

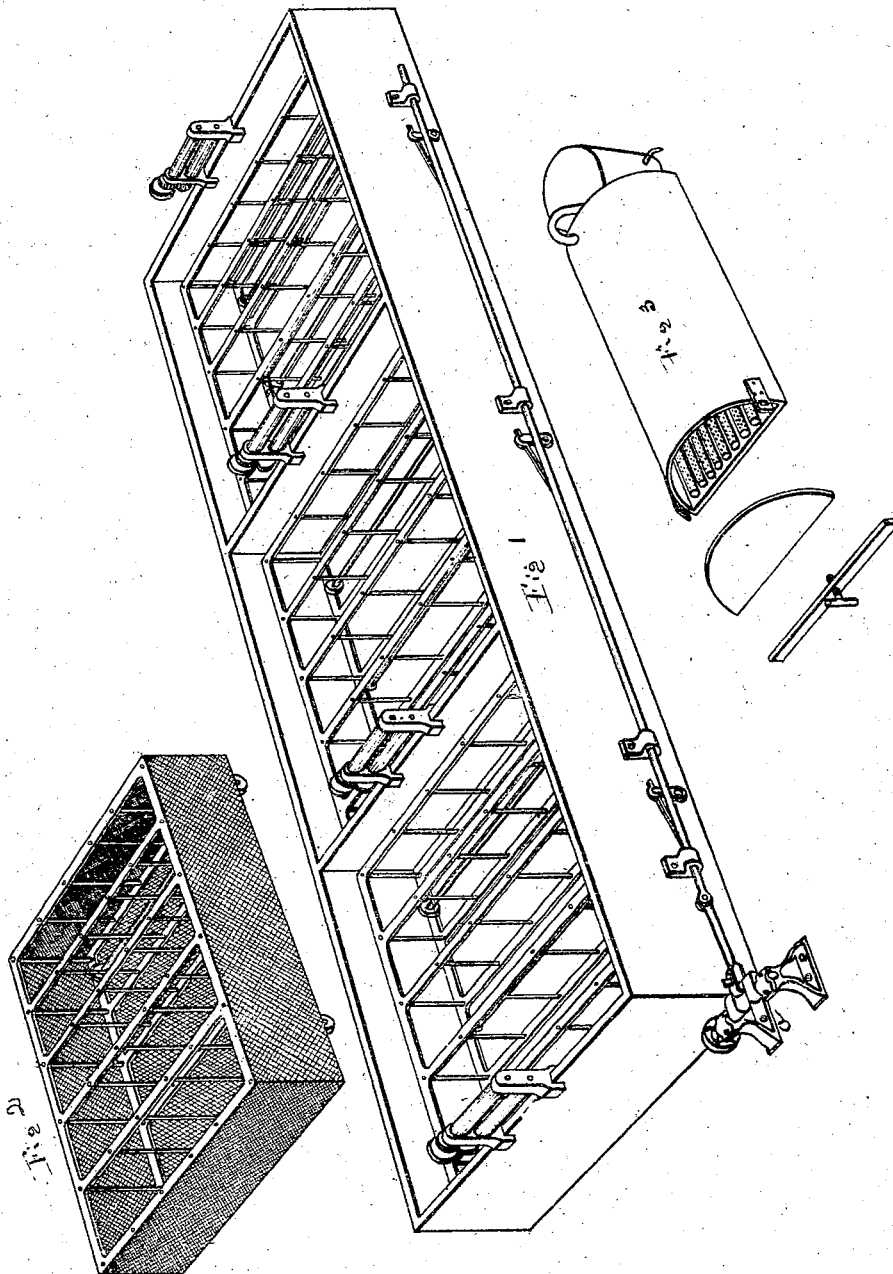
G. W. Sylvester,

3. Sheets. Sheet 1.

Cleaning Cotton Waste.

No. 110,800.

Patented Jan. 3, 1891.



