No. 846,462. PATENTED MAR. 12, 1907.

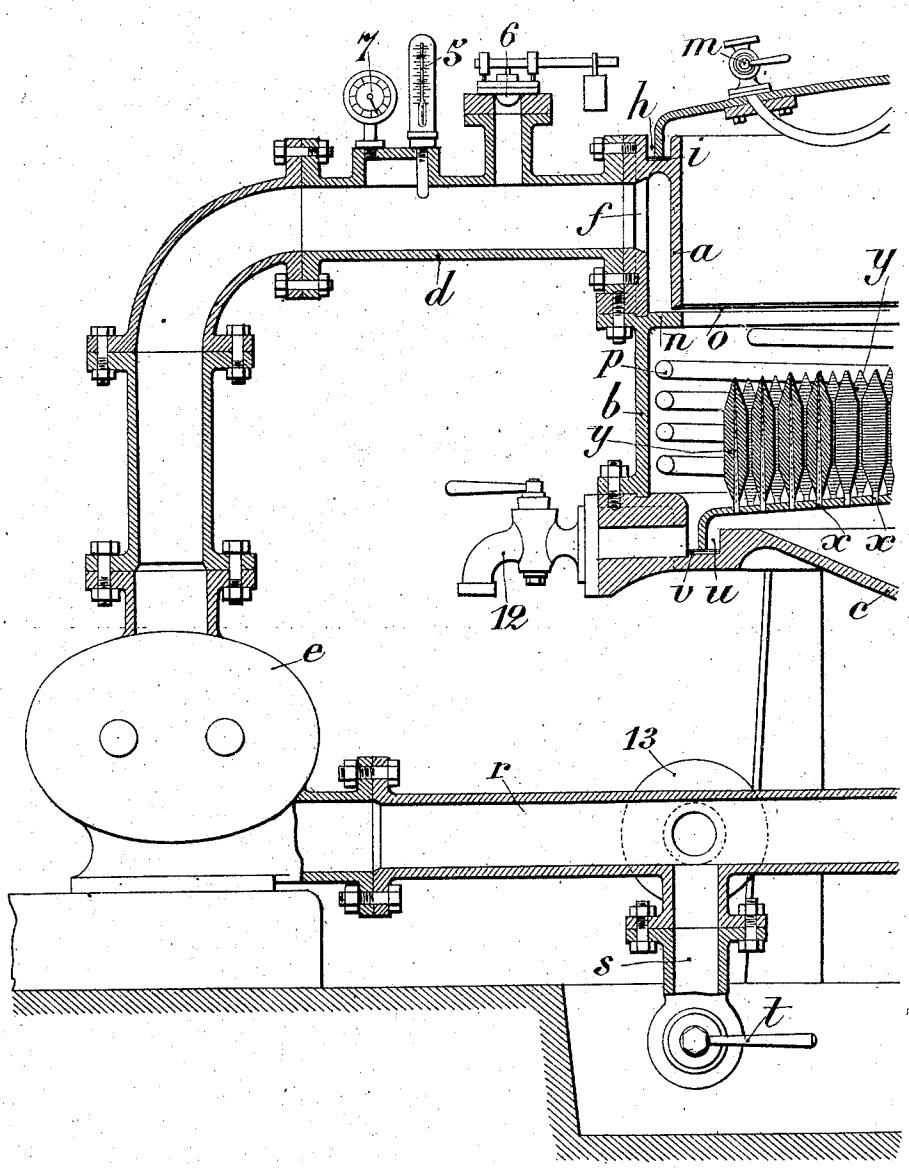
P. FONTAINE.

DYEING APPARATUS.

APPLICATION FILED SEPT. 25, 1906.

6 SHEETS—SHEET 1.

Fig. 1a.



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No. 846,462. PATENTED MAR. 12, 1907.

