(No Model.) 4 Sheets—Sheet 1.

F. A. OWEN & J. A. HARVEY.

MACHINE FOR EXTRACTING OIL FROM WOOL.

No. 379,808. Patented Mar. 20, 1888.

Fig. 1.

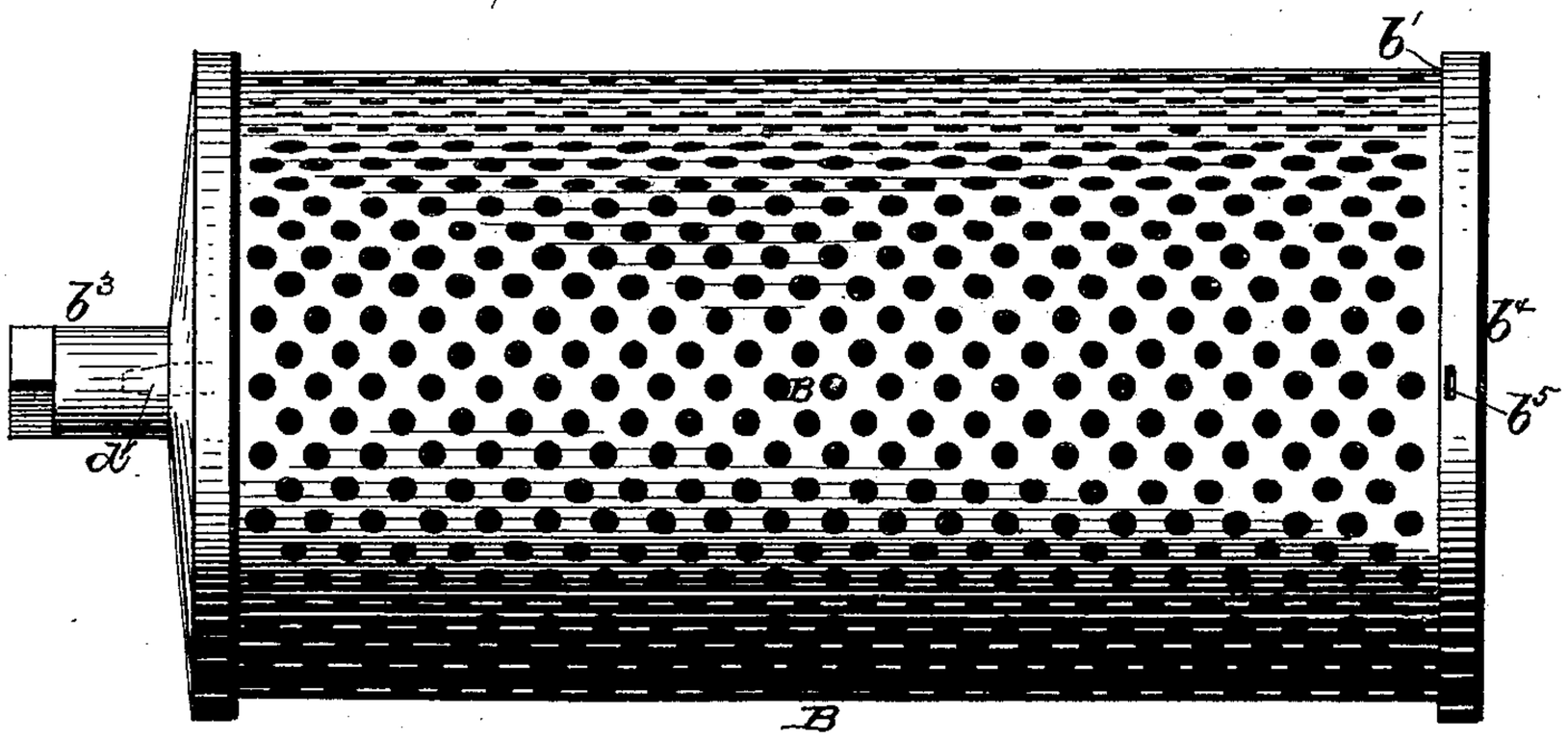
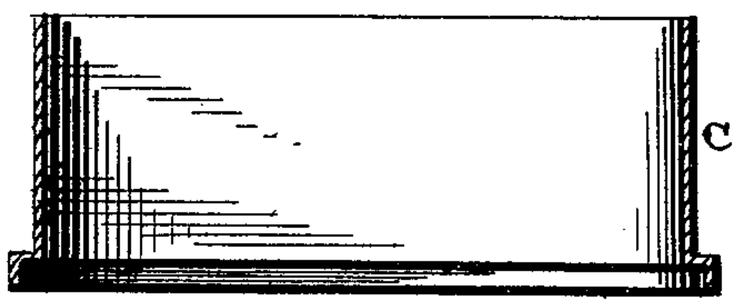


Fig. 2.

Fig. 3.



