

(No Model.)

5 Sheets--Sheet 1.

A. HARMEL.
APPARATUS FOR DYEING WOOL.

No. 391,043.

Patented Oct. 16, 1888.

Fig. 2

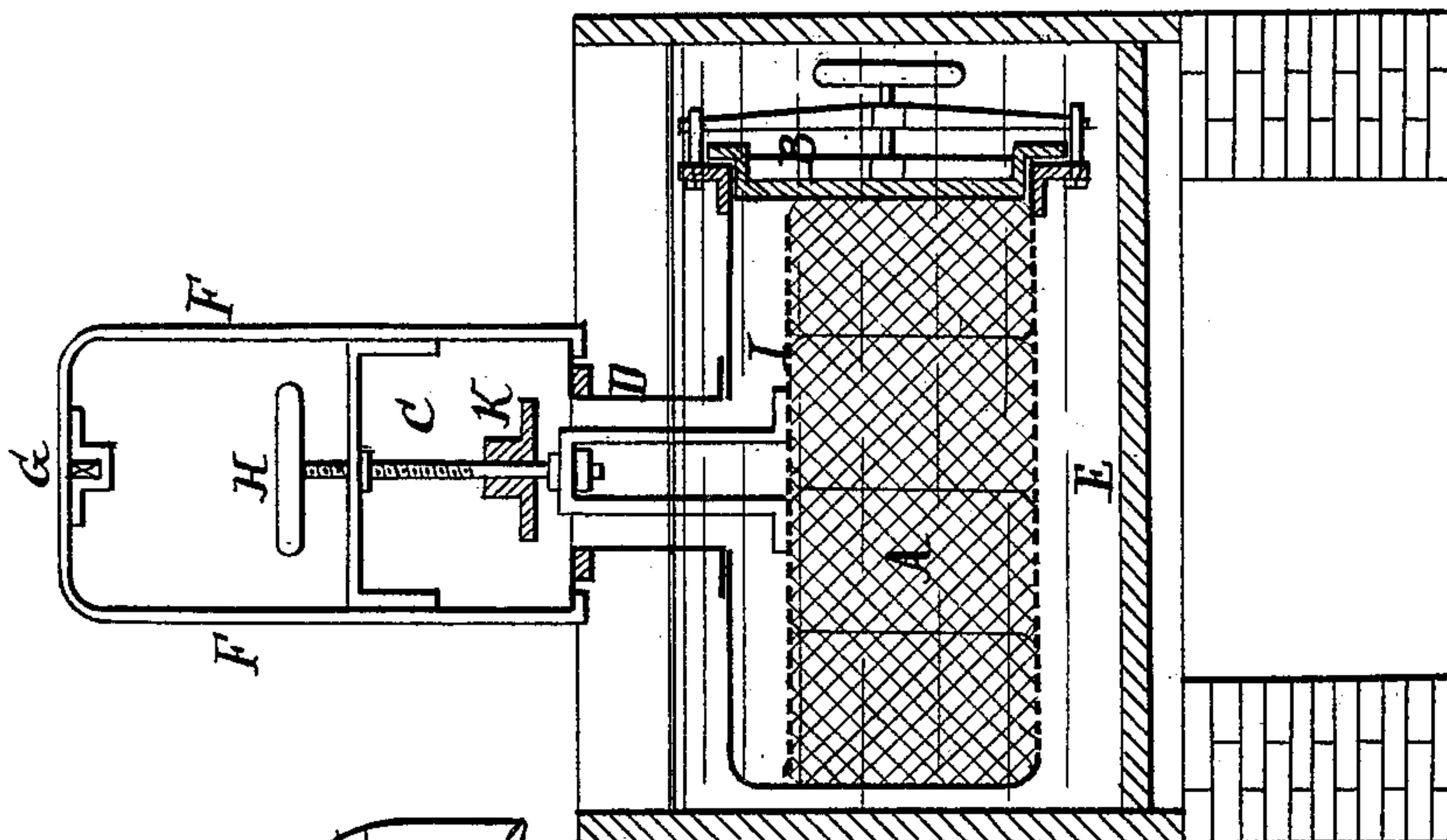
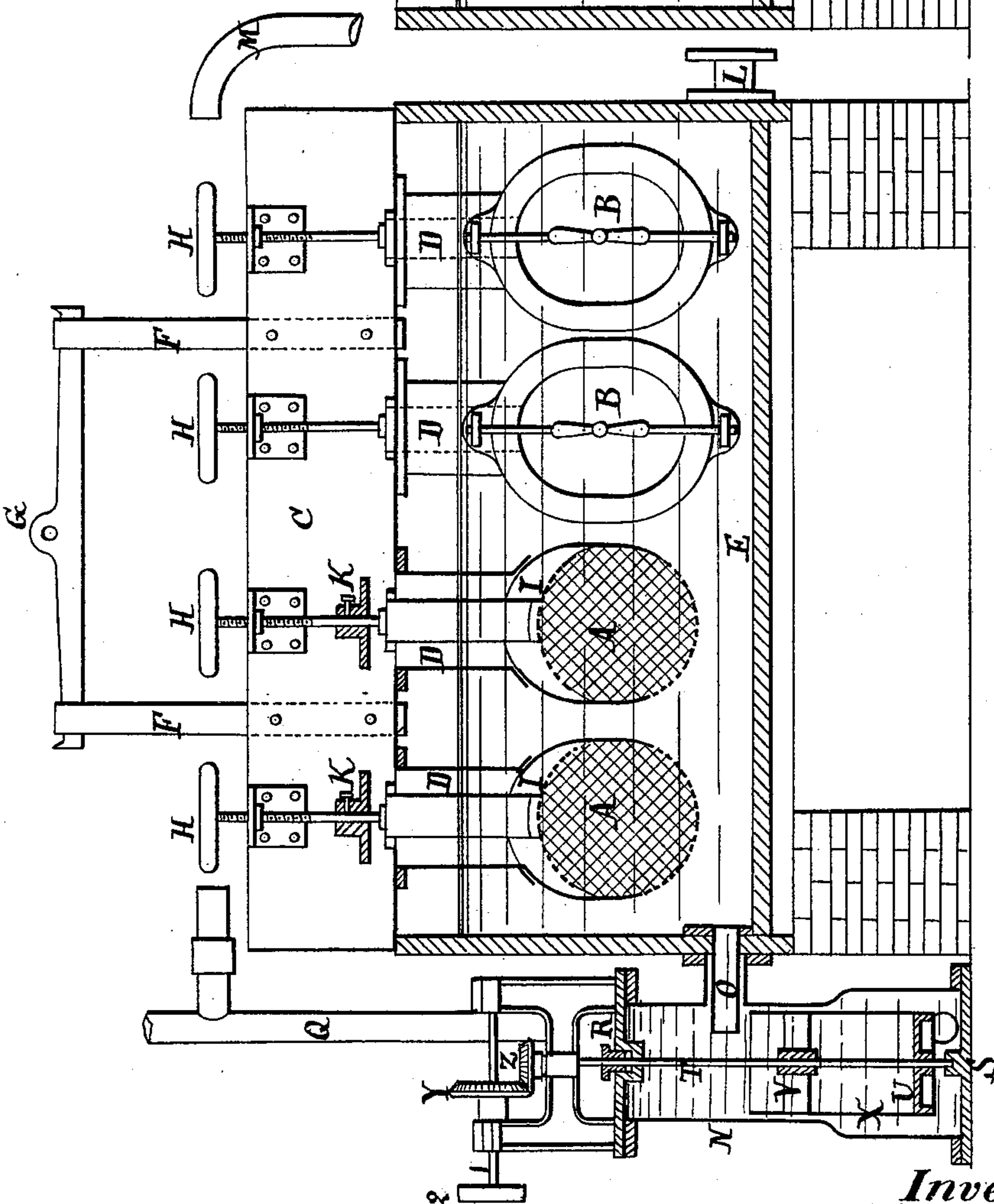


