

## **Specification of James Robey : treating sewage.**

### **Contributors**

Robey, James.

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A.D. 1873, 25th JULY. N° 2534.

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S P E C I F I C A T I O N

OF

JAMES ROBEY.

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TREATING SEWAGE.

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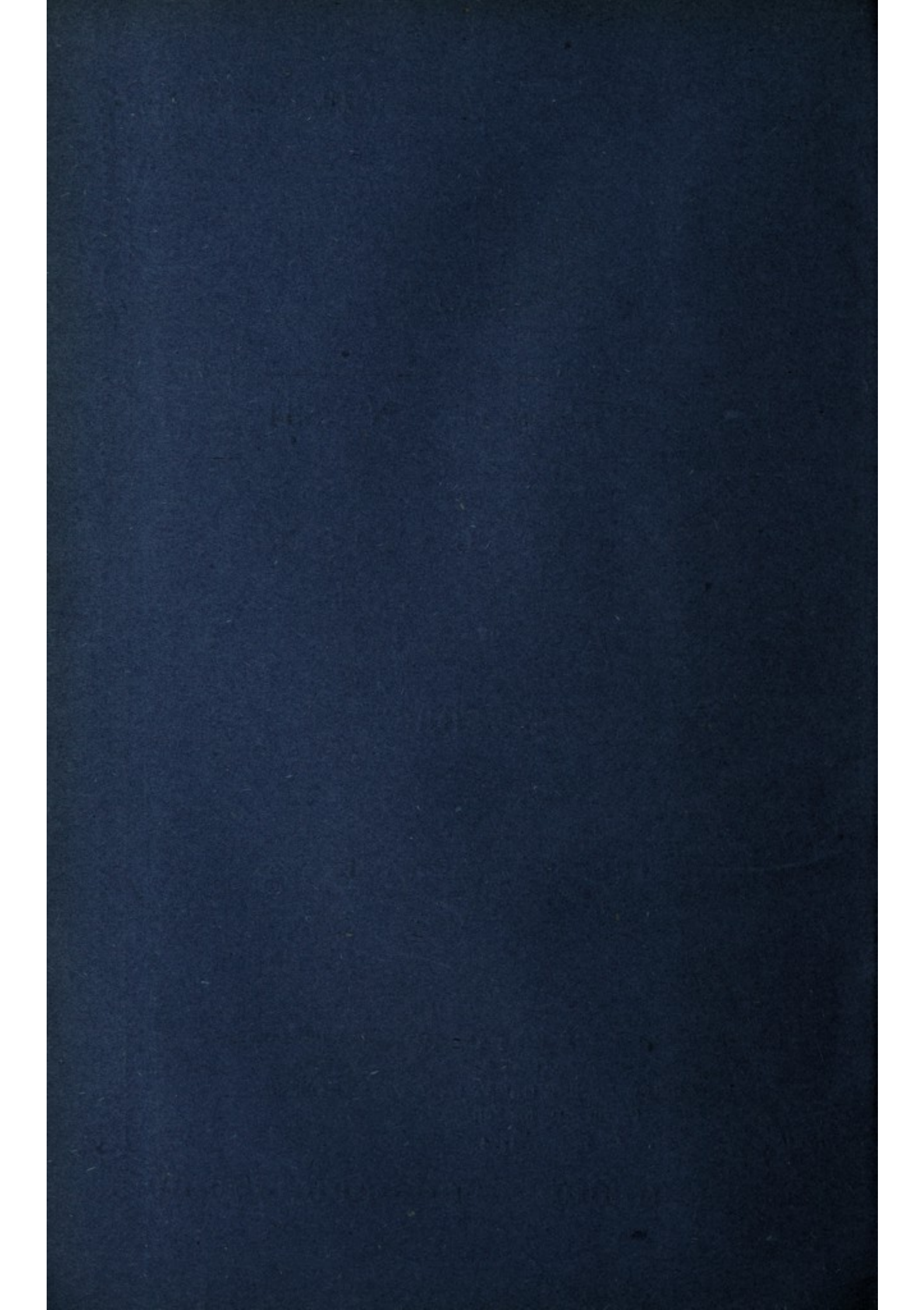
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A.D. 1873, 25th JULY. N<sup>o</sup> 2534.

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### Treating Sewage.

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**LETTERS PATENT** to James Robey, of the City of Manchester, Sugar Refiner, for the Invention of "IMPROVEMENTS IN TREATING SEWAGE AND OTHER FOUL LIQUIDS FOR THE ECONOMICAL REMOVAL AND UTILISATION OF SOLUBLE AND SUSPENDED IMPURITIES CONTAINED THEREIN, AND IN APPARATUS FOR THE SAME."

