3 Sheets—Sheet 1.

C. W. SMITH.

CLEANSING CLOTH, YARNS AND WASTE.

No. 192,844. Patented July 10, 1877.

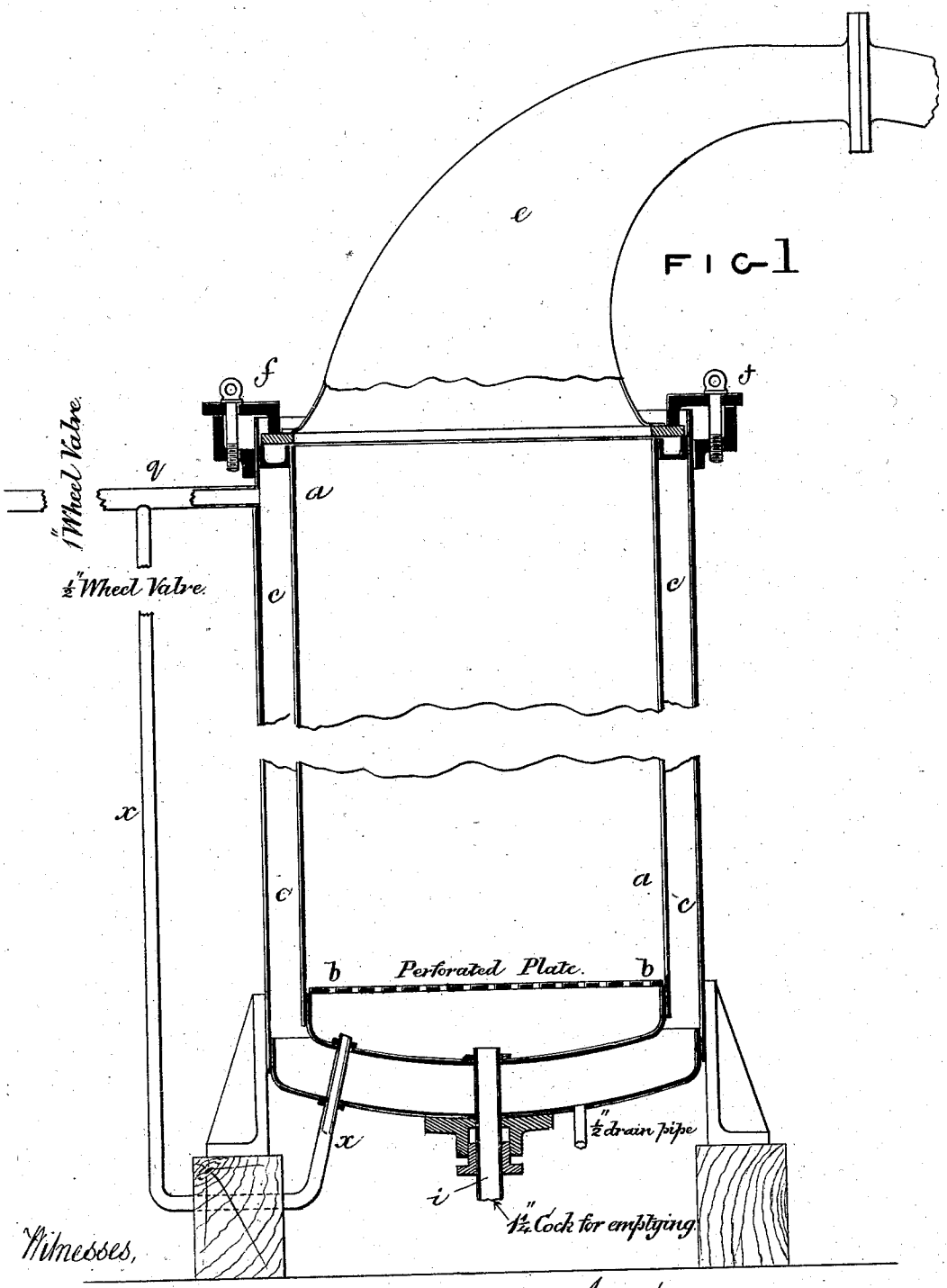


FIG-1

Witnesses,

George Shaw

Richard Skerrett

Inventor

Christopher Webb Smith

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets—Sheet 2.

C. W. SMITH.

CLEANSING CLOTH, YARNS AND WASTE.