Fig. 1.



Witnesses:
J. A. B. Buiswell.
George Dixon.

Inventor:
Albert Harmel.
By his Attorneys,
Arthur B. Draper & Co.

(No Model.)

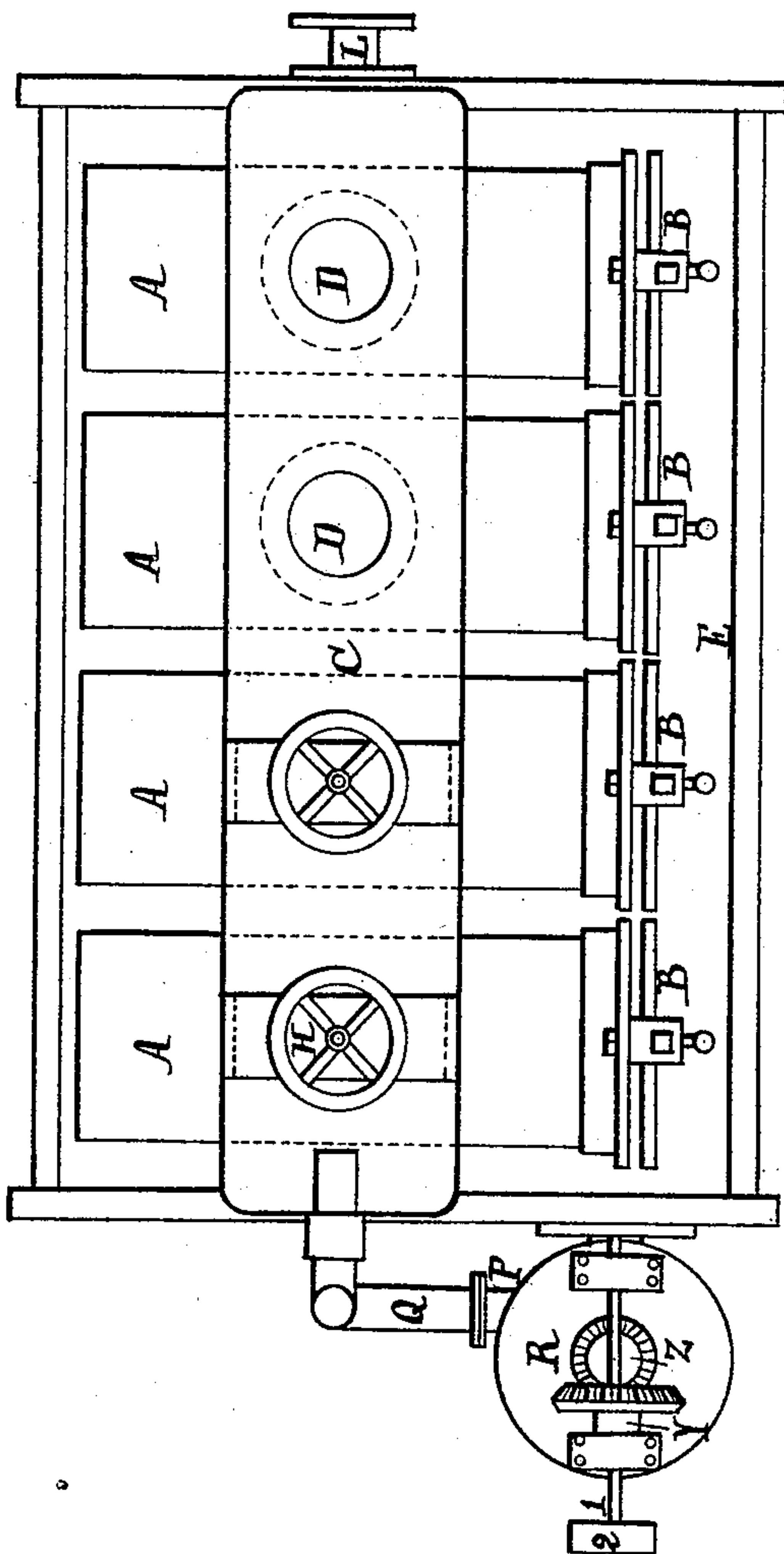
5 Sheets—Sheet 2.

A. HARMEL.
APPARATUS FOR DYEING WOOL.

No. 391,043.

Patented Oct. 16, 1888.

Fig. 3



Witnesses:

J. A. Griswell.
George Dixon.

Inventor:

Albert Harmel.

By his Attorneys,

Arthur C. Fraser & Co.

(No Model.)

5 Sheets—Sheet 3.

A. HARMEL.
APPARATUS FOR DYEING WOOL.

No. 391,043.

Patented Oct. 16, 1888.