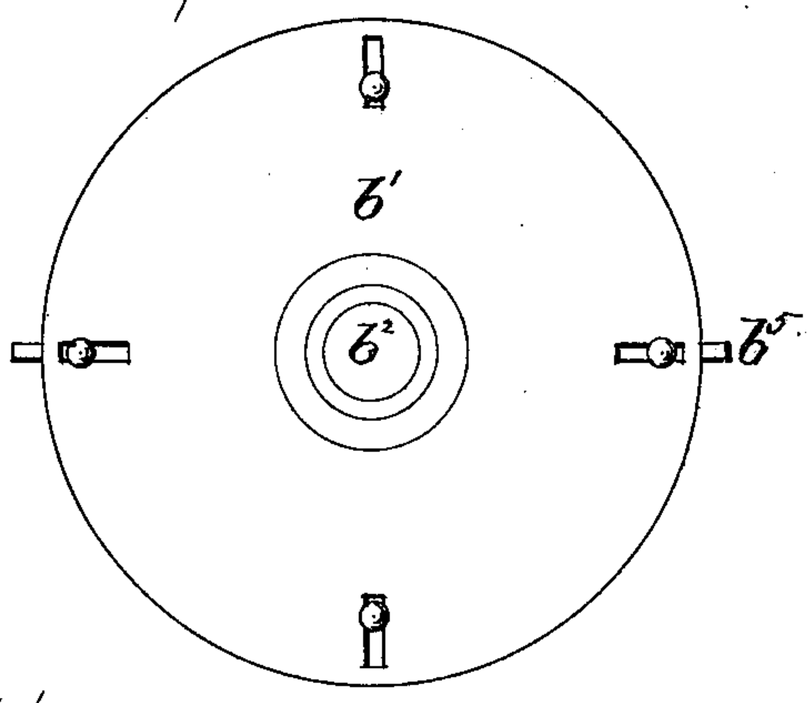
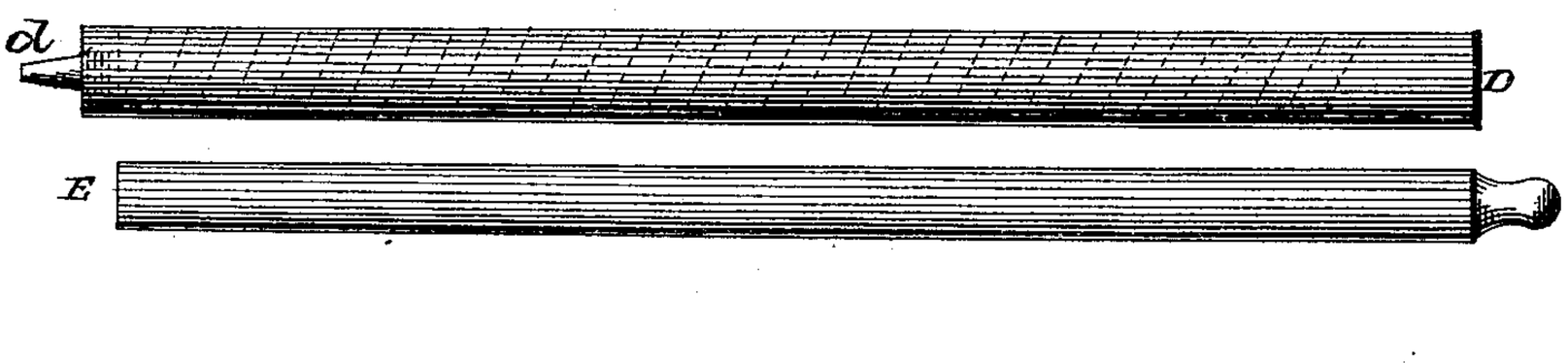


Fig. 4.



Witnesses.
L. F. Gardner
Edm. P. Ellis.

Inventors.
F. A. Owen,
J. A. Harvey,
per C. E. Allen, atty.

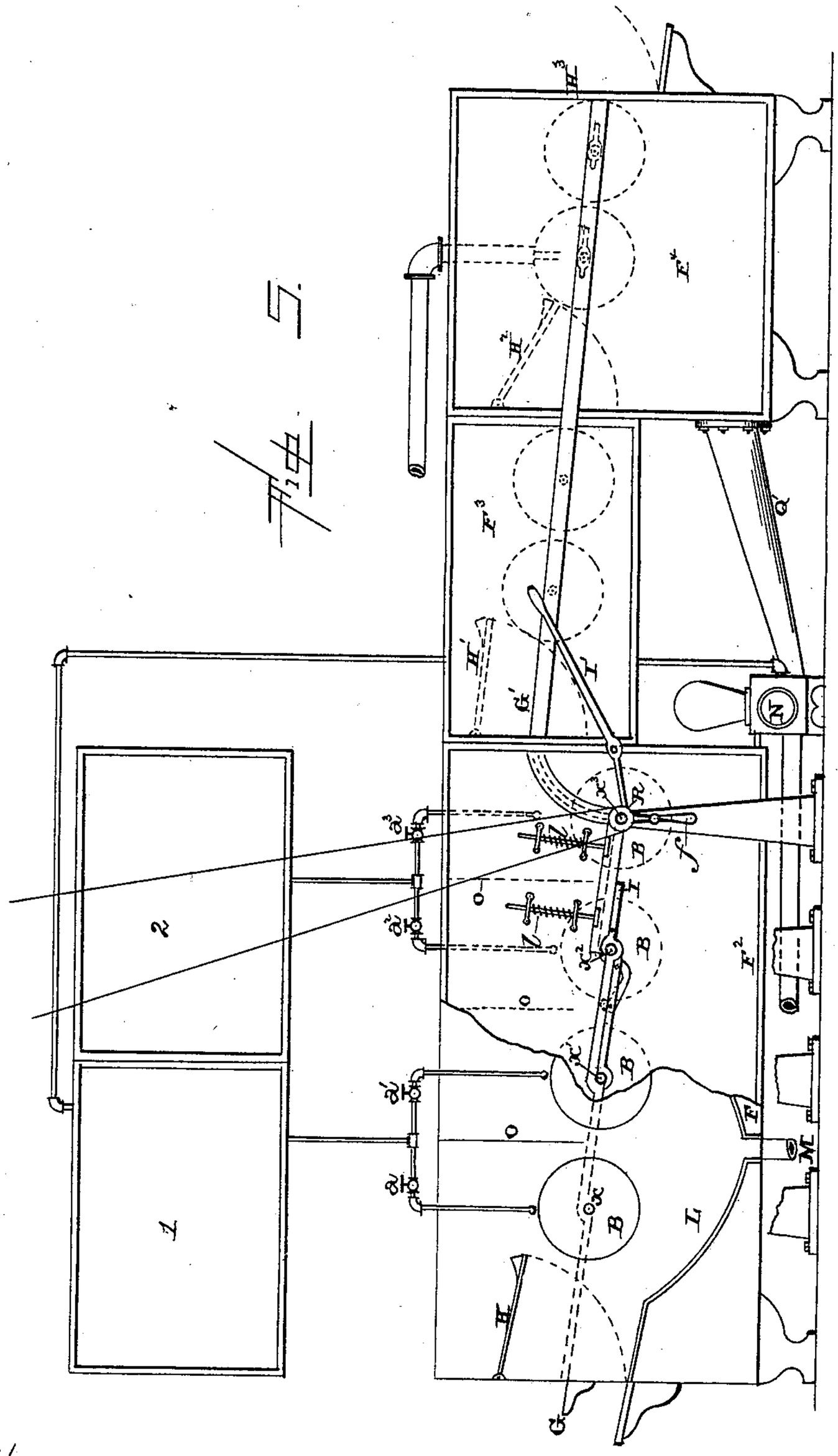
(No Model.)