Witness

E. Lehmann

Inventor: Geo. W. Sylvester

3. Sheets, Sheet 2.

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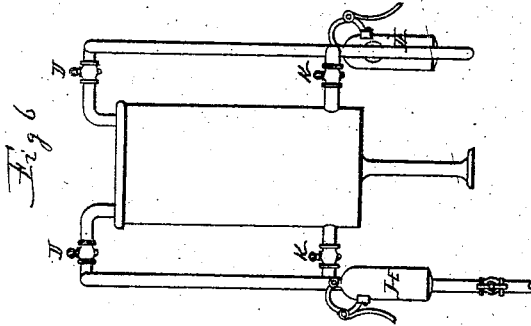


Fig 4

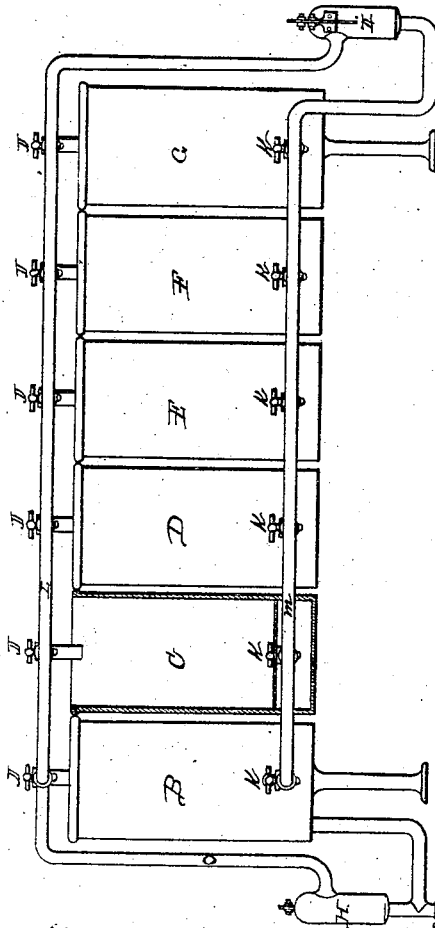
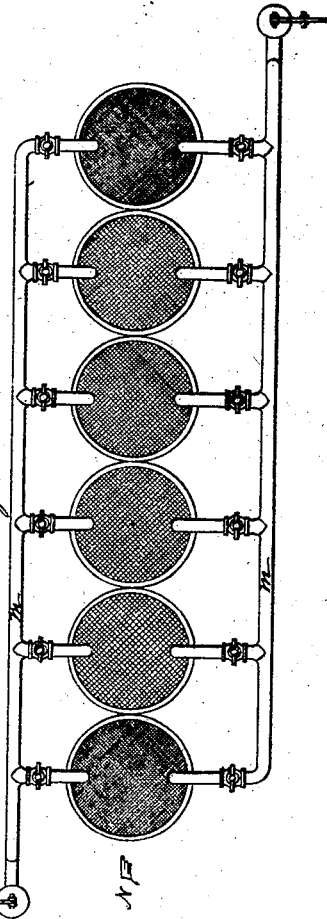