Sealed the 23rd January 1874, and dated the 25th July 1873.

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**PROVISIONAL SPECIFICATION** left by the said James Robey at the Office of the Commissioners of Patents, with his Petition, on the 25th July 1873.

I, JAMES ROBEY, of Manchester, in the County of Lancaster, Sugar Refiner, do hereby declare the nature of the said Invention of "IMPROVEMENTS IN TREATING SEWAGE AND OTHER FOUL LIQUIDS FOR THE ECONOMICAL REMOVAL AND UTILISATION OF SOLUBLE AND SUSPENDED IMPURITIES CONTAINED THEREIN, AND IN APPARATUS FOR THE SAME," to be as follows:—

The object of this Invention is to treat sewage by a combined system of precipitation and filtration in order to remove and utilise the soluble and suspended impurities contained therein, and thus allow the liquid



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portion or effluent water to flow away in a sufficient state of purity to enter rivers, or to be used for manufacturing purposes.

Now this Invention consists in taking raw peat (by preference well rotted, and as free from mineral impurities as possible), and macerating the same with water to a fluid consistency by suitable machinery, and 5 allowing a portion of such mixture to flow into the sewage and to be thoroughly mixed therewith.

The proportion I find useful is from about 75 to 150 grains to the gallon, varying the quantity according to the impurities in the sewage, and using either less or more according to circumstances. I then add 10 sufficient of any of the well-known sewage precipitants or flocculating agents, such as perchloride of iron, sulphate of alumina, waste alum sludges, or chloride of alumina; but I prefer perchloride of iron until a coagulation or flocculation of the soluble organic matters in the sewage and of the rotted peat has taken place, when I allow the 15 mixture to flow into a tank fitted with upright filtering frames of any convenient shape, and made by preference of bamboo or cane, and covered with any suitable textile filtering material having a perforated tube or tubes fitted into the bottom of each of such frames to allow the filtered liquid to escape from the interior of such frames 20 into a channel leading to a charcoal filtering bed herein-after described. Immediately the sewage so treated flows into the above tank and amongst the upright filtering frames, a process of both precipitation and filtration commences. Owing to the porous loose flocculent nature of the peat, especially after coagulation by any of the chemical pre- 25 cipitants aforementioned, the filtration through it is easy and rapid, very different to what it would be through the slimy coagulations of sewage organic matters only, and consequently an effluent water is delivered perfectly bright and clean, and totally free from suspended impurities. This effluent water now passes into beds of charcoal 30 prepared from street sweepings in accordance with a Specification of a former Patent granted to me and George Frederick Chantrell, No. 957, A.D. 1873, or of any other suitable charcoal; and which beds of charcoal I prefer to use on the oxidising plan, having a sufficient number of them in use to allow 12 to 24 hours oxidation, by which 35 means, owing to the previous removal of all suspended matters in the effluent, this oxidising process is very effective in removing the soluble impurities still contained in such effluent, and the charcoal



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- beds never can choke or become impervious to the liquid. The sewage is allowed to flow into this combined precipitating and filtering tank, herein-before mentioned, until such tank becomes full of the intercepted solids of the treated sewage, which consist mostly of the added  
5 peat. Owing to the immense area of filtering surface so presented to the sewage, such surfaces only become choked or impervious about as fast as the impurities are deposited among the upright filtering frames in a semi-solid form, and then, owing to the porous open nature of the coagulated peat, a drainage still continues which deprives the  
10 sludge of most of its water. The sludges ordinarily deposited in precipitating processes contain nine parts water to one of solids. When at last this combined precipitating and filtering tank becomes quite full of semi-solid sewage impurities, I cease to allow any more sewage to flow in, but divert the stream to other tanks similarly arranged and  
15 leave the whole mass of the wet solid sludge to drain slowly until a concentrated sludge is obtained only containing about 70 or 80 per cent. of moisture, and of such a consistency as to be now capable of being converted into bricks by suitable machinery, and dried in the open air under sheds.
- 20 By the foregoing process I not only secure an amazinly rapid removal of suspended impurities from the sewage, and upon an extremely small area of land, but I obtained more valuable sludge when dried than has hitherto been accomplished, for owing to the admixture with peat of what fertilising matters the sewage contains I secure a good manure;  
25 or such sludge if heated to redness in closed vessels will be converted into a good charcoal suitable for fuel, and for deodorising purposes.