No. 192,844. Patented July 10, 1877.

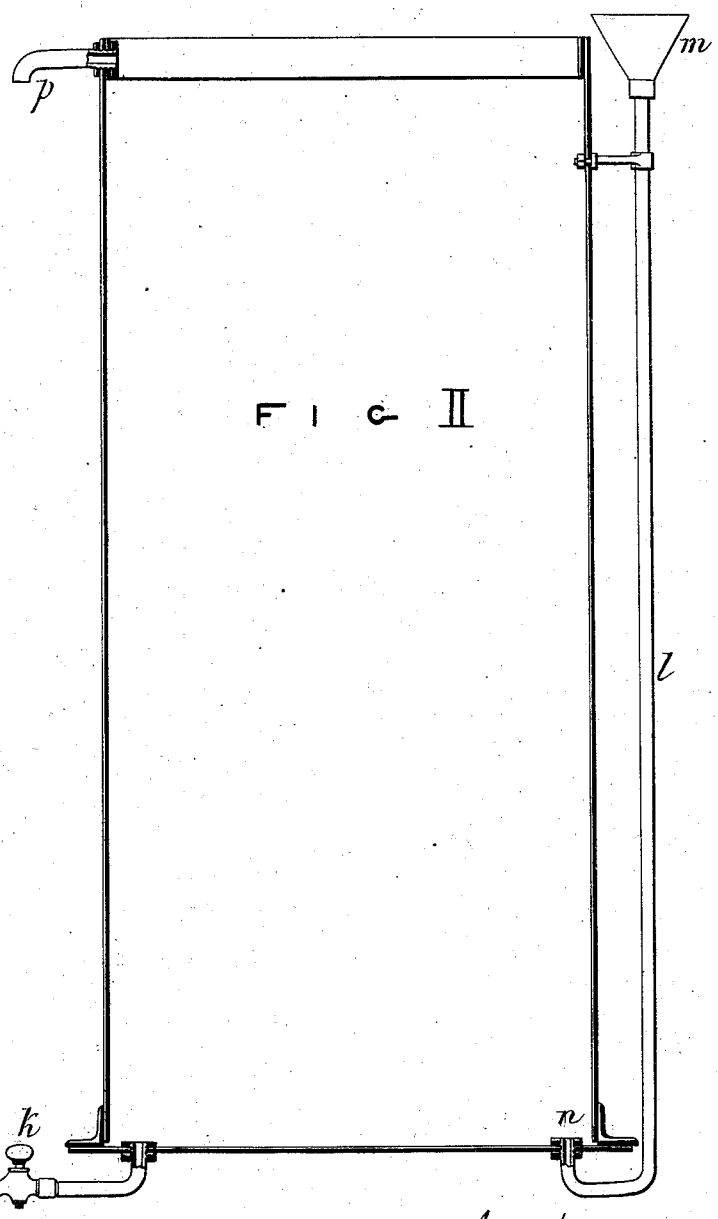


FIG. II

Witnesses,
George Shaw
Richard Skerrett

Inventor
Christopher Webb Smith

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets—Sheet 3.

C. W. SMITH.

CLEANSING CLOTH, YARNS AND WASTE.

No. 192,844. Patented July 10, 1877.