Fig 5



Witness  
J. Lehmann

Inventor G. W. Sylvester

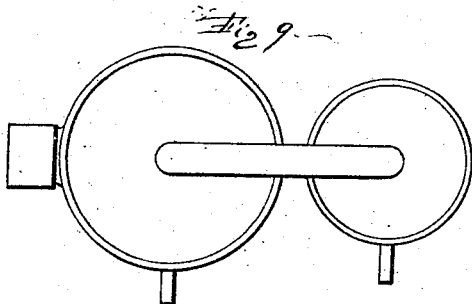
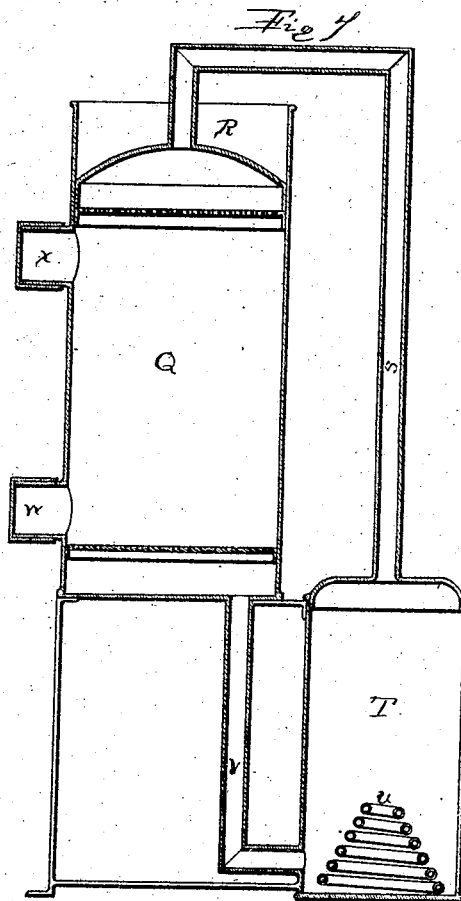
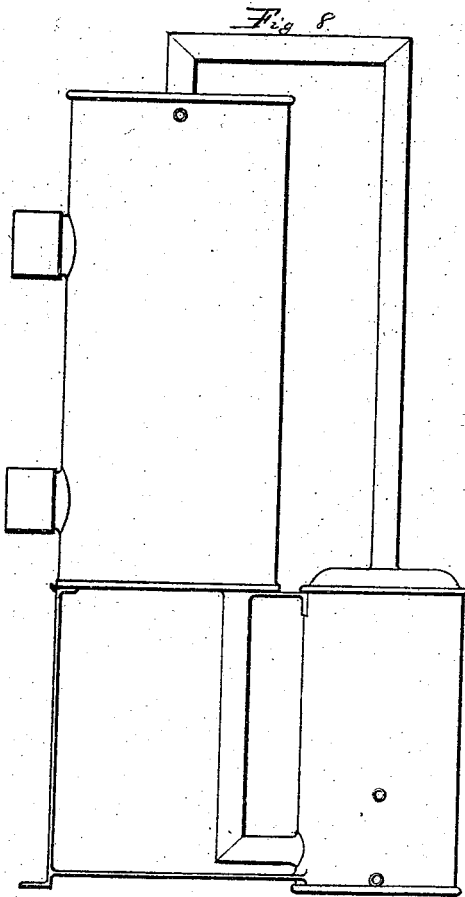
G. W. Sylvester,

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Inventor G. W. Sylvester  
Witness { J. H. Lammert,  
J. Lehmann

# United States Patent Office.

GEORGE W. SYLVESTER, OF BELLEVILLE, NEW JERSEY.

Letters Patent No. 110,800, dated January 3, 1871.

## IMPROVEMENT IN APPARATUS AND PROCESSES OF CLEANING COTTON-WASTE, &c.

The Schedule referred to in these Letters Patent and making part of the same.

### *To all whom it may concern:*

Be it known that I, GEORGE W. SYLVESTER, of Belleville, in the county of Essex and the State of New Jersey, have made a new and useful Improvement in Apparatus and Process for Treating Cotton and Woolen Waste used in cleaning machinery and packing car journal-boxes, and in recovering and purifying the products from the same; and I hereby declare the following to be a full and exact description thereof, reference being to the accompanying drawing which forms part of this specification.

The nature of my invention is to regenerate cotton or woolen waste used in wiping machinery and packing car journal-boxes by a process of washing, using as my solvent washing-liquid the heavier distillates of petroleum oil, such as kerosene or paraffine oil, or the distillates of vegetable-tar, such as spirits of turpentine or camphene: also to reclaim all the oil taken up in the use of such waste by its capillaries, freeing said oil of its dirt, decolorizing, deodorizing, and purifying it.

I am aware that various methods have been used with the above purpose in view, but in my estimation they are defective.

The use of alkalis and soaps but partially accomplish this purpose, inasmuch as it is only applicable to washing that class of waste known as "factory waste," and the railroad waste used in wiping its propelling power.