The above process is also so rapid that combined with the well-known preserving action of peat no nuisance is created during the drying or draining of the sludge, a process hitherto attended with much  
30 unwholesome effluvia.

It will thus be observed that the processes of precipitation, filtration, and concentration of the sludge are performed simultaneously according to this Invention, and in one and the same tank, so economising time and space; and it will also be apparent that this Invention is equally  
35 useful for treating other foul liquids besides the sewage herein-before particularly mentioned.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said James Robey in the Great Seal Patent Office on the 24th January 1874.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES ROBey,** of the City of Manchester, Sugar Refiner, send greeting. 5

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-fifth day of July, in the year of our Lord One thousand eight hundred and seventy-three, in the thirty-seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said James Robey, Her special licence 10 that I, the said James Robey, my executors, administrators, and assigns, or such others as I, the said James Robey, my executors, administrators, or 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, exercise, and vend, within the 15 United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**IMPROVEMENTS IN TREATING SEWAGE AND OTHER FOUL LIQUIDS FOR THE ECONOMICAL REMOVAL AND UTILISATION OF SOLUBLE AND SUSPENDED IMPURITIES CONTAINED THEREIN, AND IN APPARATUS FOR THE SAME,**" upon the condition, amongst others, that I, the said James 20 Robey, 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 25 immediately after the date of the said Letters Patent.

**NOW KNOW YE,** that I, the said James Robey, 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:— 30

The object of this Invention is to treat sewage and other foul liquids by a combined system of precipitation and filtration in order to remove and utilise the soluble and suspended impurities contained therein, and thus allow the liquid portion or effluent water to flow away in a sufficient state of purity to enter rivers, or to be used for manufacturing 35 purposes.



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Now this Invention consists in taking raw peat, by preference well rotted, and as free from mineral impurities as possible, and macerating the same with water to a fluid consistency by suitable machinery, such as a mortar mill, and allowing a portion of such mixture to flow into  
5 the sewage and to be thoroughly mixed therewith.

The proportion I find useful is from about 75 to 150 grains to the gallon, varying the quantity according to the impurities in the sewage, and using either less or more according to circumstances. I then add sufficient of any of the well-known sewage precipitants or flocculating  
10 agents, such as perchloride of iron, sulphate of alumina, waste alum sludges, or chloride of alumina; but I prefer perchloride of iron, until a coagulation or flocculation of the soluble organic matters in the sewage and of the rotted peat has taken place, when I allow the mixture to flow into a tank fitted with upright filtering frames of  
15 any convenient shape, and made by preference of bamboo or cane, and covered with any suitable textile filtering material having a perforated tube or tubes fitted into the bottom of each of such frames to allow the filtered liquid to escape from the interior of such frames into a channel leading to a charcoal filtering bed herein-after described.  
20 Immediately the sewage so treated flows into the above tank and amongst the upright filtering frames, a process of both precipitation and filtration commences. Owing to the porous loose flocculent nature of the peat, especially after coagulation by any of the chemical precipitants aforementioned, the filtration through it is easy and rapid,  
25 very different to what it would be through the slimy coagulations of sewage organic matters only, and consequently an effluent water is delivered perfectly bright and clear, and totally free from suspended impurities. This effluent water now passes into beds of charcoal prepared from street sweepings, in accordance with a Specification of  
30 a former Patent granted to me and George Frederick Chantrell, No. 957, A.D. 1873, or of any other suitable charcoal; and which beds of charcoal I prefer to use on the oxidising plan, having a sufficient number of them in use to allow 12 to 24 hours oxidation, by which means, owing to the previous removal of all suspended matters in  
35 the effluent, the soluble impurities still contained in such effluent are very effectively removed, and the charcoal beds can never choke or become impervious to the liquid. The sewage is allowed to flow into this combined precipitating and filtering tank until it becomes full of



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the intercepted solids of the treated sewage, which consist mostly of the added peat. Owing to the immense area of filtering surface so presented to the sewage, such surfaces only become choked or impervious about as fast as the impurities are deposited among the upright filtering frames in a semi-solid form, and then, owing to the porous 5 open nature of the coagulated peat a drainage still continues which deprives of the sludge of most of its water. The sludges ordinarily deposited in precipitating processes contain nine parts water to one of solids. When at last this combined precipitating and filtering tank becomes quite full of semi-solid sewage impurities I cease to allow 10 any more sewage to flow in, but divert the stream to other tanks similarly arranged, and leave the whole mass of the wet solid sludge to drain slowly until a concentrated sludge is obtained only containing about 70 or 80 per cent. of moisture, and of such a consistency as to be now capable of being converted into bricks by suitable machinery, and 15 dried in the open air under sheds.

