable or farm refuse, and



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*Bradburn's Improvements in Treating Excrementitious Matters, &c.*

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other refuse matters, and for collecting the fixed and condensable products of such drying or decomposition.

In witness whereof, I, the said William Bradburn, have hereunto set my hand and seal, this Twenty-fifth day of June, in the year of our Lord  
5 One thousand eight hundred and sixty-seven.

WILLIAM BRADBURN. (L.S.)

Witness,

GEORGE SHAW.

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LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1867.



...and for collecting the ... and a ...  
...  
In witness whereof, I, the said William Bradburn, have hereunto set my  
hand and seal, this Twenty-fifth day of June, in the second year of said  
One thousand eight hundred and sixty-seven.

WILLIAM BRADBURN. (Sd.)

George Shaw.

LONDON: Printed by George Howard Evans and William Spottiswoode,  
Printers to the Queen's most Excellent Majesty, 1867.



FIG. 1.

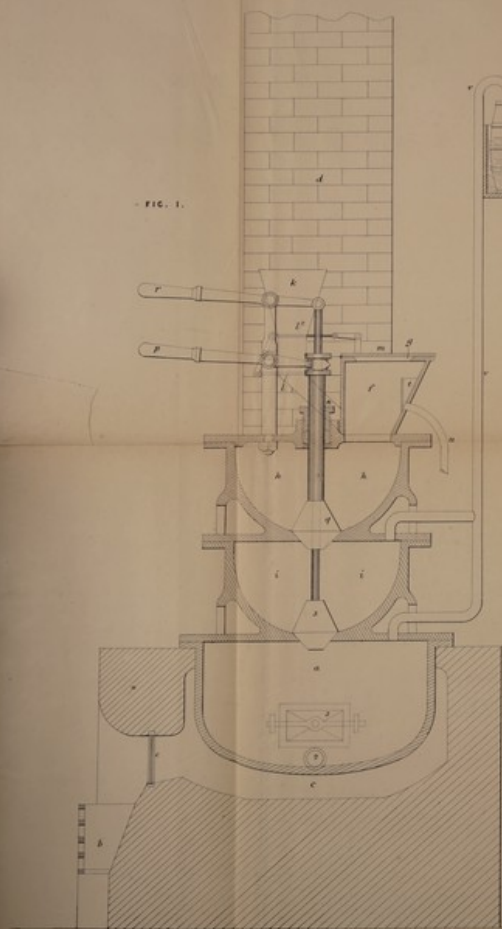
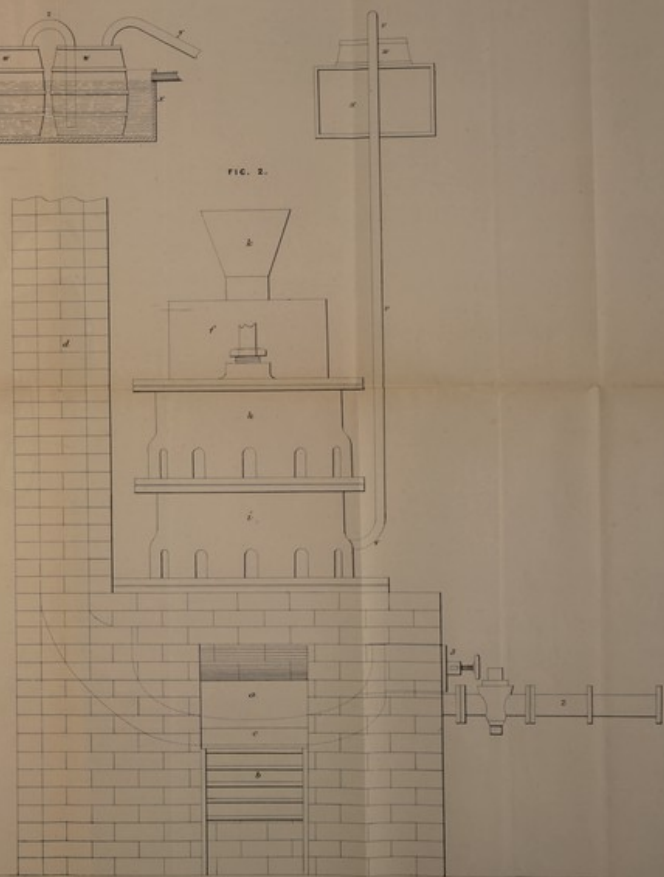


FIG. 2.