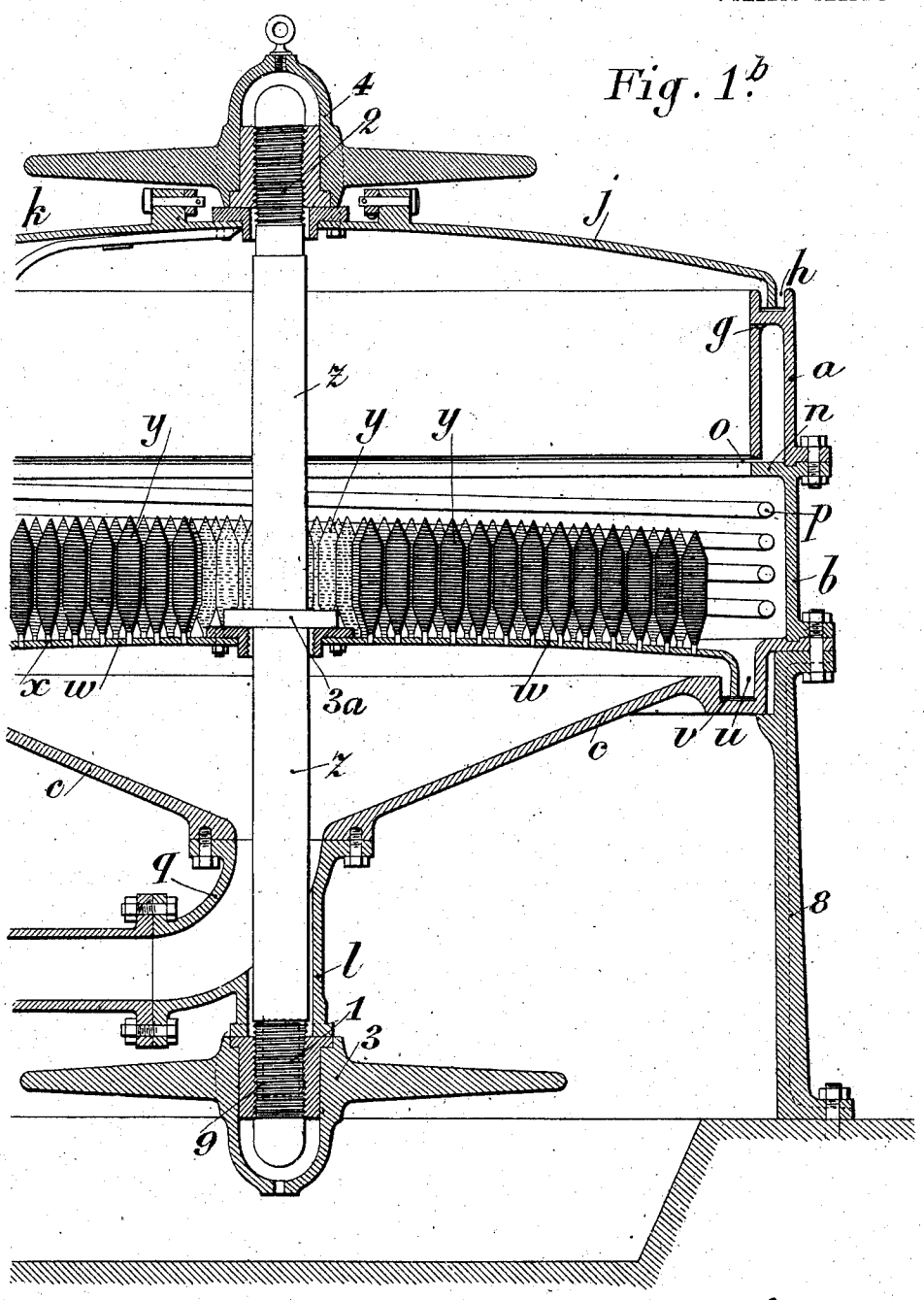
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6 SHEETS—SHEET 2.

Fig. 1b



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DYEING APPARATUS.

APPLICATION FILED SEPT. 26, 1906.