It fails to answer the purpose in washing car-box waste, as oftentimes the lubricating oils used therein resist the saponifying power of these alkalis or soaps; but should these alkalis or soaps act upon the oil in the waste, then the amount used necessary to cleanse it would be so great that it would be a serious bar to a profitable business.

The waste thus cleansed admits of no oil being recovered. The oil is lost in saponification, and is rinsed away in its sudsey mass.

The use of the light hydrocarbons as a solvent approximates more closely to the desired result, but they are dangerous and wasteful, and each construction for its use is defective when we consider the science of washing.

To wash a fabric, it is first necessary to loosen the dirt by some solvent and then rinse it out.

Those constructions making use of the light hydrocarbons contemplate cleansing waste by only one immersion in the solvent liquid. It is apparent that this would only free the waste of the heavier portions of oil or dirt, or as much as the solvent liquid would hold in suspension.

In thus failing to completely cleanse the waste the cleanser fails to realize the greatest compensation for his labor, for "discolored waste" falls below the

market of "white waste" several cents per pound, to say nothing of the oil remaining, which is valuable as a lubricator.

The use of the light hydrocarbons is dangerous and wasteful, inasmuch as they volatilize at a very low degree of temperature. Their exceeding volatile nature make it imperative (if we consult safety) that each and every vessel used should be perfectly tight.

This is simply impossible in the manipulation of washing, and its volatile portions being constantly passing off, intermix with the atmosphere, form a highly explosive compound, the record of which is familiar to all.

It is wasteful on account of its volatile nature. Immense surfaces of waste saturated with the solvent must necessarily be exposed during the washing, and hence the evaporations must be in that proportion wasteful.

To obviate these objections, which appear to my mind as radical faults, to render waste-washing entirely safe and a commercial success, and to enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

I construct tubs, three or more in number, situated side by side, or so that the process of washing and rinsing shall be consecutive.

In each of these tubs is a frame-work, its bottom and sides composed of coarse wire webbing. They are divided into compartments by partitions, but so as not to interrupt the free flow of the solvent liquid.

Into these separate receptacles the waste is loosely placed and the solvent liquid poured upon it. This frame-work containing the waste is now set in motion, passing back and forth through the solvent liquid. This movement is continued until the oil and dirt in the waste is softened and thoroughly dissolved into the liquid solvent.

On each of the partitions which divide the tubs I place a pair of pressure-rollers, through which I pass the waste from tub to tub, pressing out the solvent liquid and oil as it passes from one tub to the other, in this instance from tub No. 1 to tub No. 2.

The frame-work in tub No. 2 is exactly the same as tub No. 1. Its motion is the same, and is kept up as before.

I again charge tub No. 1 with another supply of heavy-soiled waste, inasmuch as the solvent power of the solvent liquid therein is not fully exhausted.

After the waste placed in Nos. 1 and 2 have received their appropriate agitation in the solvent liquid, No. 2 is wrung out, and, if found sufficiently cleansed, it is passed to the evaporator, which drives off any remaining solvent liquid remaining after the waste has passed

through the pressure-rollers. If it is not sufficiently cleansed, it is placed in tub No. 3 and rinsed in the solvent liquid again.

When tub No. 1 has dissolved all the oil from the waste it is capable of holding in solution, then tub No. 2 is the tub to be used for the first washing of heavy-soiled waste, and the remaining tubs as rinsing-tubs.

When the solvent power of tub No. 2 is exhausted, then No. 3 is the tub to receive the first washings of heavy-soiled waste, and Nos. 1 and 2 are rinsing-tubs, and so on.

After the waste is washed it is found to contain more or less of the solvent liquid. To disengage this I place it in a steam-tight receptacle, where it is boiled in fresh water or over perforated steam-pipes surrounded by a steam-tight jacket.

The vapors of steam and the vapors of the solvent will pass over together and through a condensing-coil. The solvent being the lightest, it can be gathered by floating it off from the water in any receptacle, which may be placed under the condensing-coil for catching its condensations.