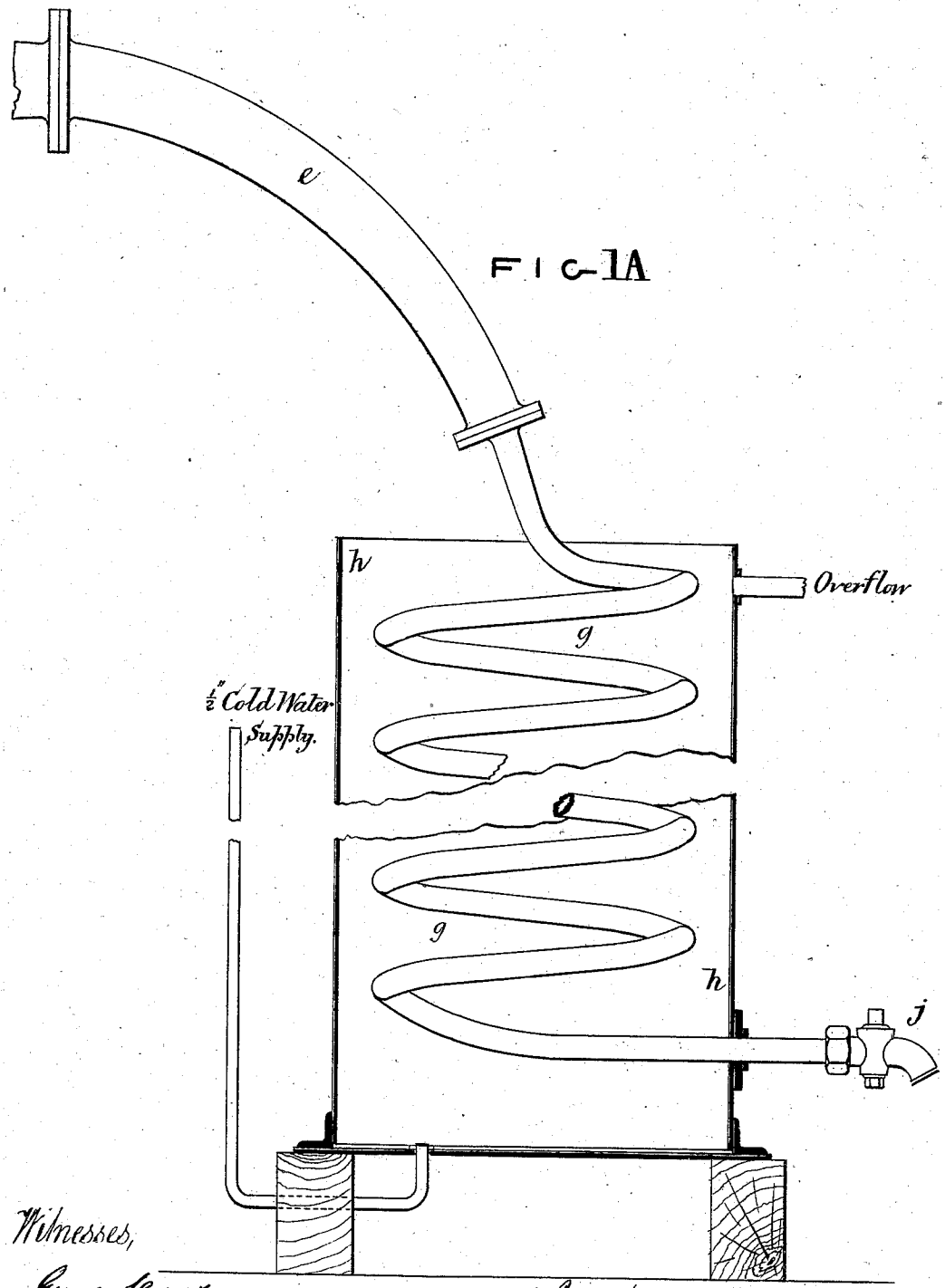


FIG-1A

Witnesses,
George Skaw
Richard Skerrett

Inventor
Christopher Webb Smith

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHRISTOPHER WEBB SMITH, OF BARNWOOD, NEAR GLOUCESTER, ENGLAND.

IMPROVEMENT IN CLEANSING CLOTH, YARNS, AND WASTE.

Specification forming part of Letters Patent No. **192,844**, dated July 10, 1877; application filed June 16, 1877.

To all whom it may concern:

Be it known that I, CHRISTOPHER WEBB SMITH, of Barnwood, near the city of Gloucester, England, chemist, have invented new and useful Improvements in and Apparatus for Scouring or Cleansing Woolen Cloth, Yarns, and Wastes, and in recovering valuable products from the materials which have been used used in conducting the said scouring or cleansing, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My invention has for its object to supersede the tedious and uncertain process of scouring or cleansing woolen cloth ordinarily employed, and substituting therefor a process which is shorter and more efficient, and which permits of the recovery of a considerable quantity of the indigo or other dye and oil which are removed from the cloth during the scouring process. My invention has the further advantage that the principal material employed can be purified after use, so as to permit of its being used over again instead of being converted into a waste or refuse material, as is the case with respect to the material commonly used in conducting the scouring or cleansing process.

My said invention is practiced by the use of the apparatus hereinafter described.