6 SHEETS—SHEET 3.

Fig 2a

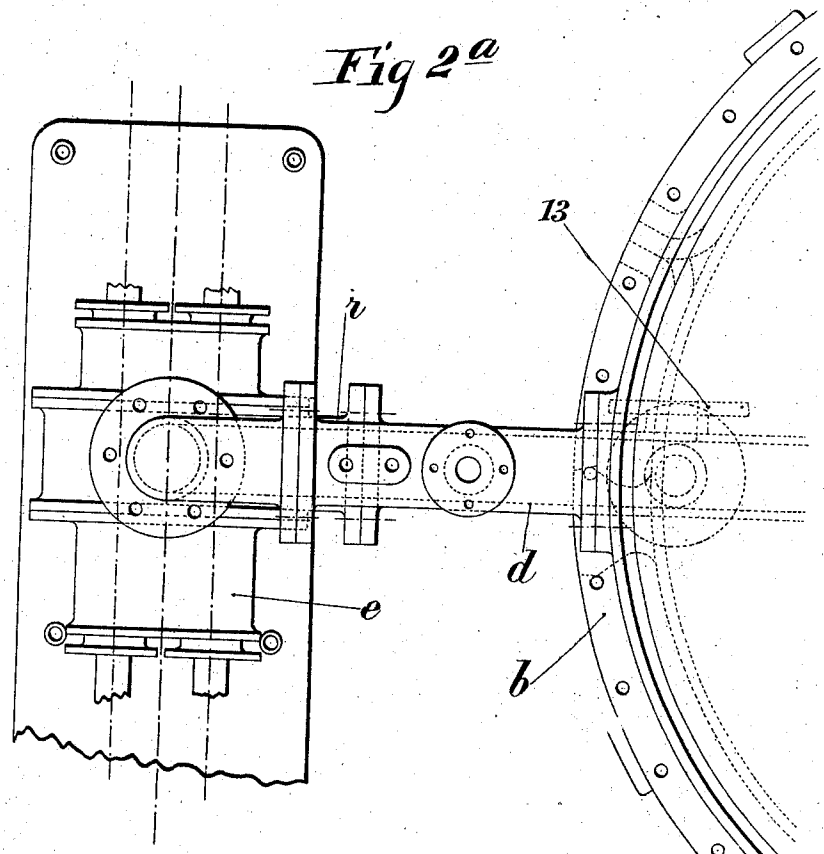


Fig. 4.

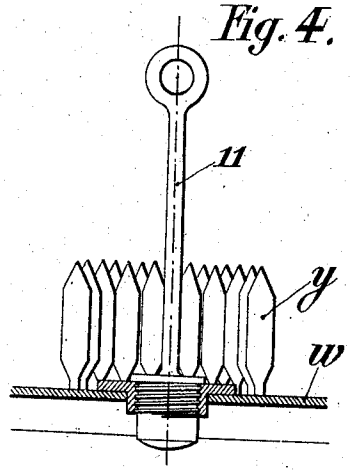
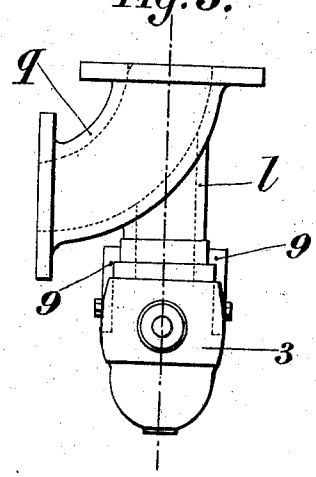


Fig. 3.



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No. 846,462. PATENTED MAR. 12, 1907.