It is well at this juncture to place the waste in a wash-wheel commonly used in laundries, and revolve it there awhile in soapsuds.

After this process it should be thoroughly rinsed, and always in boiling or very hot water. This last process is sure to divest the waste of fine particles of luff which may adhere to the fiber.

After this process the waste is again wrung out and placed in a drying-room, when it is found restored to its original integrity and fit for its former use again.

It is a well-known fact that while in use the capillaries of the waste take and hold a larger quantity of oil. In the process of washing in the solvent liquid this oil is taken out and held dissolved into the solvent liquid. This is recovered from the solvent liquid by the ordinary process of distillation. The solvent liquid being very much the lightest, passes off, leaving behind the oil taken from the waste.

Care should be used not to overheat the oil in distilling off the solvent, for in that case it would injure the lubricating qualities of the oil recovered from the waste.

The best method to drive off the solvent liquid is by the use of a steam coil, inasmuch as the temperatures necessary to use are regulated by adding or diminishing the steam pressure.

After the solvent liquid is driven off from the oil recovered from the waste it can be again used in washing other waste, but the heavy oil reclaimed from the waste is a dark, dirty, impure mass, and in that state unfit for its use as a lubricator.

To restore this, I first pass the oil through any filtering medium, such as felt, marble-dust, or sand well washed to free it of its particles of dirt. I then macerate it with "animal charcoal," commonly known as "bone-black," in a peculiarly-devised apparatus.

In coming in contact with the coal in this macerator the oil is purified, deodorized, and decolorized. It is purified of any rancidity, which always occurs when the lubricator used is either animal, vegetable, or fish oils, these oils being in a transitory state.

To accomplish this result I construct from three to six tanks in number, and situate them so they can be worked separate or together.

At a suitable distance from the bottom I locate false bottoms, perforated. On these I place thick felt. I connect the bottom of each of these tanks underneath the false bottoms on both sides, with a line of pipe to the suction of two pumps, one situated at the right of the apparatus, and one situated to the left.

I break the connection of each of these tanks with the line of pipe by stop-cocks, so that one or more can be worked at option by either of the pumps.

From the discharge of these pumps I run a line of pipe up and over the top of the macerators, providing each with a stop-cock outlet, so as to discharge into either of them.

In these tanks I place animal charcoal. I then start the pump situated at the left of the apparatus, and open the cock which connects its suction-pipe with a tank containing oil to be treated. I then open the cock on top of tank No. 1. I then start the pump, and the impure oil passes into tank No. 1.

When the oil appears at the bottom, I then close my connection with the impure-oil tank and open cock at the bottom of tank No. 1. The oil is then pumped from the bottom to the top of tank No. 1, where it is allowed to stand to receive the action of the bone-black upon the oil.

When the oil is sufficiently treated it is pumped off into a reservoir provided for that purpose. Again tank No. 1 is charged with impure oil, with the same pump, opening the same inlets and outlets, and the same process of rotating the oil in the tank from bottom gone through with as before.

This time it will be found that the coal in tank No. 1 has parted with much of its purifying power, and it will be found necessary to pass the oil from tank No. 1 to tank No. 2.

To do this I start the pump situated at the right of the apparatus, opening the cock at the bottom of tank No. 1, and open the cock in discharge-pipe of the same pump over tank No. 2.

While I am pumping the oil from No. 1 to No. 2, the impure-oil pump can be started, and tank No. 1 filled with oil to be treated while the oil partially treated is being pumped into tank No. 2. This process is kept up, and impure oil is continually pumped into tank No. 1 until the clarifying power of the animal charcoal is found to be completely exhausted.

When so found, tank No. 2 is charged with impure oil until its clarifying power is exhausted and the oil is passed on from tank to tank to receive its treatment as the necessities of the case appear.

The object of this construction is to obtain the complete power of the animal-charcoal. This can only be done by repeated charges of fresh liquid.