Fig. 5

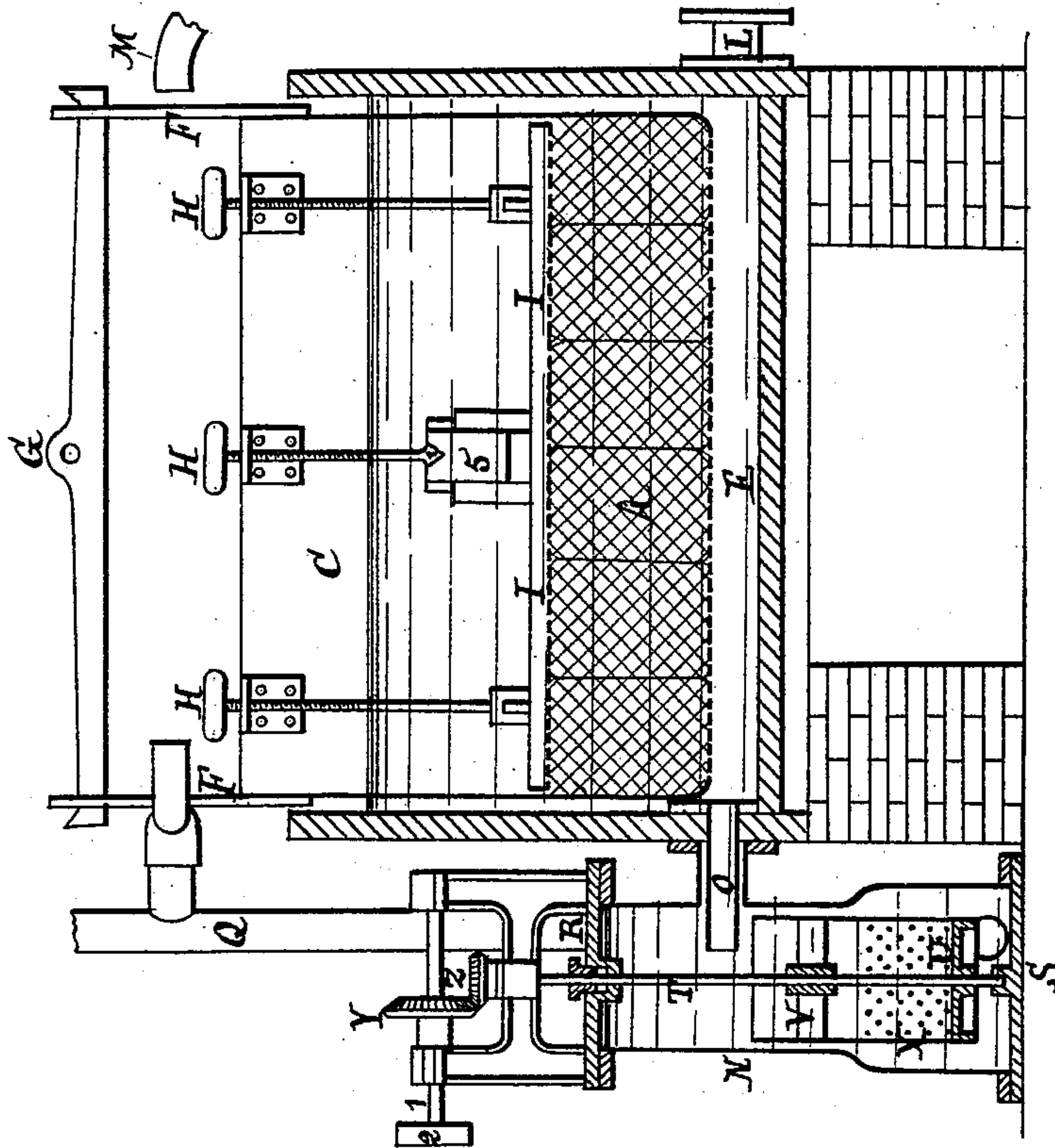
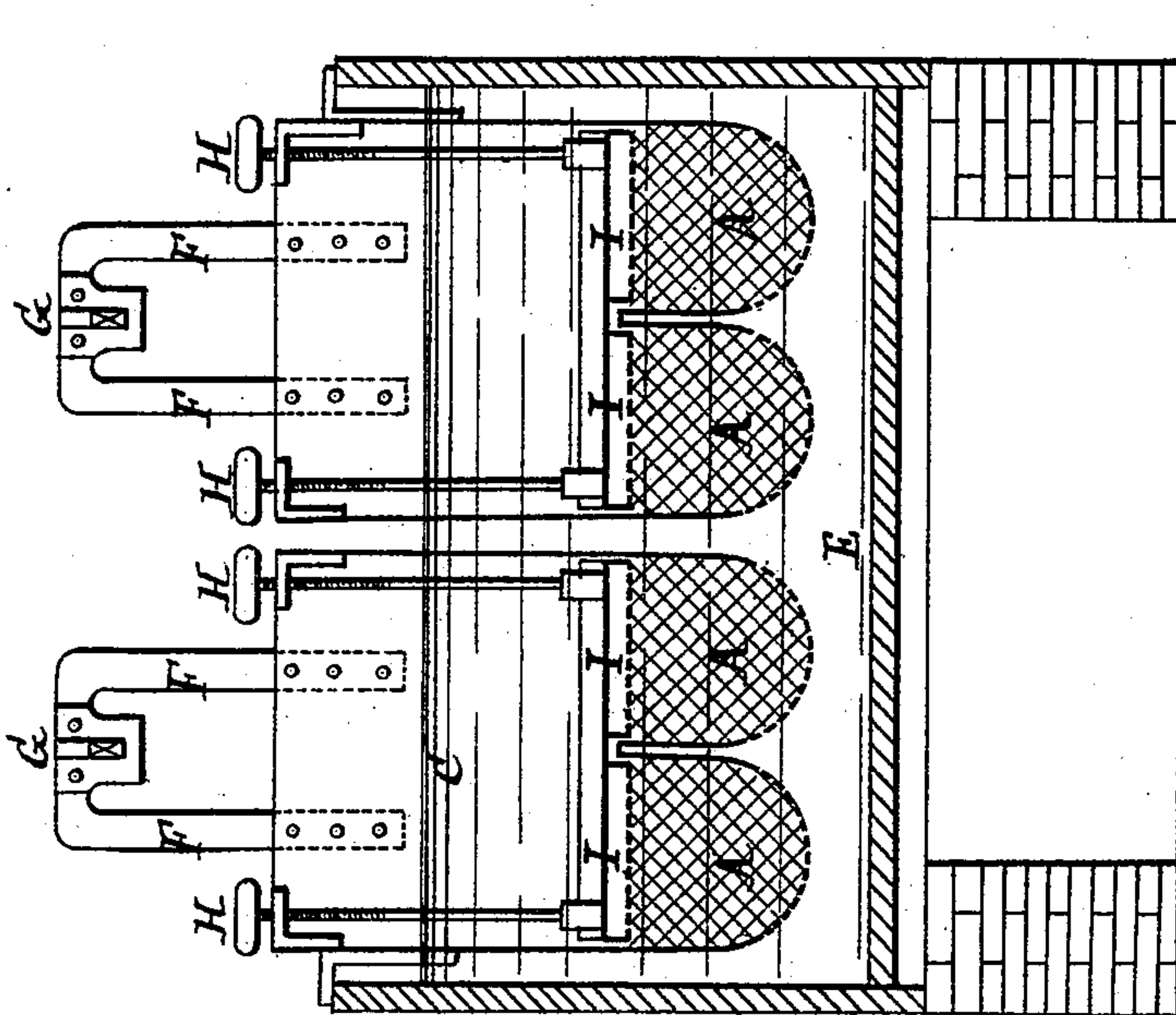