4 Sheets—Sheet 2.

F. A. OWEN & J. A. HARVEY.

MACHINE FOR EXTRACTING OIL FROM WOOL.

No. 379,808. Patented Mar. 20, 1888.



Witnesses.
L. F. Gardner
Edm. P. Ellis.

Inventors.
F. A. Owen,
J. A. Harvey,
per C. E. Allen, Atty.

(No Model.) 4 Sheets—Sheet 3.

F. A. OWEN & J. A. HARVEY.

MACHINE FOR EXTRACTING OIL FROM WOOL.

No. 379,808. Patented Mar. 20, 1888.

Fig. 6.

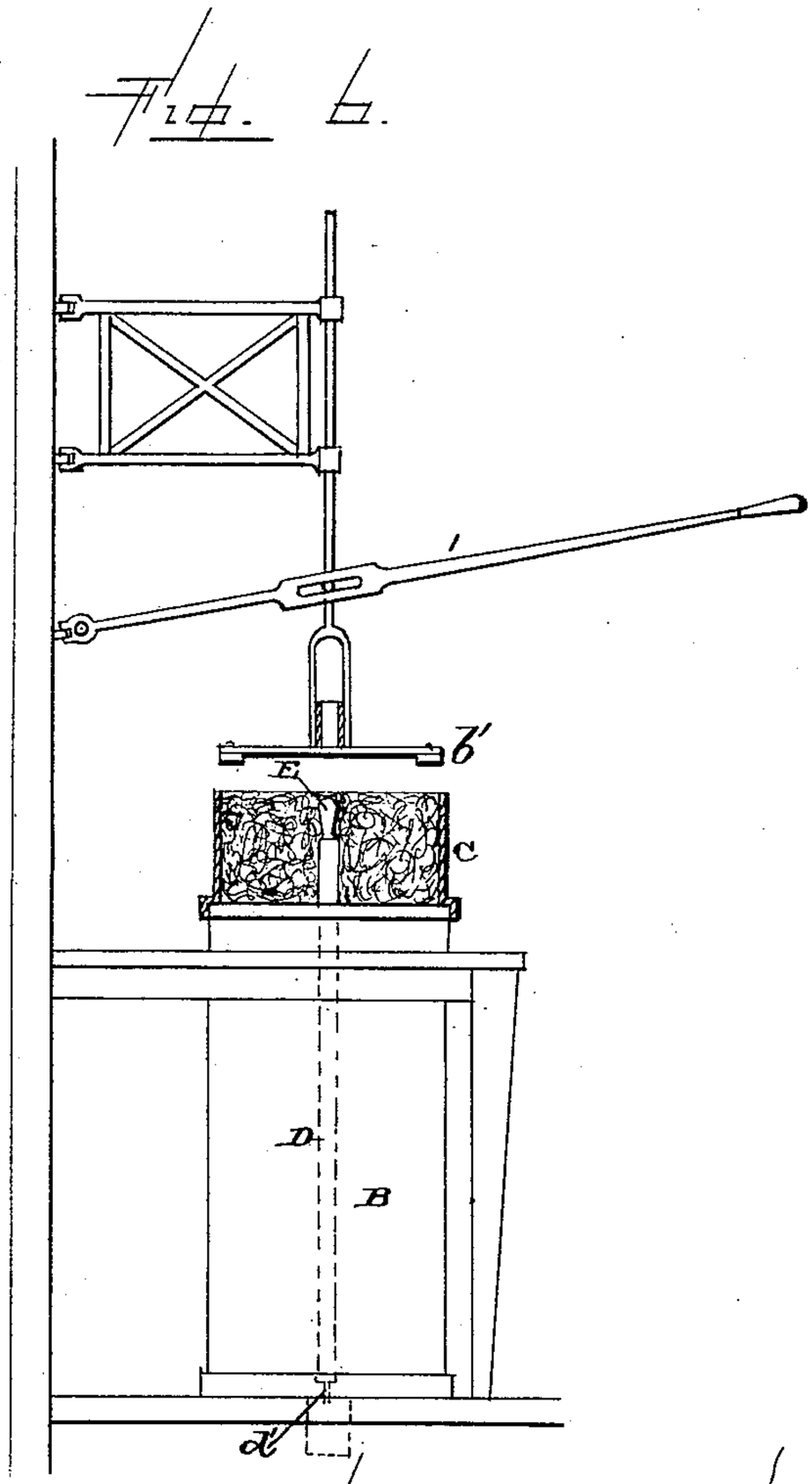


Fig. 7.