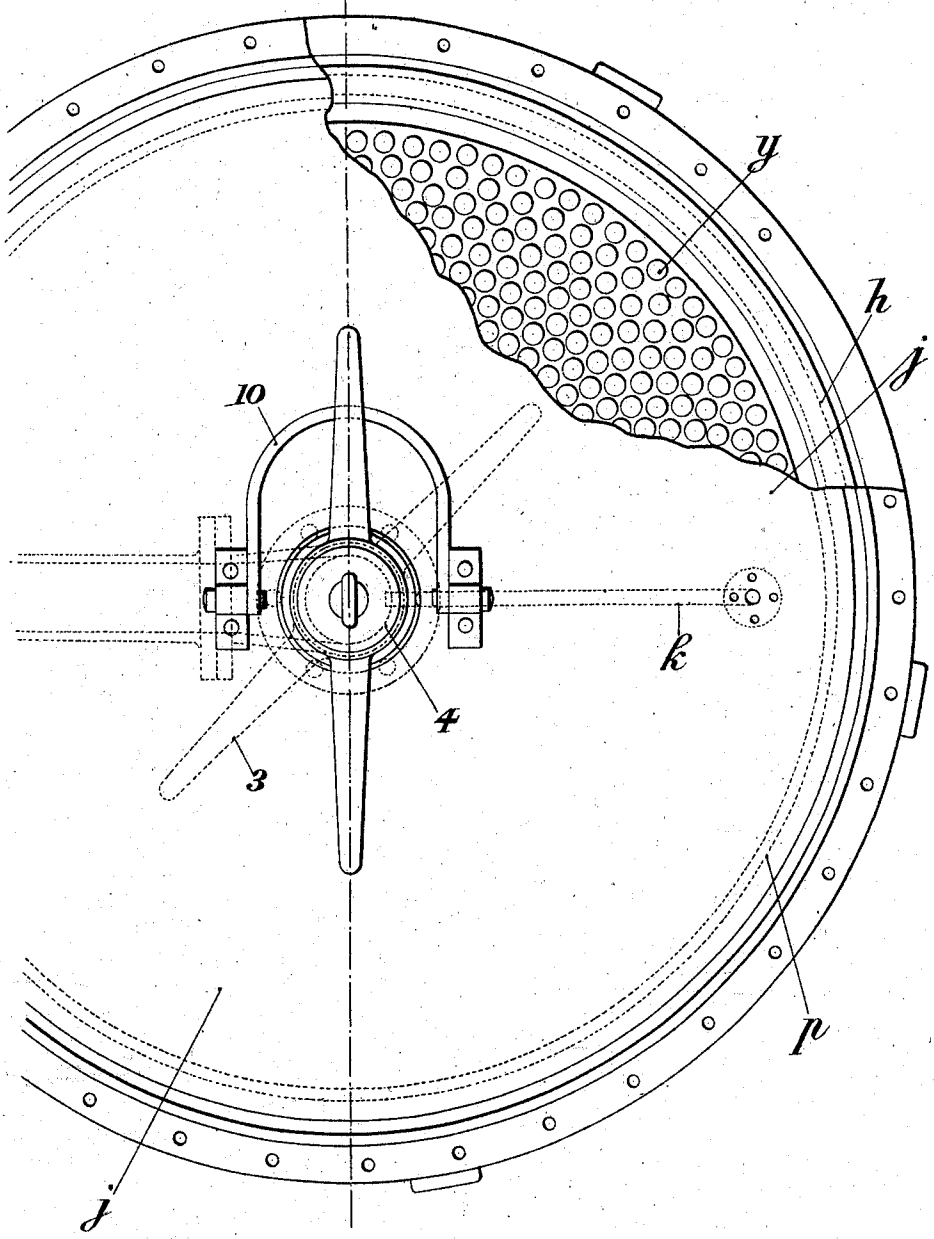
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APPLICATION FILED SEPT. 25, 1906.

6 SHEETS—SHEET 4.

Fig. 2.b



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No. 846,462. PATENTED MAR. 12, 1907.

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APPLICATION FILED SEPT. 25, 1906.

6 SHEETS—SHEET 5.

Fig. 5b

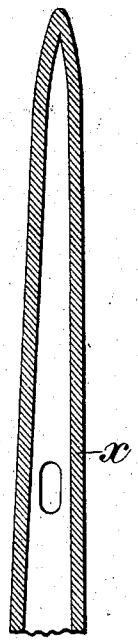
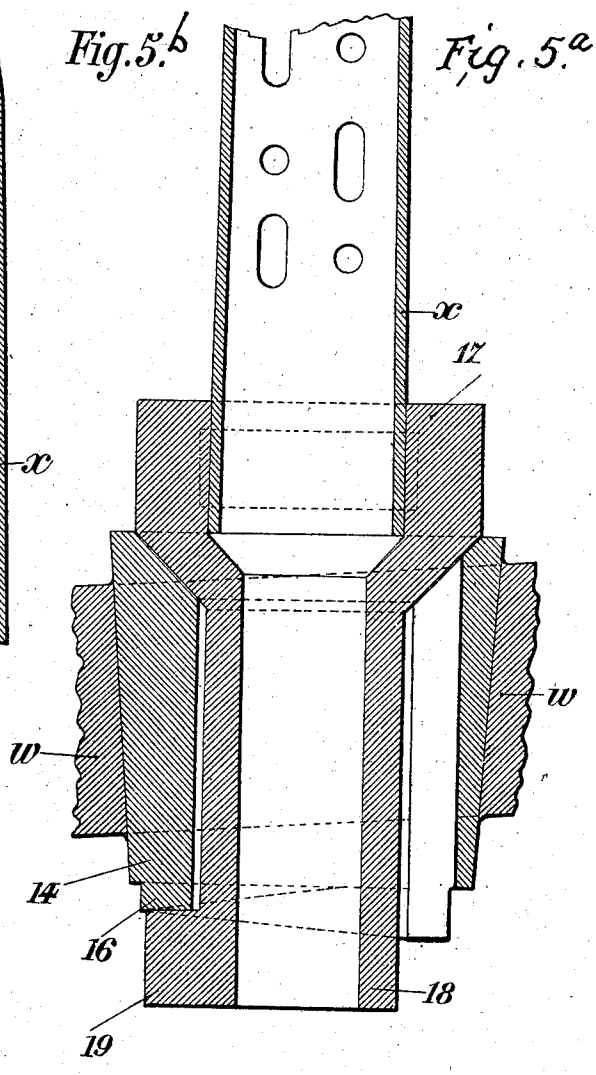