When the contents of either of the tanks are exhausted they are dug out and the oil washed out of the bone-black, for its capillaries absorb a large amount. This is necessary, for the bone-black can again be re-used after having been re-burned.

I wash the oil from the bone-black in the following manner:

I construct a tank to hold the coal, and situate beside it a still.

In the still I place a steam-coil. I then charge the still with benzine, inasmuch as this apparatus can be used entirely steam or benzine-tight.

The benzine, coming in contact with the steam-coil, vaporizes and passes up and through a condensing coil, and down and through the coal, washing with it oil held in the bone-black back into the still.

Now, as the benzine volatilizes at one degree of heat, and the oil once in the bone-black, another, and much less, the benzine again vaporizes and passes through the condensing-coil, through the bone-black, and back into the still again, conveying with it still another portion of oil.

This process is continued until the bone-black is thoroughly washed of heavy oil.

Now, benzine has taken the place of the heavy oil in the bone-black, I now pass steam through the black; it vaporizes the benzine, which, together with

the steam, passes through the condensing-coil, when it is collected.

In the still we now have benzine and heavy oil.

Now all communication with the tank holding the coal is cut off, I turn on steam through the coal in the still, and the benzine vaporizes and leaves the heavy oil behind in the still.

The following description will enable any one to construct and use my invention.

Figure 1 is the washer, with three consecutive tubs or vats, as they are designed to be used. In each of the three tubs the frame-work—the several divisions in them to hold the waste to be cleaned, and on the several partitions, the pressure-rollers designed to pass the wash through as it is taken from tub to tub. Along the side of this apparatus will be seen a parallel sliding-bar or rod, and fixed to it by a movable joint is a hook hooked to a crank-arm, which rocks a shaft which traverses each one of the several tubs. On this shaft are two tongues fitted into a slot on each side of the frame-work.

The parallel sliding-rod now being set in motion by the crank motion A, it will be seen that the frame-work will pass back and forth in each of the tubs.

When it is necessary to cease the operation of either of these tubs it only becomes necessary to lift the hook attached to the sliding-bar off the crank-pin.

Figure No. 2 is a view of the frame-work as it appears detached from the tub in which it works. It shows its various partitions and its surrounding network of wire.

Figure No. 3 is the apparatus into which the waste is placed after having passed through its washings and pressure rollers, to expel any remaining solvent liquid. It is simply a steam-tight D-shaped jacket, surrounding perforated pipes. At the end is a tub containing a condensing-coil.

Into this receptacle, fig. 3, I place the washed waste, admit steam to the perforated pipes, and the steam, passing through these perforations, volatilizes the remaining washing solvent in the waste, and it passes over and is condensed with the steam through the coil.

Figure No. 4 is the apparatus for deodorizing, decolorizing, and purifying the oil extracted from the waste after having distilled off the volatile solvent used in the process of washing. It represents six tanks with their pipe-connections, pumps, and stop-cocks for directing the inlet and outlet of the oil to be treated.

B C D E F G are six tanks, composed of any suitable metallic substance.

H is the impure-oil pump.

O is the discharge-pipe of H. This discharge-pipe is provided with a stop-cock for discharging into any one of the six tanks, but is not shown in the drawing.

I is the treated-oil pump;

M, its suction-pipe, with its stop-cocks K; and

L, its discharge-pipe, with its stop-cocks J.

Figure 5 is a view of the perforated false bottoms of fig. No. 4. Its bottom lines of suction-pipe of pumps H and I.

Figure 6 is an end view of the apparatus.

To work this apparatus and treat the impure oil I first charge these tanks with animal-charcoal; I then open stop-cock P in suction-pipe of pump H.

The oil is then pumped up through O, through the stop-cock over B. It percolates through the bone-black in B, through the false bottom, to the bottom of B. I then shut stop-cock P and open the cock in the suction-pipe back of B.

Stop-cock P being closed, and the outlet in discharge over B being open, the oil is rotated from the bottom of B, to the top of B

When I take the oil from B and place it in C, I close all connections with pump H, open stop-cock K at the bottom of B, then the stop-cock J on the top of C, and set pump I in motion.