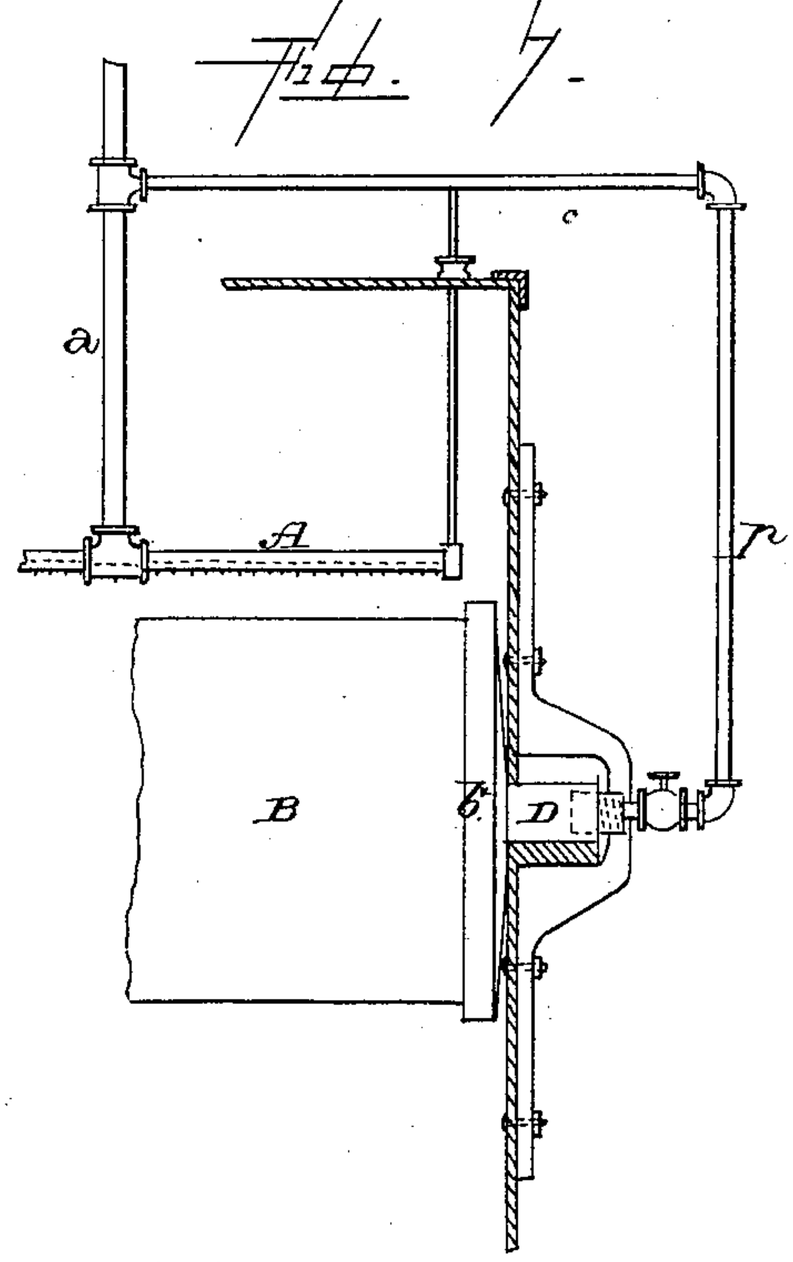


Fig. 8.

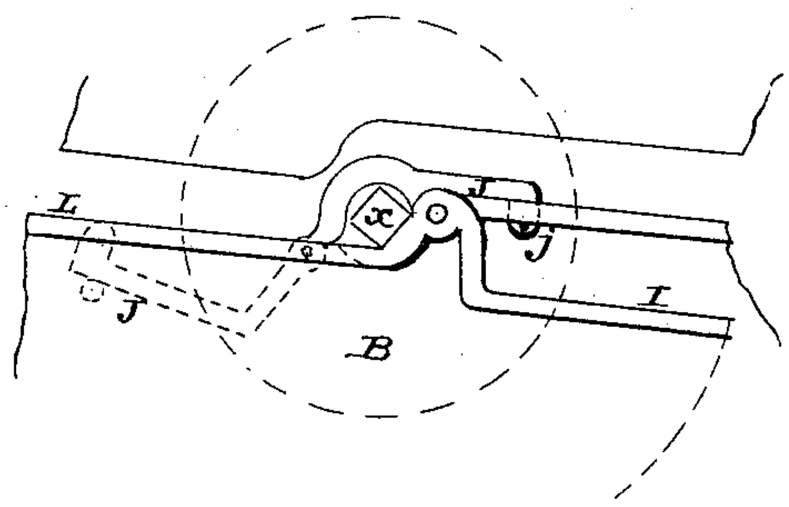
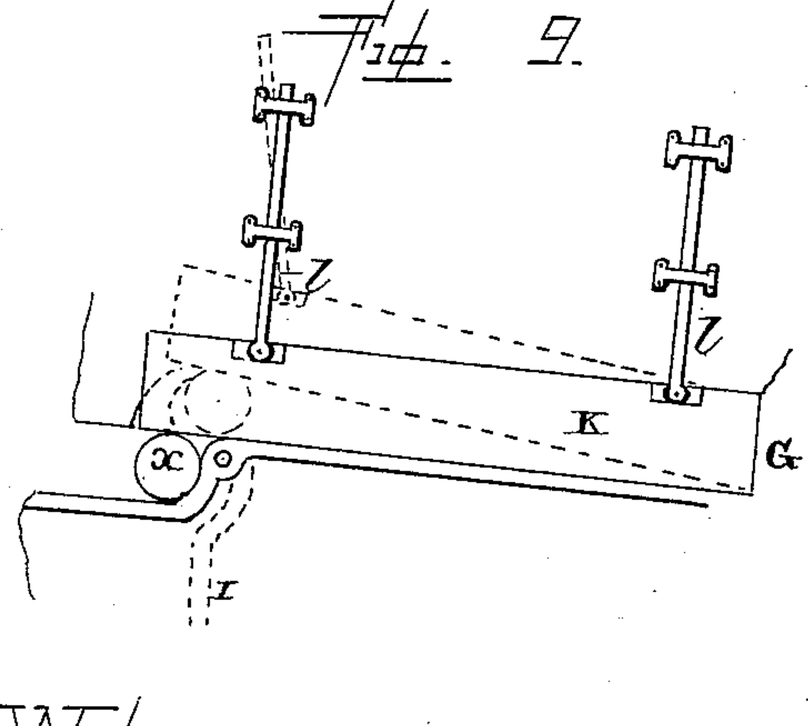


Fig. 9.



Witnesses.
L. F. Gardner
Edm. P. Ellis.

Inventors.
F. A. Owen,
J. A. Harvey,
per C. E. Allen, Atty.

(No Model.)

4 Sheets—Sheet 4.

F. A. OWEN & J. A. HARVEY.

MACHINE FOR EXTRACTING OIL FROM WOOL.

No. 379,808. Patented Mar. 20, 1888.

Fig. 10.