Fig. 5a



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No. 846,462. PATENTED MAR. 12, 1907.

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APPLICATION FILED SEPT. 25, 1906.

6 SHEETS—SHEET 6.

Fig. 7.

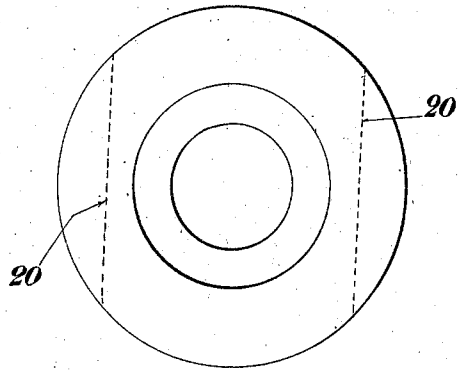


Fig. 10.

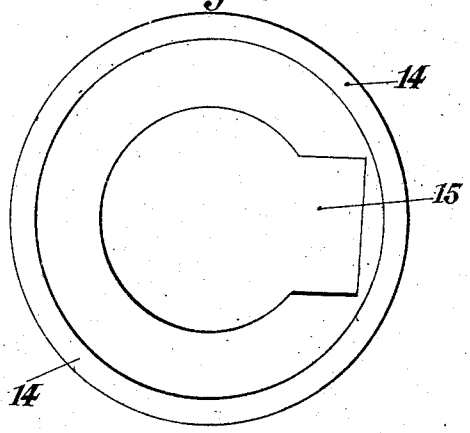


Fig. 6.

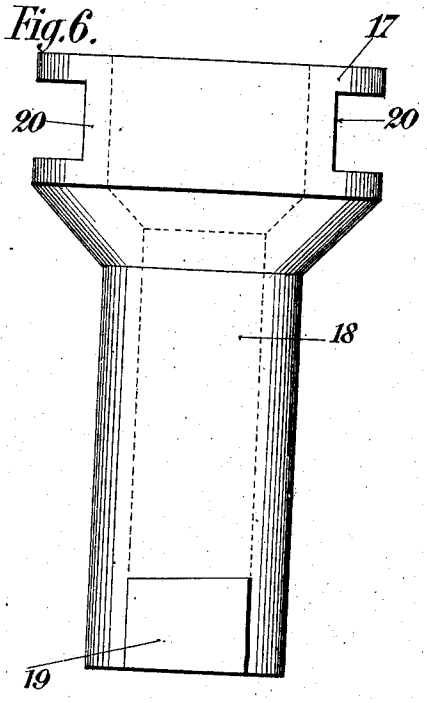


Fig. 9.

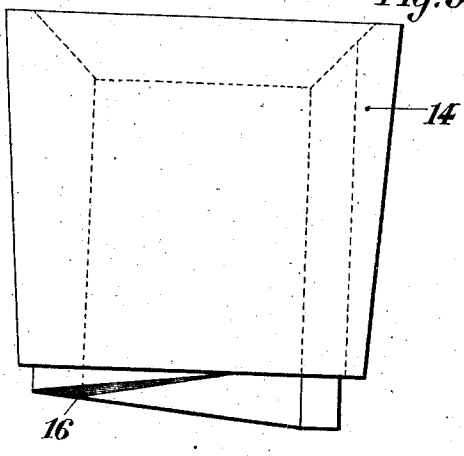


Fig. 8.