In scouring or cleansing woolen cloth of coarse or low quality, according to my invention, I proceed as follows: The cloth to be operated upon is spread out on the floor of the room in which the process is conducted, and a layer of matting or other like coarse and cheap material is placed upon the cloth. The cloth and matting are rolled into a loose coil, which is placed in an upright cylindrical vessel of a size and figure proper to receive it. The said vessel has a removable head similar to the head of a still, and after the introduction of the cloth into the vessel the said head is fixed on the vessel. Through a funnel in the said head I fill the said vessel with amylic alcohol or common petroleum-spirit, such as is commonly burned in lamps. The spirit is allowed to remain undisturbed in the vessel from twenty minutes to half an hour, during which time it dissolves all the oil contained in the cloth, the matting rolled with the cloth favoring the passage of the spirit to every part of the cloth. A considerable quantity of indigo is also removed from the cloth. After the expiration of the time indicated the spirit is drawn off from the vessel containing the cloth by means of a tap at its bottom, and is conducted into a second vessel at a somewhat lower level than the first. That portion of the spirit which is retained in the pores of the cloth is removed by volatilization, or by centrifugal force. When I employ volatilization the still-head of the vessel containing the cloth is connected with a condenser or worm, and steam is passed into the said vessel in small jets from a pipe until the spirit is driven off. The spirit contained in the cloth is volatilized and condensed in the worm or condenser, and collected in a third vessel. The cloth is now removed from the vessel, when it will be found to be dry and clean, and ready in most cases for fulling. When, however, it is thought desirable the cloth may be passed through the "washer" machine with fullers' earth, in the ordinary way. The spirit drawn off and that obtained by distillation may be mixed together and used again. After, however, the spirit has been used two or three times it is desirable to purify it by separating the suspended indigo and the oil which it has dissolved.

In order to separate the indigo or other dyes or impurities, the spirit, when drawn off from the first vessel into the second, is allowed to rest there for several hours, when the whole of the indigo or other solid subsides, and by decantation and filtration the spirit and indigo or solid may be obtained separately. The said indigo and spirit are, however, impure.

To purify the spirit—that is, to separate it from the fixed oil which it has dissolved—I subject it to distillation, whereby the spirit is obtained in a state of sufficient purity for use again in the cleansing process, and the fixed oil remains in the still. The fixed oil is purified by being placed in an open vat together with one-third its volume of water. Steam is passed into the said vat, and the whole is boiled for about an hour. After allowing the

contents of the vat to rest for a time, the oil can be run off, and can be used again in treating the wool. The impure indigo may be treated by filtration and distillation to remove all the spirit adhering to it. The indigo thus obtained is sufficiently pure to be used in dyeing. When, however, it is required still further to purify the indigo, the impure indigo may be washed once or twice with petroleum-spirit, and boiled in an open vat, first with lime and then with hydrochloric acid, or deoxidized by any of the well-known agents, such as orpiment, chloride of tin, protoxide of zinc, sulphate of iron in the presence of lime and alkalies. After the deoxidation of the indigo the liquid is allowed to stand at rest to permit the solid impurities to precipitate. The supernatant liquor is run off into another vessel and oxidized by exposure to the action of the air, or by the addition of sulphate of copper, which hastens the oxidation.

Although my invention is especially applicable to the scouring or cleansing of woolen cloth, yet it is also applicable to the scouring or cleansing of woolen and other yarns and wastes.

Although amylic alcohol is an excellent solvent of fixed oils, I only use it in treating goods where its objectionable odor is of no consequence.

For treating woolen cloths, yarns, wools, and oily cotton-waste, I prefer to use petroleum-spirit instead of amylic alcohol.

Instead of employing the apparatus described for cleansing cloths, yarns, and wastes according to my invention, the said cloths, yarns, and wastes may be treated in a centrifugal machine, the bottom of the outer shell or casing of the said machine being fitted with a tap for the exit of the spirit. The centrifugal machine should be fixed at such a level that the spirit can be run into it from a tank above.

The centrifugal machine having been filled three-fourths full of spirit, the goods are pressed under the liquid by sticks, and allowed to remain soaking for half an hour for the perfect solution of the fixed oils. A large proportion of the spirit can be run off while the machine is stationary, most of that which remains in the goods being collected by centrifugal force. This method of treatment I prefer.