Fig. 4



Witnesses:
J. A. Griswell.
George Dixon.

Inventor:
Albert Harmel.
By his Attorneys,
Arthur G. Cropper & Co.

(No Model.)

5 Sheets—Sheet 5.

A. HARMEL.
APPARATUS FOR DYEING WOOL.

No. 391,043.

Patented Oct. 16, 1888.

Fig. 8

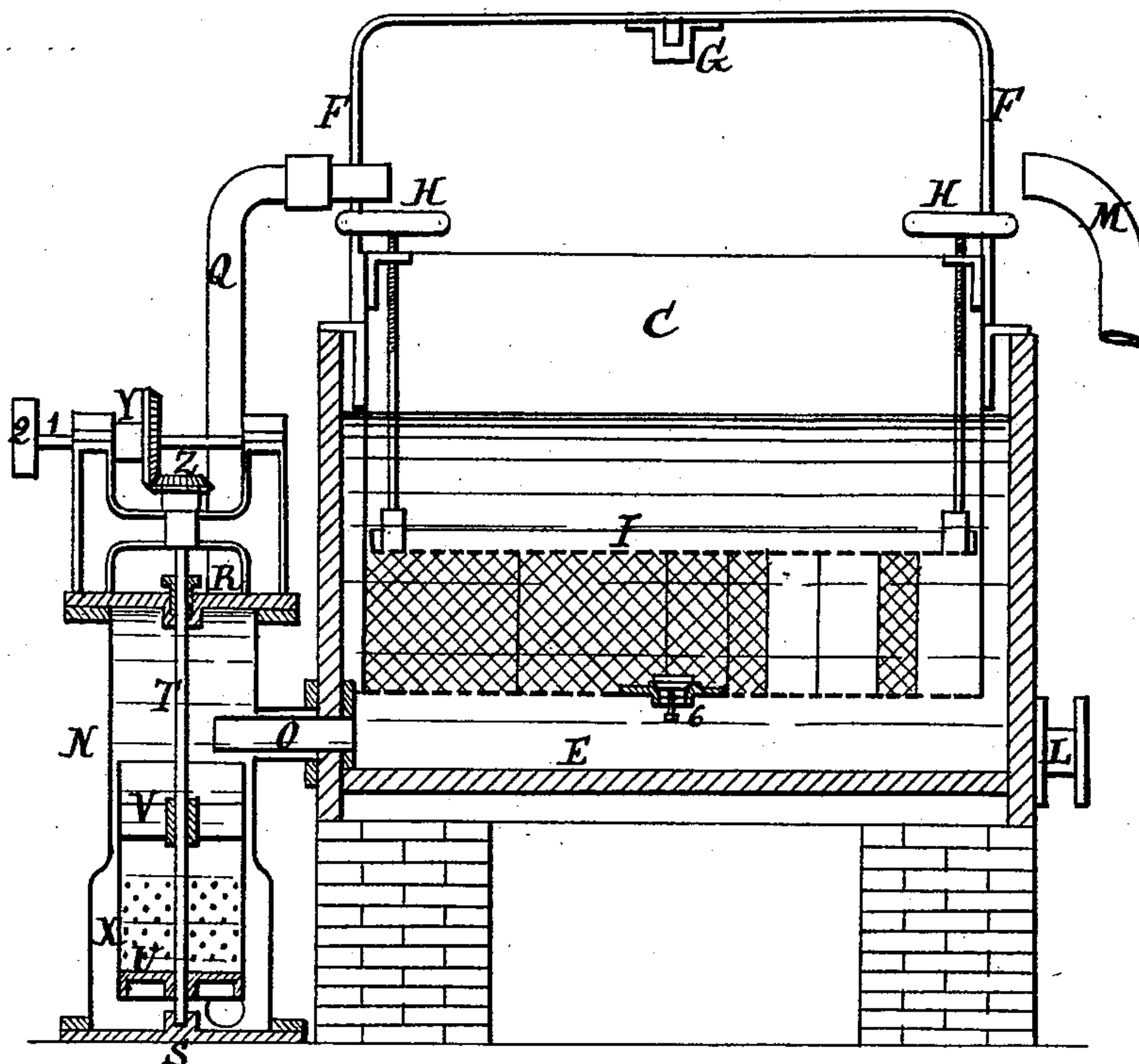
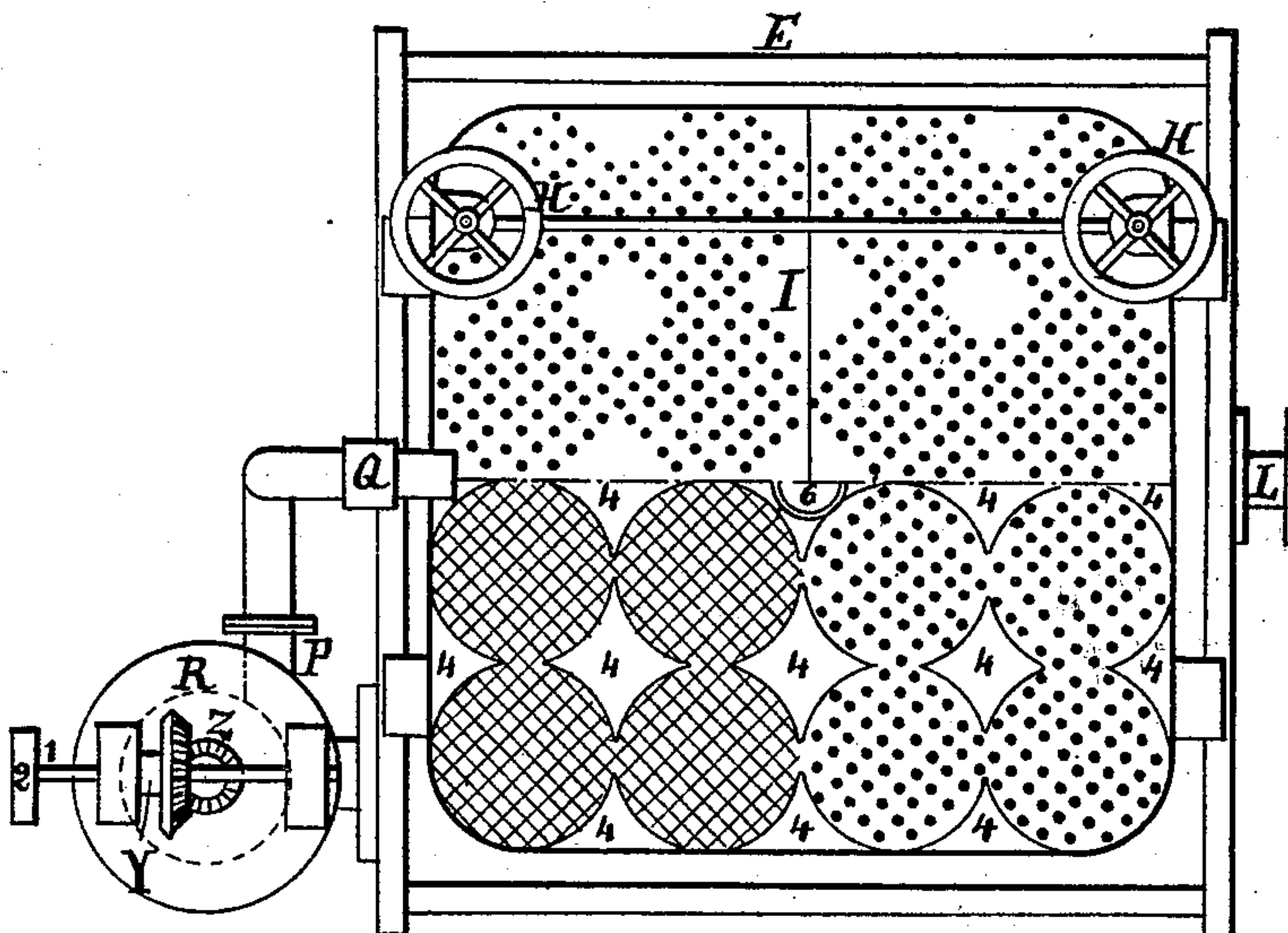