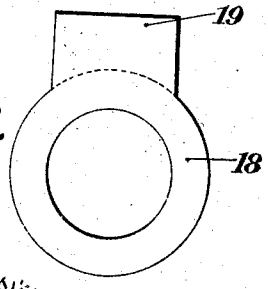
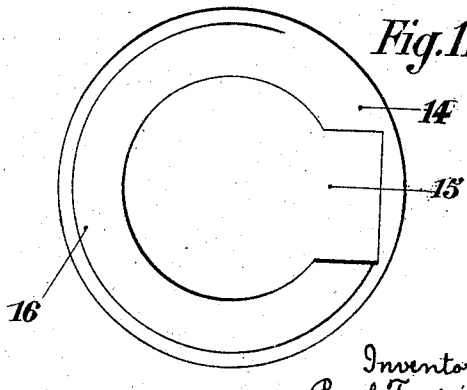


Fig. 11.



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UNITED STATES PATENT OFFICE.

PAUL FONTAINE, OF TROYES, FRANCE.

DYEING APPARATUS.

No. 846,462. Specification of Letters Patent. Patented March 12, 1907.

Application filed September 25, 1906. Serial No. 336,202.

To all whom it may concern:

Be it known that I, PAUL FONTAINE, a citizen of the Republic of France, residing at Troyes, Aube, France, have invented new and useful Improvements in Dyeing Apparatus, of which the following is a specification.

The present invention has for its object an apparatus for dyeing threads on bobbins.

The invention facilitates the formation of a completely-closed liquid circuit in which bobbins are mounted above the orifices of a perforated partition of a vat which on both sides of the partition communicates, respectively, with the suction and delivery of an exhaustion and feeding pump, the closing of the circuit being effected after the complete expulsion of the air by the liquid dye. The liquid dye, which is thus provided in constant quantity very exactly determined, is adapted to be forced through the bobbins alternatively from without to within and from within to without and always produce a correspondingly-defined tint. It will be certain with a bath of determined composition to reproduce at each operation the same tint if the apparatus is made to work during the same time at the same temperature and with the same alternation.

The annexed drawings represent, as a representative example, a practical form of construction of the apparatus embodying this invention.

Figure 1[a] is a sectional elevation of one-half of the apparatus. Fig. 1[b] is a similar view of the other half of the apparatus. Fig. 2[a] is a plan view of one half of the apparatus. Fig. 2[b] is a similar view of the other half of the apparatus. Fig. 3 is a side elevation of a part. Fig. 4 is a sectional elevation showing a contrivance for removing the perforated partition. Fig. 5[a] is a sectional elevation of assembled means for fixing the bobbin-carrying spindles on the perforated partition. Fig. 5[b] is a vertical sectional view of a perforated spindle upon which the bobbin may be mounted. Figs. 6 to 11 are elevations and plans in detail of the parts of this contrivance.

The apparatus comprises a vat, preferably made in three parts *a b c*. The upper part *a* consists of a ring of inverted-**U** section, from the exterior wall of which emerges at *f* one of the passages *d* of the pump *e*, adapted to operate with the same volume of delivery in either of the two directions. The interior wall of the **U**-section of the piece *a* is pierced with an orifice *g* for the escape of air, and in the base of the ring of inverted-**U** section is formed a groove *h*, which receives a metallic lining-ring *i*, on which is close pressed, with a water-tight joint, the edge of the cover *j*. A pipe *k*, fixed in the crown and provided externally with a stop-cock *m*, serves for the escape of air or eventually some of the liquid dye itself on its introduction. The intermediate ring *b* is joined to the upper and lower portions *a* and *c*. It carries on its upper edge a flange *n*. Between the interior edge of this flange and the edge of the interior wall of the ring *a* is provided an annular slit *o* for the escape of the liquid. A serpentine coil *p*, whose inlet and outlet are situated outside the vat and commanded by valves, is disposed against the interior wall of the ring *b*. It receives live steam for heating purposes.

The lower element *c* of the vat is formed as a truncated cone, the small end of which, situated below, is joined to a tubular branch *q*, by which it is connected to a pipe *r*, forming one of the passages of the pump *e*, (suction or delivery, according to the direction of flow.) To the pipe *r* is branched an evacuation-pipe *s*, provided with a turn-cock *t*, and on a lateral branch 13 is joined an inlet-pipe provided with a turn-cock. (Not shown.)