For most goods the treatment described will be sufficient, and the spirit sufficiently recovered. When, however, the goods are of such a nature that the spirit is removed with difficulty, a jet of water may be thrown in at the center of the centrifugal machine while in motion, which will secure the collection of all that remains. When water is employed for this purpose it should afterward be conducted into another vessel for the easy separation of the water and oils. Oily goods which have been soaked in spirit and deprived of the spirit by centrifugal force, as described, can be further completely cleansed by injecting spirit into the middle of the centrifugal machine during its action.

I also, in some instances, treat the goods in an upright cylindrical vessel of the kind hereinafter described. The cloth being packed in the upright cylindrical vessel, with coarse canvas intervening, as before explained, spirit is run in at the bottom, which ascends through the cloth. When the vessel has been filled with the spirit, it should remain from twenty minutes to half an hour, to act upon the cloth. Water is then made slowly to flow into the vessel by the same entrance at bottom by which the spirit was introduced, which water, forcing its way upward, drives the spirit before it, the said spirit flowing out at a spout or pipe provided for the purpose. The water by which the spirit is displaced must be admitted slowly into the vessel.

In treating oily cotton-waste it should, when very foul, pass twice through the process described. The said cotton-waste, after it has been treated, will only require shaking on wire hurdles, or dusted by machinery, to free it from any dust or insoluble impurities not removed by the spirit. When very much stained by iron the cotton-waste can be treated by very dilute hydrochloric acid, and afterward washed in a centrifugal machine; but this treatment is rarely necessary.

Figures 1 and 1A of the accompanying drawing, represent, in vertical section, the apparatus which I employ for the scouring or cleansing of woolen cloth according to my invention.

a, Fig. 1, is an upright cylindrical vessel, of a size and form proper to receive the loose coil of cloth and matting. The loose coil is supported on the perforated bottom *b*. *c* is a steam-jacket, between which and the cylindrical vessel *a* steam is introduced for the purpose of heating the contents of the vessel *a*. *e* is a removable still-head, capable of being readily fixed on and removed from the vessel *a*. Screw-clamps, of the kind represented at *f*, may be used for connecting and disconnecting the still-head *e*. The said still-head *e* is in communication with a worm, *g*, Fig. 1A, immersed in a vessel, *h*, containing cold water, the said worm and vessel constituting a condensing apparatus of the ordinary kind. After the cloth has been introduced into the vessel *a*, and the said vessel filled with amylic alcohol or petroleum-spirit, the head *e* is fixed on the vessel, and after the lapse of the time hereinbefore indicated the spirit is drawn off by the pipe *i*. The portion of the spirit retained by the cloth is volatilized by introducing steam by the pipe *q*, in connection with a steam-boiler, between the jacket *c* and vessel *a*. The vapor of the spirit, passing through the still-head *e* into the worm *g*, is there condensed, and is drawn off at the cock *j*. By means of the small pipe *x* steam in small jets may be passed into the vessel *a* and the spirit thereby driven off.

Fig. II represents, in vertical section, the upright cylindrical vessel hereinbefore referred

to, in which, in some cases, I treat the woolen cloth or other goods to be cleansed.

This vessel is furnished with a tap, *k*, at bottom for emptying it, and with a vertical pipe, *l*, surmounted with a funnel, *m*, and opening into the bottom of the vessel at *n*. Through this funnel and pipe the spirit, to act upon the woolen cloth or goods, is first introduced, and, after a sufficient lapse of time, is drawn off at the tap *k*. The spirit remaining in the pores of the cloth or other goods is displaced by a stream of water heated to about 80° Fahrenheit, which is slowly introduced through the funnel *m* and pipe *l*. This warm water, slowly ascending in the vessel, displaces the spirit contained in the goods under treatment, which spirit, collecting at the top of the vessel, passes off by the pipe *p*.

Having now described the nature of invention, and the manner in 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, as the same may be varied without departing from the nature of my invention; but

I claim as my invention—

1. The process of cleaning and scouring woolen cloths, yarns, and wastes when rolled into mats, into coils, and placed in cylindrical receivers with amylic alcohol or petroleum-spirit, substantially as hereinbefore described.

2. The methods of scouring or cleansing woolen cloth, yarns, and wastes, and recovering valuable products from the materials which have been used in conducting the said scouring or cleansing, substantially by the means and in the manner herein shown and set forth.

CHRISTOPHER WEBB SMITH. [L. S.]

Witnesses:

GEORGE SHAW,

RICHARD SKERRETT,

Both of 37 Temple Street, Birmingham.