The filed drawing is not colored.

London: Printed by George Eyre and William Spence, 15, Abchurch Lane, 1867.

Drawn in Sheet by Wm. H. Cox.







FIG. 3.

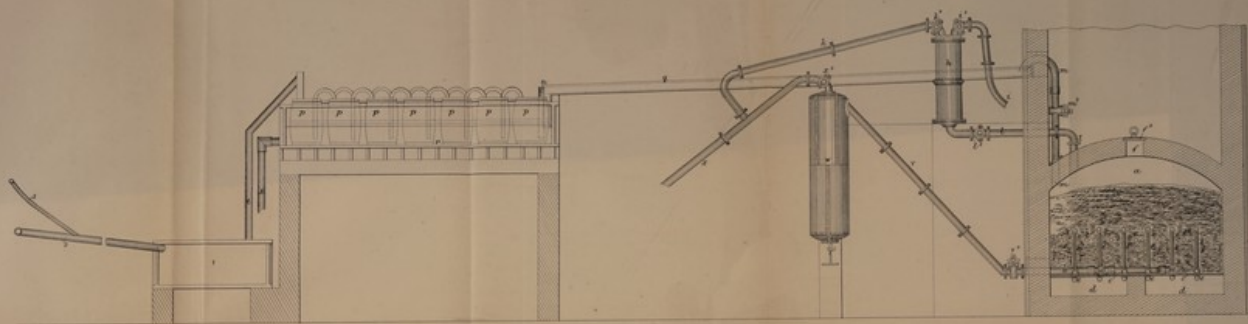
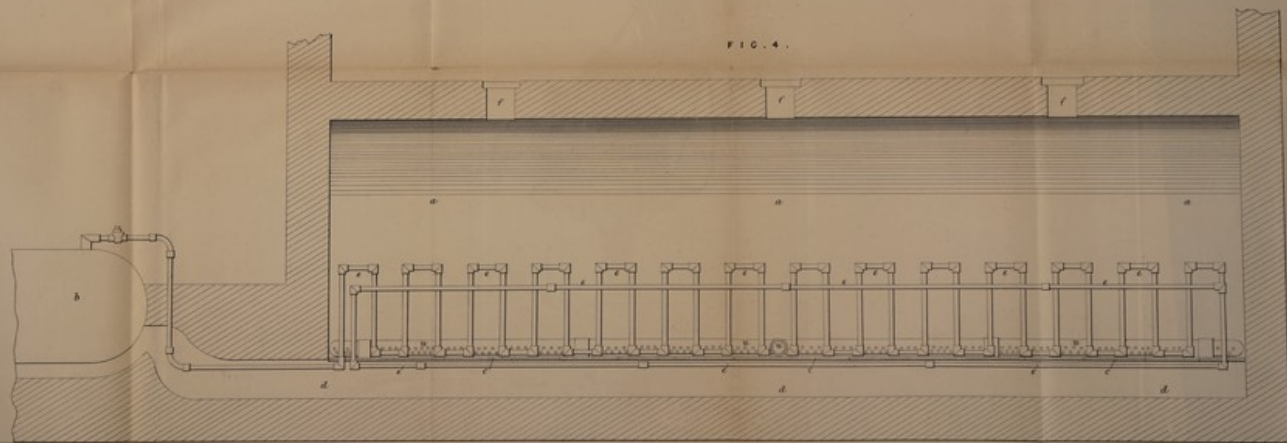


FIG. 4.



The filed drawing is not altered.

Witness: *Franklin George Evans* (Eng. and Machine) *Superintendent*  
Patent Office, London, England, 1866.

Drawn on Stone by *Wm. S. G. Cox*.