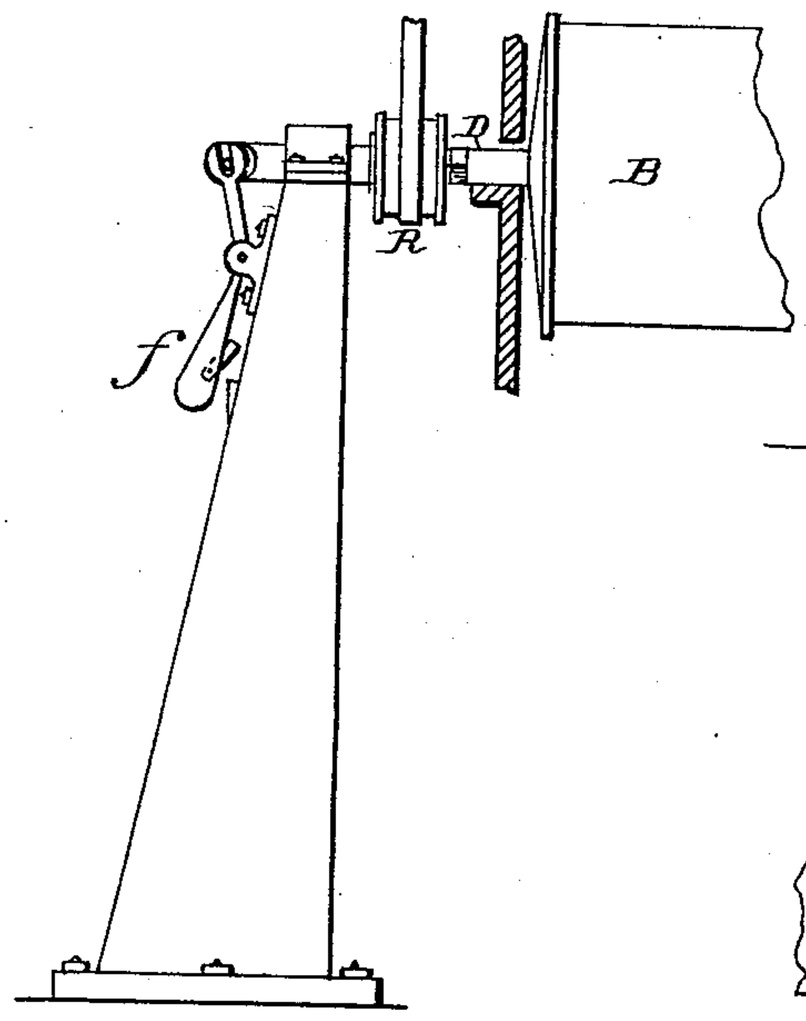


Fig. 11.

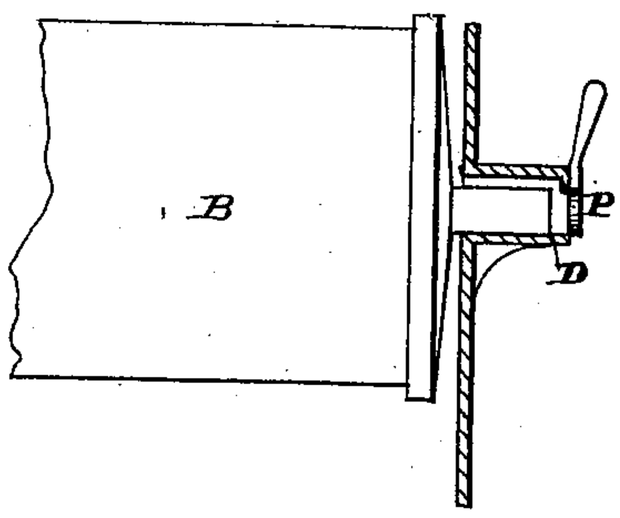
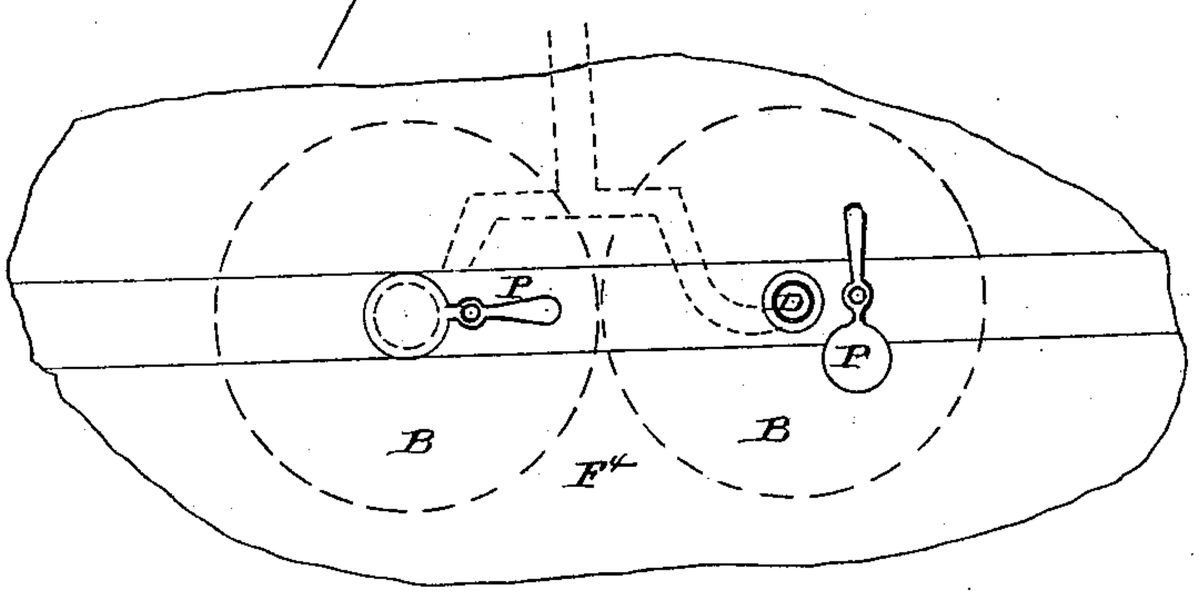


Fig. 12.



Witnesses.

L. F. Gardner.
Edm. P. Ellis.

Inventors.

F. A. Owen,
J. A. Harvey,
per C. E. Allen, Atty

UNITED STATES PATENT OFFICE.

FRANK A. OWEN AND JAMES A. HARVEY, OF BURLINGTON, VERMONT.

MACHINE FOR EXTRACTING OILS FROM WOOL.

SPECIFICATION forming part of Letters Patent No. 379,808, dated March 20, 1888.

Application filed September 21, 1886. Serial No. 214,211. (No model.)