In a groove *u*, formed around the edge of the upward-situated base of the truncated cone *c*, rests a metallic joint-ring *v*, on which is close pressed the downward-bent edge of a perforated diaphragm *w* of the form of a spherical cap. In the orifices of this diaphragm are mounted the perforated spindles *x*, on which are carried the bobbins *y*, with or without a central core of perforated cardboard. An axial rod *z* passes through the cover *j*, the diaphragm *w*, and the bottom tubular branch *q* through a projection *l*. It is screw-threaded at its two extremities 1 2 and carries at an appropriate level a collar 3[a]. On the threads 1 and 2 are screwed, respectively, the securing-nuts 3 and 4. These nuts are shown as made in two parts connected by pins, the core, being of the harder metal, adapted to be easily replaced when it is worn by use. The nuts 3 and 4 apply pressure, respectively, on the projection *l* and on the cover *j*, and the collar 3[a] presses itself on the diaphragm *w*.

The apparatus is furnished with a thermometer 5, a safety-valve 6, and a manometer 7, mounted on the passage *d*.

The vat is represented as supported on a base 8, the construction of which can be varied as required.

The working of the apparatus is as follows: Suppose the vat empty and the lower nut 3 suspended to the vat, for example, between the branches 9 of a loop carried by the tubular projection *l*. The cover *j* having been lifted by its jointed handle 10 and the rod *z* withdrawn, the diaphragm *w* is removed by means of a screw-threaded rod, such as 11, Fig. 4, screwed into the aperture provided for the passage of the rod *z*. In order to proceed with the assembling of the apparatus, the diaphragm charged with bobbins to be dyed is inserted in place, the axial rod is then passed through the central orifice of the diaphragm and the tubular projection *l* and secured by screwing on the thread 1 the lower nut 3, which remained suspended from the vat, the collar 3^a being thereby close pressed onto the diaphragm. The cover is then replaced, the handle turned downward, and the nut 4 is screwed on the thread 2. The exit turn-cocks *t* and 12 are then closed, and the turn-cock of the passage from the liquid-dye receptacle which is connected with the inlet branch 13 is opened and also the stop-cock *m* for the escape of air. Finally the pump *e* is put in action, drawing the liquid by the passage *r* and delivering it by the passage *d*, care being taken to place the bottom of the dye-container above the level of the diaphragm *w*. The apparatus being full of liquid, which will become evident as soon as it appears at *m*, this latter as well as the admission turn-cock are closed, and the pump is continued working in the initial direction during the half of the time fixed for the operation of dyeing. As the apparatus is perfectly closed the body of the bobbins will be traversed from top to bottom by a determined quantity of liquid in a unit of time. The direction of the working of the pump is then changed and the liquid forced in a reversed direction from the bottom to the top. When the time assigned for the dyeing has passed, the pump *e* is stopped, and the stop-cock *m* and draw-off turn-cocks 12 and *t* are opened. The vat being emptied, the nut 4, the cover *j*, and the diaphragm are removed. There remains nothing more to do than to withdraw the bobbins and hang them in the air in order to dry.

Figs. 5 to 11 show a practical form of construction of a device for fixing on the diaphragm *w* the perforated spindles *x*, on which are carried the bobbins *y*. In each of the conical orifices of the diaphragm *w* is inserted a sleeve 14. (Shown in section in Fig. 5 and in elevation, plan, and inverted plan in Figs. 9, 10, and 11, respectively.) This sleeve, in the interior of which there is a longitudinal groove 15, is formed at the bottom end with a helicoidal surface 16. With the sleeve 14 15 16 engages a second sleeve of two external diameters 17 18, formed at its lower extremity, with a bent spur 19. This second sleeve is shown separately in elevation, plan view, and inverted plan in Figs. 6, 7, and 8, respectively. The perforated spindle *x* is mounted in the upper part 17 of the sleeve 17 18. The spur 19 is passed through the groove 15 of the sleeve 14 15 16, and then by a rotation of this spur when it protrudes through the groove it is pressed on the helicoidal surface 16. The element 14 15 16 of this bayonet-joint can of course instead of being independent of the diaphragm-plate *w* be cast with this latter. Two indentations 20, made in the sleeve 17, facilitate the fixation by means of a wrench.

I claim—

1. In dyeing apparatus, as herein described, the combination of a vat comprising an intermediate casing having projecting thereinto a perforated diaphragm, an upper casing forming an annular chamber communicating with the chambers formed by said intermediate casing and a lower casing of truncated cone form, there being an annular recess in said lower casing in which said diaphragm rests, and means for supplying a circulation of liquid to said chambers, substantially as described.