Fig. 9



Witnesses:
J. A. Griswell
George Dixon

Inventor:
Albert Harmel
By his Attorneys,
Arthur C. Fraser & Co

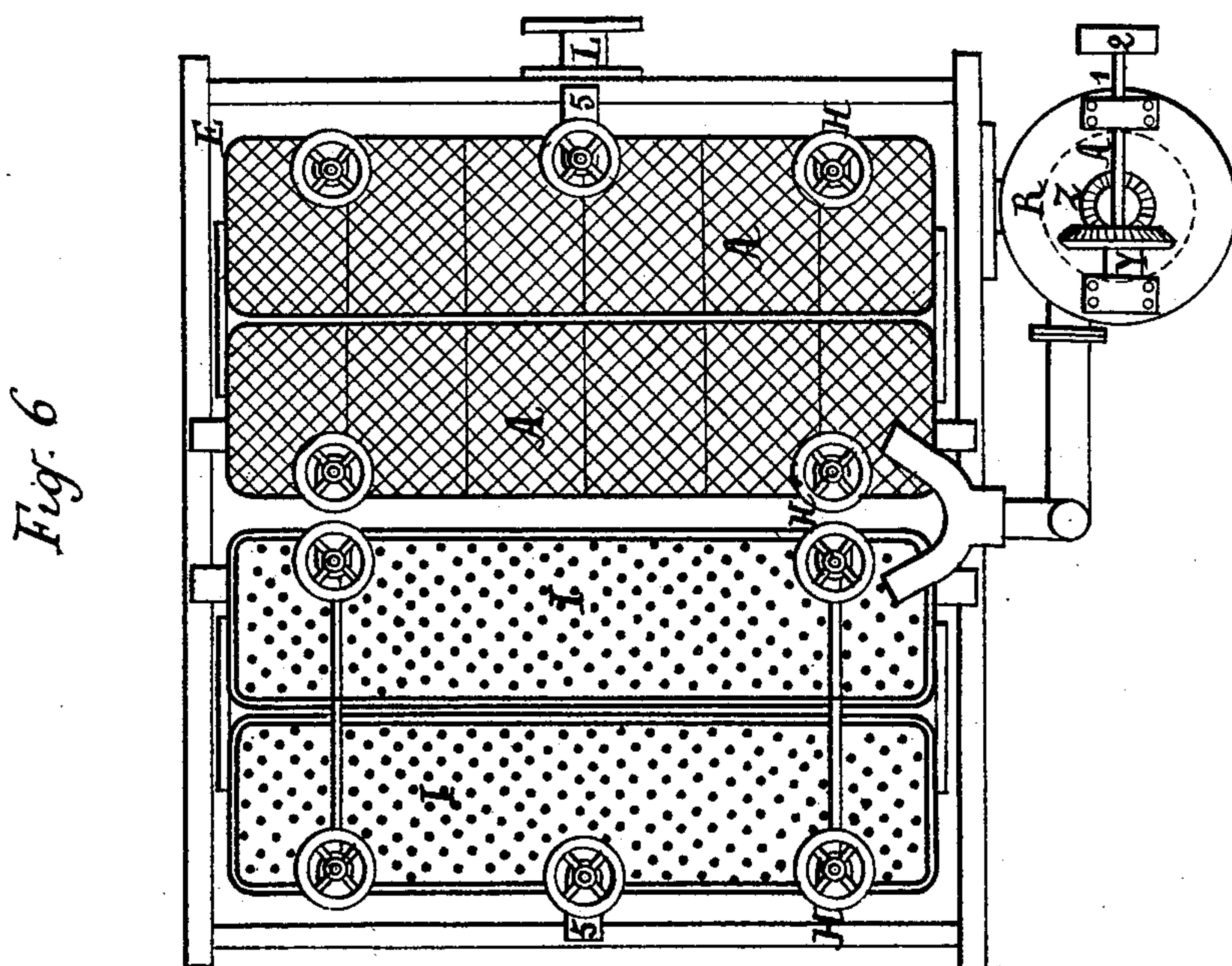
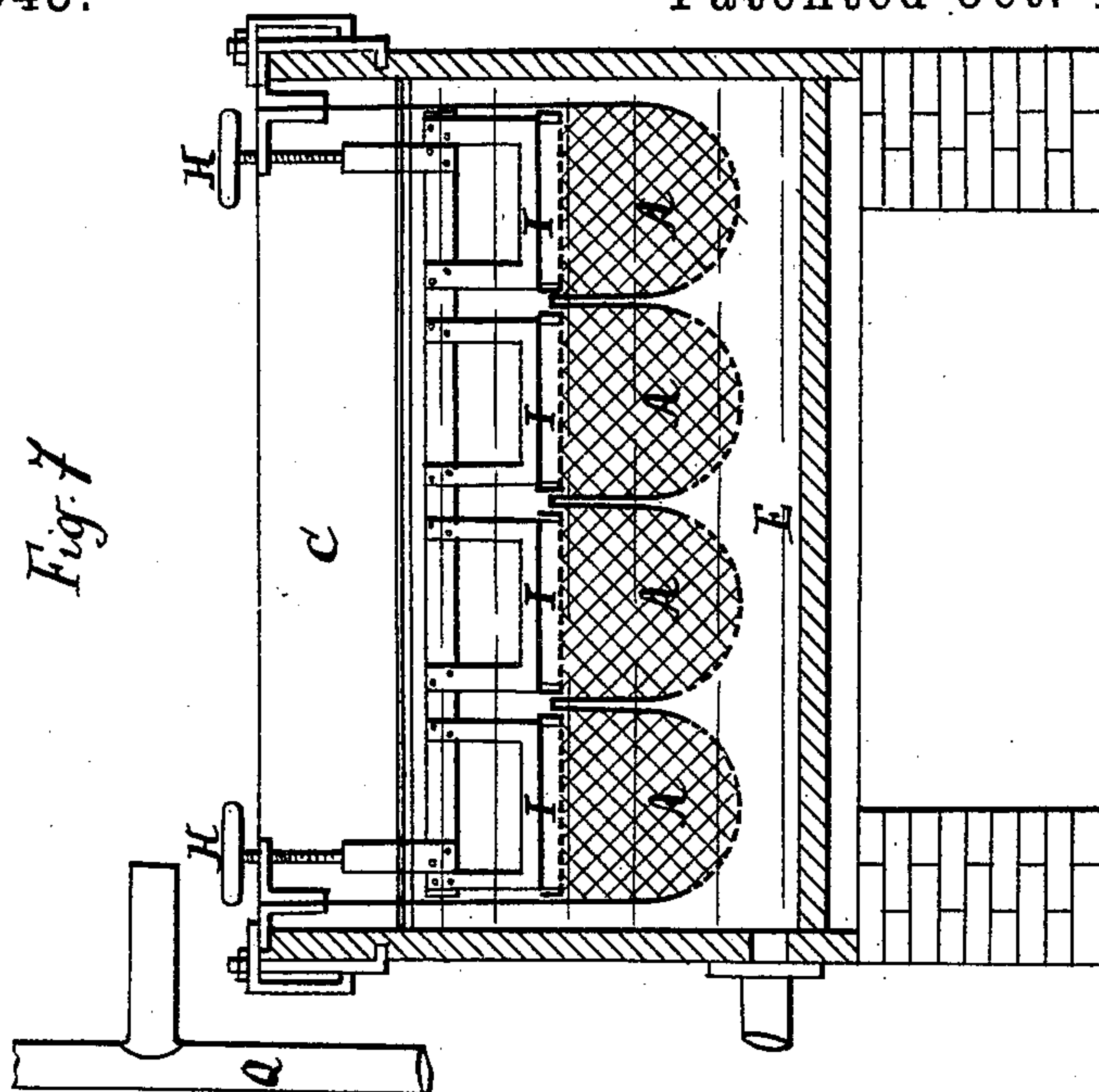
(No Model.)

5 Sheets—Sheet 4.

A. HARMEL.
APPARATUS FOR DYEING WOOL.

No. 391,043.

Patented Oct. 16, 1888.



Witnesses:
J. A. Griswell.
George Dixon.

Inventor:
Albert Harmel.
By his Attorneys,
Arthur C. Fraser & Co.

UNITED STATES PATENT OFFICE.

ALBERT HARMEL, OF VAL DES BOIS, MARNE, FRANCE.

APPARATUS FOR DYEING WOOL.

SPECIFICATION forming part of Letters Patent No. 391,043, dated October 16, 1888.

Application filed May 8, 1888. Serial No. 273,201. (No model.)

To all whom it may concern:

Be it known that I, ALBERT HARMEL, of Val des Bois, in the Province of Marne, in France, have invented a new and Improved
5 Apparatus for Dyeing Wool, of which the following is a specification.

This improved apparatus is more particularly designed for the dyeing of wool or similar fibrous materials in tops, cops, noils, flocks,
10 tufts, and wastes.

The apparatus which constitutes the object of this invention consists, principally, in a movable metallic frame-work which is designed and constructed to be placed within the dye-
15 vat, said frame-work comprising in its construction a series of receptacles for holding the wool, said receptacles having perforated tops and bottoms, and being so arranged that when in operative position they are entirely sub-
20 merged in the dye-liquor within the vat, and said frame-work also comprising a liquid reservoir or tank, which, when the apparatus is in operation, is located above the dye-vat, and is in communication with the several recepta-
25 cles which hold the material to be dyed. The liquid for dyeing is kept constantly in circulation by suitable apparatus, the circulation of the liquid being downward through the receptacles containing the material to be dyed
30 into the vat, thence outward through an aperture in the bottom of the vat, and thence upward into the liquid-reservoir carried by the movable frame-work above the vat. The liquid descends from the upper reservoir down
35 through the material to be dyed solely by its own weight, so that there is a gentle percolation of the liquid through the material to be dyed, and since the liquid passes only in vertical lines through the material to be dyed the
40 receptacles in which the material is contained having imperforate walls and the receptacles being entirely filled with the material, the material is uniformly and evenly dyed.