To all whom it may concern:

Be it known that we, FRANK A. OWEN and JAMES A. HARVEY, citizens of the United States, residing at Burlington, in the county of Chittenden and State of Vermont, have invented certain new and useful Improvements in Machines and Processes for Removing Oils from Wool by Means of Simple Solvents, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to improvements in the apparatus and process for removing the natural oils or suint from wool preparatory to its application in manufactures by means of simple solvents; and the objects of our invention are, first, to saturate the wool with a volatile solvent the odors of which are not respirable without prejudice to the health and comfort of the operator, and, second, to so conduct the operation of cleansing the wool that it is delivered by the machine in a perfectly dry condition and denuded from all oily substances without personal handling. This desired result is accomplished by first packing the wool in perforated cylinders, which can be conveniently and repeatedly saturated with the solvent while inclosed in such a manner that the oil is entirely removed with but little loss of the solvent by evaporation, and with therefore no injurious exposure to the operator. The cleansing operation is rapid and thorough, while the stock, being finished with but a single handling, without the use of water, is not felted, nibbed, or broken, but is as free as in the fleece, thus rendering it more fit for coloring, picking, burring, carding, and spinning, thereby greatly reducing the waste in carding and increasing the evenness and strength of the yarn, while the entire expense of the process is largely compensated by the value of the potash and lubricants which are obtained from the valuable ingredients saved in the operation of cleansing, all of which are usually lost in the ordinary alkali cleansing, which causes it to be a source of expense instead of a profit. I attain these objects by the mechanism illustrated in the accompanying drawings, in which similar letters indicate like parts.

Figure 1 is a perspective of the perforated cylinder in which the wool is placed. Fig. 2 is an end view of the removable head of the cylinder. Fig. 3 is a sectional view of the hoop used to extend the length of the cylinder. Fig. 4 is a view of the perforated pipe within the cylinder to maintain an open space in the longitudinal center of the charged cylinder, whereby the solvent is introduced; also, a view of the solid filler, designed to be placed within the pipe during the process of charging and adjusting the cylinder. Fig. 5 is a side elevation of the cleansing apparatus. Fig. 6 is a side elevation of the press and cylinder, showing the operation of filling. Fig. 7 is a sectional view of one of the cylinders when in position, showing the connection between the naphtha-tank and the cylinder. Fig. 8 is a side elevation showing the manner of journaling the cylinder. Fig. 9 is a similar view of the cover of the slot, within which the journal rolls lengthwise of the machine. Fig. 10 is a side elevation of the support of the pulley whereby the cylinder is revolved. Fig. 11 is a similar view of the opposite end of the cylinder in the same position. Fig. 12 is a view showing the respective positions (in dotted lines) of the cylinders in the dry-air chamber.

B is a perforated metallic cylinder of suitable dimensions and designed to hold the wool from which the suint is to be extracted. It is provided with two heads, one of which, b', is removable, each having a journal, which in the removable head is hollow, b^2, and in the fixed head is solid, b^3. The removable head b' rests upon a shoulder on the inside of the exterior flange, b^4, of the cylinder, and is held in position by slide-bolts b^5, or other suitable device.

C is a circular metallic hoop designed to extend the cylinder B in the operation of charging or filling the cylinder with the wool. (See Fig. 6.)

D is a perforated pipe, one end of which is closed, and is provided with a pin, d', designed to rest within a corresponding aperture or seat in the solid journal b^3 of the cylinder. Its perforations are purposely sufficiently small to modify the flow of the solvent which it is intended to receive and to distribute equally to the contents of the cylinder. This pipe D is designed to extend longitudinally through the

center of the cylinder B and open into the central aperture of the removable head *b'* when the latter is in place.

E is a solid plug, preferably longer than the pipe D, which it is designed to fill, both for greater convenience in handling and as a guide to the removable head *b'* when placed in position, as shown in Fig. 6.

F, Fig. 5, is the extracting-box, of any convenient size, preferably constructed of metal, and divided into two parts, upper and lower, by the ledge or runway G, on which the journals of the several cylinders B are designed to roll in their passage from the entrance-gate H of the box F to the discharge-box F^3. The box F should be of sufficient length to hold at least four of the cylinders B at equal distances from each other.

The ledge G is so made as to receive and support the cylinder-journals, and is provided with seats *x x' x²* *x³*, at equal distances from each other, to temporarily receive and retain the several cylinders in their passage to the discharge-box F^3. Between these seats *x* the ledge is sufficiently inclined to allow the cylinders to roll automatically from seat to seat, after being raised from one inclined section to the next by means of any suitable device. The one illustrated consists of a pivoted lever, I, (see Fig. 8,) so arranged that by pressing down its handle the journal is elevated onto the succeeding section of the ledge. The cylinder-journals are held in place in each seat *x* by the hinged cap J, which is carried over the journals and there held firmly by a pin or bolt in the ear *j* at its outer extremity.

To allow the cylinder to roll into its seat, the cap J is thrown back into the position indicated by the dotted lines in Fig. 8, in order that it shall offer no obstruction to the passage of the cylinder-journals. The lever I', by which the cylinder is raised into the ledge G' in the discharge-chamber, is of similar construction, only sufficiently longer to elevate the cylinder to a height sufficient to allow the entire apparatus to stand on the same level, without having the lower end of the ledge in the drying-chamber inconveniently low. The opening in each section between the upper and lower divisions of the extracting-box F, along the line of the ledge G, is closed by a cover, K, which is so supported by the spring adjustable rods *l* that it is readily raised by the elevation of the journal into the section, and at once is made to drop into place as soon as the journal passes from beneath it into the next seat, thereby causing the ledge-opening to be closed automatically as soon as the cylinder-journals are in their respective seats *x*.

Beneath the first two cylinders in the extracting-box F is a metallic diaphragm, L, designed to receive and carry into a still, through a pipe, M, the solvent, together with the suint which has resulted from the two first saturations.

The solvent used in the succeeding saturations falls onto the bottom of the compartment F^2, whence it is removed by the pump N, and thence forced back into tank 1, to be reused on the first two cylinders. After the cylinders in the extracting-box have been sufficiently treated they are elevated by the lever I' through the door H' into the discharge-chamber F^3, there to remain until there is a sufficient number of cylinders to charge the drying-chamber F^4, which consists of a box practically air-tight to prevent loss of the solvent by evaporation.