In order that this my said Invention may be the more readily seen and understood, I have hereunto annexed a Drawing illustrating my improved method of precipitating and filtering in one and the same tank.

20

Fig. 1 is a perspective view of a portion of a tank fitted with a series of my filtering frames.

Fig. 2 is a front view, and Fig. 3, a side or edge view (both drawn to a scale of about one inch to the foot) of one of my filtering frames shewn removed from the tank, and Fig. 4 is a plan of Fig. 2 through 25 the line *a, b*.

Fig. 5 is an enlarged view of one of the perforated or slotted tubes of my filtering frames shewing more clearly the method adopted for connecting the same with the pipes which carry off the clear effluent water from the interior of the filtering frames.

30

In all the views the same letters of reference are used to denote similar parts.

A is the tank or basin constructed of or lined with stone or brickwork; B is a channel which conveys the sewage after being mixed and thoroughly incorporated with the raw peat and precipitating agents, 35 as before mentioned, and permits the mixture to enter the tank by



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overflowing its lower edge C, which is so arranged in height that the liquid flows over the entire length of the channel simultaneously and gradually, and thus obviates any tendency to disturb the filtering frames D, herein-after described, or to stir up the solid contents of the  
5 tank, which would occur if the liquid was introduced in a volume or large quantity at any particular place. The filtering frames D are by preference constructed of bamboo or cane, wicker or basket work, between the two sides of which the metallic tubes E are interwoven, and thus secured firmly to such frames, whilst the sides of such wickerwork are prevented  
10 collapsing or approaching too near together by working in between them the short thick pieces of bamboo or cane F. These filtering frames are covered on the outside with any suitable woven fabric, such as the treble-twilled cloth of which sugar refiners' filtering bags are made; but the lower ends of the metallic tubes E are allowed  
15 to protrude, and at their lower extremities are provided with male sockets G which fit into and thus make a water-tight joint with the female sockets H upon the pipes I which are disposed beneath the bottom of the tank, as illustrated. The filtering frames D are thus held in a vertical position in the tank A, and when the liquid has filtered  
20 from outside to inside of such filtering frames through the woven fabric and has thus entered the interior of such frames, it is allowed to escape into the pipes I by the metallic tubes E, which are either perforated for the purpose inside the frames, or constructed with long side slots J, as seen more clearly in Fig. 5; the pipes I then convey  
25 the filtered liquid to any desired position to be further treated on the oxidising charcoal system herein-before described, or to be used in any other desired manner.

The action of this combined precipitating, filtering, and sludge draining tank may be described as follows:—Immediately the sewage,  
30 mixed with the rotted peat and flocculating or precipitating agents, has entered the tank the action of precipitation and filtration commences, the clear liquid finding its way into the interior of the filtering frames D, and thus escaping through the tubes E and pipes I, and the solid matter precipitating itself at the bottom of the tank; this  
35 combined operation continues until the filtering frames become sluggish in their action, when the sewage may be diverted to another tank, and the sludge in the first-mentioned tank will then continue to drain itself until a sufficient degree of solidity or consistency has been reached,



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when such sludge may be removed by lifting out the filtering frames, the female sockets being meanwhile plugged up to prevent the sludge getting into the pipes I.

It should be here observed that whilst I prefer the flat and upright form of filtering frame, shewn on the Drawing, which possesses many 5 advantages, such as presenting a large filtering surface in small compass, and facility for removal from the tank, being in a handy form, still I do not confine myself either to the form or position of such frames, as the same may be varied without departing from the Invention.

It will also be apparent that by the foregoing method I not only 10 secure an amazingly rapid removal of suspended impurities from the sewage, and upon an extremely small area of land, but I obtain a more valuable sludge when dried than has hitherto been accomplished, for owing to the admixture with peat of what fertilising matters the sewage contains I secure a good manure; or such sludge may be dried and 15 used as fuel, or if heated to redness in closed vessels will be converted into a good charcoal suitable for fuel and for deodorising purposes.

My process of treating sewage is also so rapid that combined with the well-known preserving action of peat no nuisance is created during the drying or draining of the sludge, a process hitherto attended with 20 much unwholesome effluvia.

It will be further observed that as the processes of precipitation, filtration, and concentration of the sludge are performed simultaneously according to this Invention, and in one and the same tank, that time and space are considerably economised, and although not mentioned 25 particularly it will be readily apparent that other foul liquids besides sewage are equally capable of being treated by my improved process.