The oil flows through suction-pipe M, pump I, and discharge-pipe L, to tank O.

Tank B can again be filled while the oil is being pumped to C by starting pump H, as before, only keeping the cock K closed in the bottom of B.

It is desirable to again charge B with oil, inasmuch as the purifying power of the coal would be by no means exhausted. This can be repeated several times and the oil passed onto C and D, and so on, until the power of the coal to extract color or to purify is found to be gone.

Figure 7 is the apparatus for washing the oil out of the bone-black taken up by its capillaries while performing service of purifying the oil.

Figure 8 is the same apparatus, and as it appears in operation.

Figure 9 is a top view of the same apparatus.

Fig. 7 is the apparatus cut through from top to bottom.

In Q, I place the bone-black. It rests upon the perforated false bottoms.

In T, I place the benzine.

Through the steam-coil U I pass steam.

The benzine is reduced to vapor, passes up through pipe S and is condensed, and in its liquid state passes down through the bone-black in Q down through the false bottom, through V, back again into still T.

The oil washed out of the bone-black by the passage of the benzine through it is now in still T, and, being the heaviest, remains there, while the benzine again passes over to be again condensed, and through the bone-black to wash still another portion of oil out.

The operation of continued distillation of the benzine over upon the bone-black is to be continued until no traces of heavy oil remain behind.

This is designated by a glass tube being inserted in V, and when the liquids pass back through the glass to still T colorless it is evident that the black is thoroughly washed.

Communication between Q and T is now shut off, and steam is admitted to Q, and the benzine which has taken the place of the heavy oil is driven off when the bone-black is ready for the re-burning process.

I have described three washing-tubs, but I do not limit myself to this number, nor to the form shown. The number may be increased or diminished and the form changed without departing from the principle of my invention.

I desire to be distinctly understood that successive washings or rinsings are necessary to give the best results, and this constitutes one feature of my invention.

I have described a D shaped retort to receive the waste after being washed, to expel any remaining volatile washing liquid.

Any form, shape, or size of vessel would answer the same purpose so long as it employs the principle of employing heat sufficient to expel the volatile solvent.

I also have described six macerating tanks, but do not limit myself to this number, as they may also be increased or diminished in numbers.

The object and design of this apparatus are to utilize the extreme and the whole power of the bone-black to extract color and purify, and to exert that influence upon the substance to be treated.

It is an apparent fact that the upper stratas of any filtering medium are exhausted first, and become less exhausted as you descend through the filter, and it is only by taxing the lower stratas with fresh supplies that it yields up its power.

By repeating these fresh supplies at last the lowest

strata is reached, and only then can we say its power to filter or to extract is gone.

Having thus described my invention,

What I claim, and desire to secure by Letters Patent, is—

1. The apparatus herein described for washing and cleansing cotton and woolen waste, composed of a series of tanks or vessels, so as to alternately immerse and wring or squeeze the material, as set forth.

2. Apparatus for expelling the solvent, composed of a steam-tight jacket and perforated steam-pipes.

3. The process of cleaning waste by the application of hydrocarbons, such as herein described, applied substantially in the manner set forth.

4. The macerators herein described, arranged so as to purify the oil by filtration in the manner described.

5. The method described for purifying oil from waste by macerating or filtering with bone-black or its equivalent, as set forth.

6. The apparatus described, for separating the heavy oils from the light solvents, consisting of the still T, digester Q, steam-coil U, its connecting-passages or pipes S and V, and condensing-chamber R, arranged and operating substantially as described.

7. The combination of the following separate parts, which constitute a complete method, viz., successive washing and squeezing or wringing, the separating of the impurities from the mixed oils by maceration and filtration, the separation of the heavy oils from the filtering medium by solvents, and the final separation of these from the heavy oils, all substantially as set forth.

GEO. W. SYLVESTER.

Witnesses:

T. C. CONNOLLY,

I. LEHMANN.