The solvent which remains in the contents of the cylinders while in this box F^4 is removed either by heating the box by a steam-jacket or by heated air introduced into the interior pipe, D, of the cylinders through the end opening of the hollow shaft, which is covered by the gate P, Fig. 12, by means of a flexible steam pipe, which is closely attached to the end of the pipe b^2, care being taken to perfectly close the connection at P. The latter method is preferred, as the solvent is thereby more quickly expelled and a gentle current created to carry the vapor of the solvent from the drying-chamber off through the pipe Q to the condenser. Both methods, however, may be advantageously combined, in order that the inner walls of the chamber may be quickly brought to a temperature which will prevent condensation of the solvent upon its surface. The heating process should be continued until all the solvent is completely expelled from the chamber, when the door H^3 is opened and the cylinders removed, their contents being perfectly dry and denuded of all natural oils.

The inclined ledge G' in the last two compartments, F^3 and F^4, upon which the cylinder-journals run, is continuous and attached to the interior of the chambers, having no openings through the sides of the chambers except those covered by the gates P P, which are located exactly opposite the open ends of the perforated pipes D D of the cylinders, as they lie in close contact with each other after being rolled automatically into the drying-chamber. (See Fig. 5, dotted lines.)

The cylinders are revolved in the extracting-box F by means of pulleys R R, Fig. 10, which are adjusted to the open ends of the cylinder-journals by means of the lever *f*, which is controlled by a spring-clutch. These pulleys are rotated by suitable belting connected with pulleys on shafting overhead.

The method of subjecting the contents of the first two cylinders to the action of the solvent while in the extracting-box may be either by conveying it from the storage-tank 1, through suitable pipes having cut-offs *a a'*, into the horizontal perforated pipes A A, located above the central line of the cylinders, from whence it drips upon the exterior of the cylinders as it slowly revolves, (see Fig. 7,) or it may be conveyed by suitable pipes, *p*, to the open end of the hollow shaft D of each cylinder, and thence into the perforated pipe. In either case the solvent is allowed to flow until the contents of

the cylinders are thoroughly saturated. As soon as this is accomplished, the solvent-supply is cut off, and power is applied to rotate the cylinders rapidly to expel by centrifugal force the solvent from the contents of the cylinders.

Each section of the box is divided by the flexible aprons *o o*, suspended from the top of the box, and weighted at the bottom to prevent as far as possible the solvent from being thrown violently into the adjoining section and upon the adjacent cylinder. The contents of the third and fourth cylinders in the extracting-box are saturated in the same manner as the first two, the solvent being drawn from tank 2, its flow being controlled by the cut-offs a^2 a^3.

In operation the wool from which the suint is to be removed is placed in the perforated cylinder B, which for this purpose is set upon its closed end, and filled by hand as tightly as is possible around the perforated pipes D with its solid plug E, which occupies its perpendicular position in the center of the cylinder. The cylinder is then lengthened by the addition of the hoop C, which is packed with the wool around the pipe D and the projecting end of the plug E. The entire contents of the cylinder are then subjected to such pressure as will cause the removable head *b'*, which acts as a follower, to be brought down into its place upon the flange b^4 of the cylinder, the plug E projecting through the central aperture in the head. (See Figs. 6 and 2.) This operation is repeated until the cylinder is sufficiently packed, or a weighed amount of wool is introduced into the cylinder, when the head *b'*, through the center of which the plug E projects, is firmly secured to the cylinder by means of the slide-bolts b^5, or other suitable fastening device. After a sufficient number of these cylinders have thus been packed they are carried to the extracting box F. The long plug may then be removed and a short one substituted. One of the cylinders is placed in the box F through the door or opening H. Revolving upon its journals down the inclined ledge or runway G, formed in the side of the box by elevating its upper division, it reaches the first seat, *x*. Each section of this ledge or slot G is protected by spring-actuated covers K, (shown in Fig. 9,) which are forced quickly into place as soon as the cylinder has passed from seat to seat, thus rendering the box F perfectly tight, except the moment required for the passage of the cylinders to their respective seats. The pulley R is then adjusted to the open end of the cylinder-journal D, (see Fig. 10,) for the purpose of slowly rotating the cylinder, or the cylinder can be turned by hand. The valve *a* is then opened to allow the solvent in the tank 1 to drip lengthwise, through the perforated pipe A, upon the exterior of the cylinder; or, if preferred, the solvent may be conveyed to the interior of the cylinder by suitable pipes connected with the open end of the hollow perforated shaft D, or both methods may be employed at the same time, the object being to thoroughly saturate the contents of the cylinder with the solvent. As soon as this is done, the supply is cut off. The power is then increased, for the purpose of rotating the cylinder with sufficient rapidity to expel the solvent, together with the oil it has dissolved, by centrifugal force. The flexible apron *o* prevents the solvent and oil from being thrown into the adjoining sections. The cylinder is then raised, by means of one of the levers I, to the next section of the slot G, whence it rolls into the seat *x'*, to give place to the second cylinder, which is then introduced into the box F, and the same process of saturation and extraction is repeated with both cylinders, the solvent for the second cylinder being drawn through the opened valve *a'*. The first cylinder is then rolled to the seat x^2 and its place is occupied by the second, to allow a third to be introduced into the seat *x*, and the entire process is then repeated, the first cylinder being saturated from tank 2. With the removal of all the cylinders one seat forward and the introduction of a fourth cylinder and the repetition of the saturation and extraction process the box F is filled, and the first cylinder has been subjected to four saturations and extractions, which is sufficient to thoroughly dissolve and remove the suint. The solvent used on the first two cylinders, together with the extracted oil, falls onto the diaphragm L, and is carried thence, through the pipe M, into a still for distillation. The solvent used to saturate the last two cylinders is furnished from tank 2. This falls on the floor F^2, and is sufficiently free from suint to be forced back by the pump N into tank 1, to be reused for the first two saturations. As fast as the process of cleansing the wool is completed in the cylinder on seat x^3, the cylinder is elevated by the long lever I' into the discharge-box F^3 through the door H', whence it rolls down to place on the inclined ledge G' on the interior of the box. This box is designed to be air-tight to keep the solvent from evaporation until a sufficient number of cleansed cylinders are placed in the box to charge the drying-chamber F^4. When the requisite number is obtained, the pin which secures the door H^2 of the drying-chamber is withdrawn, and the cylinders are rolled on the ledge into the chamber, where they lie in close contact with each other. Thus located, the open ends of the hollow shafts D are opposite the openings through the side of the chamber, which are tightly covered by the gates P P. (Shown in Figs. 11 and 12.)