2. In dyeing apparatus as herein described, the combination of a vat comprising an upper casing forming an annular chamber, an intermediate casing and a lower casing of truncated cone form, there being a communicating passage between the chambers formed by said upper and intermediate casings, a diaphragm resting in an annular groove in said lower casing and projecting into the chamber formed by said intermediate casing, and a cap or cover resting upon and closely pressed to an annular groove formed in the upper part of the wall of said upper casing, substantially as described.

3. In dyeing apparatus as herein described, the combination of an upper casing forming an annular chamber, an intermediate cylindrical casing secured to said upper casing, a lower casing of truncated cone form secured to said intermediate casing, a perforated diaphragm resting upon said lower casing and reaching into the chamber formed by the intermediate casing and a pump having two branch pipes one of which communicates with the chamber formed by said upper casing and the other of which communicates with the chamber formed by said lower casing, substantially as described.

4. In dyeing apparatus as herein described, the combination of an upper casing provided with an exterior annular groove, a removable cap having a depending flange resting in said

groove, an intermediate casing secured to said upper casing, there being an intercommunicating liquid-passage of limited area between the chambers formed by said casings, a lower casing of truncated cone form secured to said intermediate casing, a diaphragm seated upon the interior of said lower casing and extending into the chamber formed by the intermediate casing, and means for pressing said diaphragm to its seat, substantially as described.

5. In dyeing apparatus as herein described, the combination of an upper casing provided with an exterior annular groove, a removable cap having a depending flange resting in said groove, an intermediate casing secured to said upper casing, there being an intercommunicating liquid-passage of limited area between the chambers formed by said casings, a lower casing of truncated cone form secured to said intermediate casing, a diaphragm seated upon the interior of said lower casing and extending into the chamber formed by said intermediate casing, and means for pressing said diaphragm to its seat, said means comprising a rod extending through said chambers and carrying substantially at its median point a collar which is adapted to press upon the diaphragm, substantially as described.

6. In dyeing apparatus as herein described, the combination of an upper casing provided with an exterior annular groove, a removable cap having a depending flange resting in said groove, an intermediate casing secured to said upper casing, there being an intercommunicating liquid-passage of limited area between the chambers formed by said casings, a lower casing of truncated cone form secured to said intermediate casing, a diaphragm seated upon the interior of said lower casing and extending into the chamber formed by said intermediate casing, and means for pressing said diaphragm to its seat, said means comprising a rod extending through said chambers and carrying substantially at its median point a collar which is adapted to press upon the diaphragm, and a nut engaging a screw-threaded portion near each extremity of said rod, said nuts serving to hold the cover tightly to the upper casing, substantially as described.

7. In dyeing apparatus as herein described, the combination of a series of three superposed casings forming a dyeing-vat, an arched perforated diaphragm resting upon the lower casing and extending into the chamber formed by the intermediate casing, and bobbin-carriers adapted to be held in the perforations of said diaphragm, each of said bobbin-carriers comprising two telescoping interlocking sleeves and a spindle set in one of said sleeves, substantially as described.

8. In dyeing apparatus as herein described, the combination of three superposed casings forming a dyeing-vat, a perforated diaphragm resting upon the lower casing and extending into the chamber formed by the intermediate casing, and bobbin-carriers adapted to be held in the perforations of said diaphragm, each of said bobbin-carriers comprising an external sleeve having a lower helicoidal surface, a second sleeve adapted to telescope with said first-named sleeve and having a spur engaging the helicoidal surface of said external sleeve, and a perforated spindle set in said second sleeve, substantially as described.

9. In dyeing apparatus as herein described, the combination of three superposed casings forming a dyeing-vat, a perforated diaphragm resting upon the lower casing and extending into the chamber formed by the intermediate casing, and bobbin-carriers adapted to be held in the perforations of said diaphragm, each of said bobbin-carriers comprising an external sleeve having an enlarged internal longitudinally-extending slot and a helicoidal lower surface, an internal sleeve being adapted to telescope with said external sleeve, said internal sleeve having a spur which is adapted to be passed through the slot in the external sleeve and is designed to engage the lower helicoidal surface of said external sleeve, and a perforated conical spindle secured in the upper part of said internal sleeve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL FONTAINE.

Witnesses:

GUSTAVE LAROCHE,

LÉON TAGET.