Having thus particularly described and ascertained the nature of this my said Invention, together with the best methods with which I am acquainted for carrying the same into practical effect, I wish 30 it to be understood that I make no claim to the use and application of any of the flocculating or precipitating agents herein-before described, save and except when used in conjunction with rotted peat, and I particularly claim,—

1st. The method of treating sewage and other foul liquids with rotted 35 peat, as and for the purposes herein-before described.



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2nd. The combined precipitating, filtering, and sludge draining process and apparatus, substantially as and for the purposes herein-before described and illustrated on the accompany Drawing.

3rd. The construction of filtering frame covered with suitable woven  
5 fabric, substantially as and for the purpose herein-before described, and illustrated on the accompanying Drawing.

4th. The manufacture of fuel and manure, as herein-before described.

In witness whereof, I, the said James Robey, have hereunto set  
my hand and seal, this Twenty-third day of January, in the year  
10 of our Lord One thousand eight hundred and seventy-four.

JAS. ROBEY. (L.S.)

Witness,

JOHN G. WILSON,

Patent Agent,

15 71, Market Street,  
Manchester.

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LONDON:

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Printers to the Queen's most Excellent Majesty. 1874.



THE PATENT OFFICE

And the Commission of the said Patent Office, in the said  
 and separate, substantially as and for the purpose hereinbefore  
 described and illustrated on the accompanying Drawing, by the said

And the Commission of the said Patent Office, in the said  
 & fabric, substantially as and for the purpose hereinbefore described,  
 illustrated on the accompanying Drawing.

And the Commission of the said Patent Office, in the said

In witness whereof, I the said James Hobbs, have hereunto set  
 my hand and seal, this Twenty-third day of January, in the year  
 of our Lord One thousand eight hundred and seventy-four.

JAMES HOBBS. (Ses.)

Witness,

John G. W. W. W.

Agent

11, Market Street,

Manchester.

LONDON:

Printed and Published by JAMES HOBBS, at the Patent Office, 11, Market Street, Manchester.











FIG. 1.

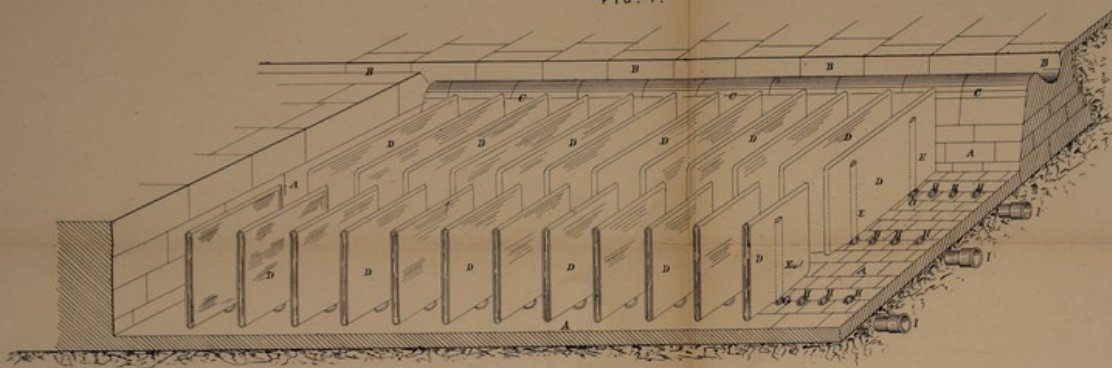


FIG. 2.

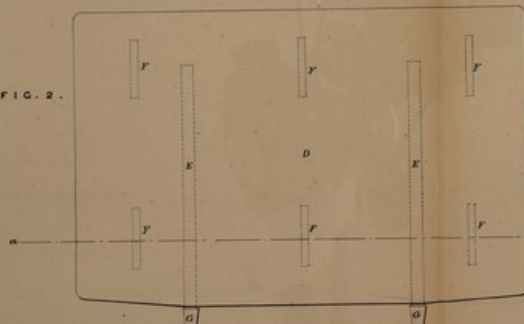


FIG. 3.



FIG. 5.

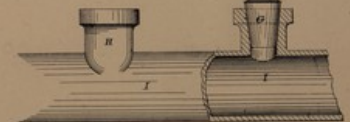
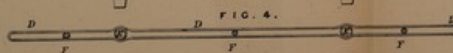


FIG. 4.



The filed drawing is not colored.

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