The improved apparatus is illustrated in the
45 accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of one form of the apparatus. Fig. 2 is a vertical cross section of the same. Fig. 3 is a plan view of the same. Figs. 4, 5, and 6 are ver-
50 tical and cross-sections and plans, respectively, of a modified form of the apparatus. Fig. 7 is a vertical section of another modification of

the apparatus. Fig. 8 is a vertical sectional view, and Fig. 9 a plan view, of still another modification.

Referring first to Figs. 1, 2, and 3, E represents a dye-vat, of any ordinary or suitable construction, which contains the dye-liquor. A A represent the receptacles which contain the material to be dyed, and which are sus-
55 pended within the vat during the process of dyeing. These receptacles are suspended and form part of the vertically-movable frame-work, which, when the receptacles are in operative position, rests upon and is supported by
60 the vat. Constituting part of this frame-work and extending across the vat is a liquid reservoir or tank, C, from which the receptacles A are suspended by means of tubes D, which also establish communication between said
65 reservoir and the receptacles.

As shown in the drawings, there are several of the receptacles, four being the number shown suspended side by side from the reservoir C. Each receptacle has a perforated fixed
70 bottom and three of its sides fixed and imperforate. The fourth side, which, as shown, is one of the ends of the receptacle, is removable, and constitutes a door, B, for placing the material within the receptacles. This door is
75 imperforate and fits tightly in the receptacle, so as to prevent the passage of liquor between it and the receptacle. The receptacles shown in these figures are shaped and adapted more particularly for the reception of wool tops or
80 cops, and when the wool tops are placed within the receptacles they completely fill the lower part of the same, so that no dye-liquor can pass through the receptacles except by passing through some portion of the material. The
85 cover B is arranged as shown, so that it is capable of lateral adjustment for the purpose of slightly compressing the material to be dyed. The material when placed within the recepta-
90 cles does not fill the same throughout its vertical extent, so that a space is left within each receptacle above the material for the reception of the dye-liquor. Within each receptacle, however, there is a perforated or foraminous cover, I, which rests upon the upper portion
95 of the material within each receptacle. Each of these perforated covers I is vertically adjustable, being connected to a screw-shaft, H, which extends upwardly through the tube D
100

above the reservoir C, where it is manipulated by a hand-wheel. By means of this method of mounting the perforated covers may be pressed down upon the material in order to
 5 apply a suitable and proper pressure thereto.

The frame-work, which carries the receptacles and the upper reservoir, C, has attached to it upwardly-extending straps F F, which are connected by a cross-bar, G, by means of
 10 which the frame-work may be lifted and removed from the vat. In this manner the frame-work, carrying with it the receptacles containing the material, may be bodily transferred to other vats for the purpose of continuing or
 15 carrying on other operations connected with the dyeing of the material, such as mordanting, rinsing, burnishing, fixing, washing, &c.

In case there should not be enough material to be dyed to fill all of the receptacles, and
 20 since it is essential for the proper dyeing of the material that the dye-liquor should pass only through the material to be dyed, the receptacles are so arranged that each may be cut off from the reservoir C by means of a valve,
 25 K, carried by the screw-rod H, immediately above the pipe D. When any one of the receptacles A is empty, the rod H is lowered until its valve K closes the tube D, thus cutting off the flow of the liquor into such recep-
 30 tacle.

In the process of the dyeing the dye liquor is introduced into the reservoir C, whence it flows down through the tubes D into the receptacles A, where it percolates down through the
 35 material and out through the perforated bottoms of the receptacles into the lower part of the vat. The surplus dye-liquor thus introduced passes out through a horizontal pipe, O, at the bottom of the vat. A downward flow of
 40 the liquor is thus maintained through the material within the receptacle. Normally the dye-liquor stands within the vat above the covers I of the material being dyed, and the inflow of liquor being the same in quantity as the
 45 outflow the level of the liquor within the vat is thus maintained. The pressure of the liquor upon the material being dyed is thus determined by the height of the liquor above the material and by the rapidity of the flow.

In order to economize the dye-liquor, the same liquor is used continuously, it being carried from the outlet-pipe O of the vat upward through an inlet-pipe, Q, leading to the upper
 50 reservoir, C. This upward current of the liquor may be effected by any suitable or convenient means—such as by an injector, a pump, or any suitable suction device. The preferred method of elevating the liquor is, however,
 55 one which has been particularly designed for this purpose, and which is illustrated in the drawings. The outlet-pipe from the vat flows into a closed cylindrical jacket, N, having a tight cover, R, and bottom S. From the upper part of this jacket extends a horizontal
 60 outlet-pipe, P, which communicates with the pipe Q, which conveys the liquor to the upper reservoir, C. Within this receptacle or

jacket N is a vertical rotary shaft, T, having its bearings in the top R and bottom S of the jacket. This shaft is rotated from a horizontal
 70 shaft, 1, by intervening beveled gears Y Z, and the shaft 1 carries a band-pulley, 2, which is driven from any convenient source of power. The shaft T carries near its lower end
 75 an annular plate, U, which constitutes the bottom of a cylinder, X, having an open mouth, which is located immediately beneath the outlet-pipe O. The cylinder X is supported near
 80 its upper end from the shaft by cross-bars V, and the lower part of said cylinder is perforated, so that it communicates with the exterior jacket, N. When the apparatus is in operation, the dye-liquor flowing out from the
 85 vat flows into the rotating cylinder X, and the liquor is thrown by the centrifugal force through the perforations in the cylinder into the jacket N, and is thus forced upward through
 90 the pipe Q into the reservoir C, and thus the circulation of the liquor is maintained. In case this liquid elevating apparatus should be out of order for any reason, the circulation of
 95 the liquor may be carried on through the outlet-pipe L and the inlet-pipe M, through which the liquor may be caused to circulate in any convenient manner.

The dye-liquor may be kept at a proper temperature during the dyeing process by any suitable heating means.