The process of removing the remainder of the solvent and drying the wool is effectually accomplished by means of a steam-jacket, or by heated air introduced into the perforated pipes D D by means of flexible pipes with suitable collar-connections to fit the ends of the perforated hollow shafts D D when the gates P P are opened. This latter method has the advantage of greatly hastening the drying process, as a gentle current is thereby created,

which rapidly carries off the vapor through the pipe Q to the condenser.

A combination of both methods is preferred, as it raises the temperature in the chamber more quickly to a point where there will be no condensation, the air-current rapidly expelling all the solvent and forcing it to the condenser. On the completion of this operation the cylinders are rolled out through the door H^3, their contents perfectly dry and all the suint removed. As the dry wool is taken from the cylinder, the dirt and other similar impurities which may remain are easily shaken out and saved for further treatment.

By this simple arrangement of apparatus all the suint is entirely extracted by a volatile solvent, without sensible loss by evaporation or dissipation in the free air, the entire work being accomplished in tight boxes, which effectually guard the operator from inconvenient or injurious effects of the presence of an irrespirable vapor.

The wool is rapidly and easily finished with but one handling, and without liability to felting, nibbing, or breaking, and is left as free as when in the fleece, and therefore in a condition best adapted to its subsequent manipulation, as less waste will result from carding. The fiber will be stronger by reason of the absence of all alkali treatment.

The fabric made from wool treated as described felts or fulls more rapidly, as it has never been wet. It requires less coloring material than goods manufactured from wool treated in the ordinary way, for the reason that the wool has no grease adhering to it. It does not cling to the burr any more than it does in the uncleaned fleece. It can therefore be burred more thoroughly and with less waste of material than when the wool is washed with alkalies. Fewer pieces of cloth will require to be chemically treated to remove vegetable matter, because the burring has been more thoroughly done, and as the wool is cleaner and the fiber free, making little card waste, less allowance has therefore to be made for loss in carding. A calculation of the amount of stock required to produce a certain number of yards of cloth of a specified weight can therefore be made with greater precision.

The suint which is obtained in solution is free from other matters, and by the ready removal of the solvent and subsequent proper refining most valuable lubricants can readily be obtained from it. All of these valuable products, usually lost in the ordinary process of cleansing, are sufficient to render our improved method of cleansing one of profit rather than of expense.

What we claim is—

1. In a wool-cleansing apparatus, a series of perforated metallic cylinders, B, to contain the wool to be cleansed, each having at one extremity a fixed head and a solid journal, b^3, and at the other a removable head, b', provided with suitable devices to secure it to the cylinder, and having a central aperture for the insertion of the hollow shaft D, substantially as described.

2. In a wool-cleaning apparatus, the perforated hollow pipe D, one end of which is closed, and provided with a projecting pin, d', to hold it in position in the solid journal of the cylinder B, the other end of which opens into the hollow journal of the removable head b' of the cylinder, for the purpose of receiving and distributing the solvent through the contents of the cylinder, substantially as set forth.

3. In a wool-cleaning apparatus, in combination with the perforated hollow pipe D, the long plug E, which is designed to be placed in the pipe and extend beyond it for the purpose of preventing the entrance of wool and dirt into the pipe, and to act as a guide to the head b' in the operation of pressing, substantially as described.

4. In a wool-cleaning apparatus, the cylinder B, in combination with the circular metallic extension-hoop C, the hollow shaft D, and plug E, substantially as and for the purpose set forth.

5. In a wool-cleaning apparatus, the adjustable pulley R, operated by the spring-clutch f, in combination with the journal on the fixed head of the cylinder for the purpose of rotating the cylinder B, substantially as set forth.

6. In a wool-cleaning apparatus, the extracting-box F, provided with a door, H, an inclined sectional ledge or slot, G, protected by spring-actuated covers K, journal-seats for the several cylinders B, a diaphragm, L, to catch and carry off the solvent from the first series of perforated pipes A, and the flexible aprons o, to separate the cylinders on their respective seats, substantially as and for the purpose described.

7. In a wool-cleansing apparatus, the slot G, provided with vertically-sliding covers K, having spring-adjustable rods l, for the purpose of keeping the slot G closed, except during the passage of the cylinder from one journal-seat to another, substantially as described.

8. In a wool-cleansing apparatus, the tanks 1 and 2, connected by suitable supply-pipes controlled by valves, with perforated drip-pipes A, in combination with the extracting-box F, substantially as and for the purpose set forth.

9. In a wool-cleansing apparatus, the tight discharge-box F^3, having the end opening H', and the inclined ledge G', to contain the several cylinders B until they are ready to charge the drying-chamber F^4, substantially as set forth.

10. In a wool-cleansing apparatus, the drying-chamber F^4, having the end openings H^2 and H^3, and an inclined ledge, which is provided with suitable openings for the ends of the shafts D, and the cylinders B, which are protected by gates P, substantially as and for the purpose described.

11. In a wool-cleaning apparatus, the drying-chamber F^4, constructed as described, to

contain the treated cylinders, while any solvent still adhering is removed by means of heat applied, either by a steam-jacket or a warm-air current, or both together, through the pipe Q, to the condenser, substantially as set forth.

12. In a wool-cleansing apparatus, the combination of suitable chambers, F, F^3, and F^4, for extracting the suint, holding the cylinders, and drying the wool, in combination with the cylinders B, tanks 1 and 2, provided with their several pipes for conveying the solvent to the cylinders, the adjustable pulleys R, and force-pump N, all constructed and arranged to operate substantially as set forth.

13. In a wool-cleaning apparatus, the combination of a receiving-box, F, with one or more perforated cylinders, B, which are provided with stationary and removable heads, and with solid and hollow bearings, the pipe *p*, which connects with the hollow bearings, and a tank for holding a solvent, substantially as shown.

In testimony whereof we do affix our signatures in presence of two witnesses.

FRANK A. OWEN.
JAMES A. HARVEY.

Witnesses:
CHARLES E. ALLEN,
CHAS. F. LEWIS.