In the modification of the apparatus shown in Figs. 4, 5, and 6 the construction of the vat
 100 and of the elevating apparatus is the same as in the arrangement just described. The changes made consist in a different construction of the removable frame-work and in the receptacles for holding the material. This
 105 modified apparatus is more particularly intended for dyeing when the colors or shades are easy to be produced. The principal changes consist in the omission of the intermediate tubes between the reservoir C and the wool-re-
 110 ceiving receptacles and in the construction of the receptacles themselves. The receptacles A communicate directly with the reservoir C, and constitute, in fact, the bottom of said reservoir, and the material, instead of being
 115 introduced through removable doors, is introduced through the reservoir C; also, as shown in the figures, there are two independent frame-works shown arranged side by side in the vat, this arrangement being shown to
 120 indicate the fact that more than one such frame-work may be used in the same vat. The operation of this modified apparatus is substantially the same as that of the first-described
 125 apparatus, except that there is no means shown for cutting off the supply of liquor to any of the receptacles. A slide-valve, 5, is shown in one wall of the reservoir C above the receptacles A, but below the water-level in the vat, in order to permit the liquor within the vat to
 130 flow into the reservoir when the latter is lowered into the vat. This valve is closed during the operation of dyeing.

In both of the apparatuses described the

dye-liquor within the vat is constantly exposed to the exterior air, and the dyeing is accomplished without any pressure beyond that of the weight of the liquor itself. In this manner the material is not injured or deteriorated by being subjected to great pressure, as it sometimes is where the dyeing is done under pressure. If it is desired, however, to dye with the liquor in the vat unexposed to the outer air, the vat itself may be hermetically sealed by having the flanges of the frame work extend over the upper edges of the vat in the manner shown in the modification illustrated in Fig. 7. In other respects the apparatus shown in Fig. 7 is similar to that shown in Fig. 4, with the exception that all of the receptacles A are carried by a single frame, and all of the perforated covers I are acted upon simultaneously from the same pressure screws.

In the modified form of receptacles A shown in Figs. 8 and 9 the receptacles are adapted indifferently for dyeing the material either in tops or in flocks, noils, tufts, &c. In this modified construction the receptacle A is a single large receptacle at the bottom of the reservoir C, having a single horizontal perforated bottom, upon which the material to be dyed is placed, and having a single horizontal perforated cover, which presses upon the material placed upon the bottom plate. The material is placed upon the bottom plate, and any interstices between the different tufts of the material are filled by means of plugs 44, which are movable, and are made of wood, metal, or other suitable material. These plugs prevent the liquor passing down through such interstices and compel it to percolate through the material under treatment. At the bottom of the receptacle is a check-valve, 6, which opens when the frame-work is lowered into the vat in order to permit the liquor within the vat to rise up into the reservoir C; but this valve remains closed during the operation of dyeing.

I claim as my invention—

1. In a dyeing apparatus, a vat for containing the dyeing-liquor, in combination with a frame-work carrying a receptacle for containing the material to be dyed, said receptacle being submerged in the dye-liquor within the vat, and a reservoir carried by said frame-work and communicating with said receptacle, into which reservoir the dye-liquor is introduced, substantially as set forth.

2. In a dyeing apparatus, a dye-vat for containing the dye-liquor, and a removable frame-work resting upon said vat, in combination with receptacles for containing the material to be dyed, said receptacles being suspended from said frame-work and submerged within the liquor in said vat, and said receptacles having imperforate sides and perforated bottoms, and a reservoir supported by said frame-work above said receptacles and communicating therewith, into which reservoir the dye-liquor is introduced, substantially as set forth.

3. In a dyeing apparatus, a dye-vat for containing the dye-liquor, receptacles for con-

taining the material to be dyed submerged within the liquor in said vat, said receptacles having closed sides and perforated bottoms, and said receptacles communicating with said vat solely through said perforated bottoms, and a reservoir located above said receptacle and communicating with the upper parts thereof, in combination with an outlet-pipe leading from said vat, an inlet-pipe conveying liquor to said reservoir, and a liquid-elevator for conveying the liquor from said outlet to said inlet-pipe, substantially as set forth.

4. In a dyeing apparatus, a dye-vat for containing the dye liquor, receptacles for containing the material to be dyed submerged within the liquor in said vat, said receptacles having perforated bottoms through which they communicate with said vat, and a reservoir located above said receptacles and communicating therewith, in combination with an outlet-pipe leading from said vat, a jacket or receptacle into which said outlet-pipe leads, an upwardly-extending pipe leading from said jacket and conveying the liquor into said reservoir, a rotary shaft within said jacket, and a cylinder mounted on said shaft, said cylinder having perforated walls, into which cylinder said outlet-pipe discharges the dye-liquor, substantially as set forth.

5. In a dyeing apparatus, a vat for containing the dye-liquor, in combination with a frame-work mounted upon said vat, a receptacle for containing the material to be dyed carried by said frame-work, said receptacle having a perforated bottom through which it communicates with said dye-vat, and a reservoir carried by said frame-work communicating with the upper part of said receptacle, substantially as set forth.

6. In a dyeing apparatus, a dye-vat for containing the dye-liquor, in combination with a reservoir located above said vat, a series of receptacles for containing the material to be dyed suspended from said reservoir and submerged in the dye liquor within said vat, said receptacles having perforated bottoms through which alone they communicate with said vat, and tubes connecting said reservoir with the upper portions of said receptacles, substantially as set forth.

7. In a dyeing apparatus, a dye-vat for containing the dye-liquor, a reservoir located above said vat, and a series of receptacles for containing the material to be dyed suspended from said reservoir and submerged within the liquor in said vat, said receptacles having perforated bottoms through which alone they communicate with said vat, in combination with a series of tubes connecting said reservoir and said receptacles, perforated pressure-covers within each of said receptacles, and a screw pressure-rod extending through each of said tubes and operating said pressure covers, substantially as set forth.

8. In a dyeing apparatus, a dye-vat for containing the liquor, in combination with a reservoir located above said vat, a series of re-

ceptacles suspended from said reservoir and submerged within the liquor in said vat, said receptacles having perforated bottoms through which alone they communicate with said vat, 5 tubes connecting said reservoir with the upper part of said receptacles, and valves adapted to each of said tubes for closing said tubes when desired, substantially as set forth.

9. A receptacle for containing material to 10 be dyed having a perforated bottom and closed sides and ends, a tube communicating with the upper part of said receptacle, and a

perforated cover within said receptacle, in combination with a removable end to said receptacle, which permits access thereto, substantially as set forth. 15

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALBERT HARMEL.

Witnesses:

JONATHAN HOLDEN,
FRANÇOIS CHAMPION.