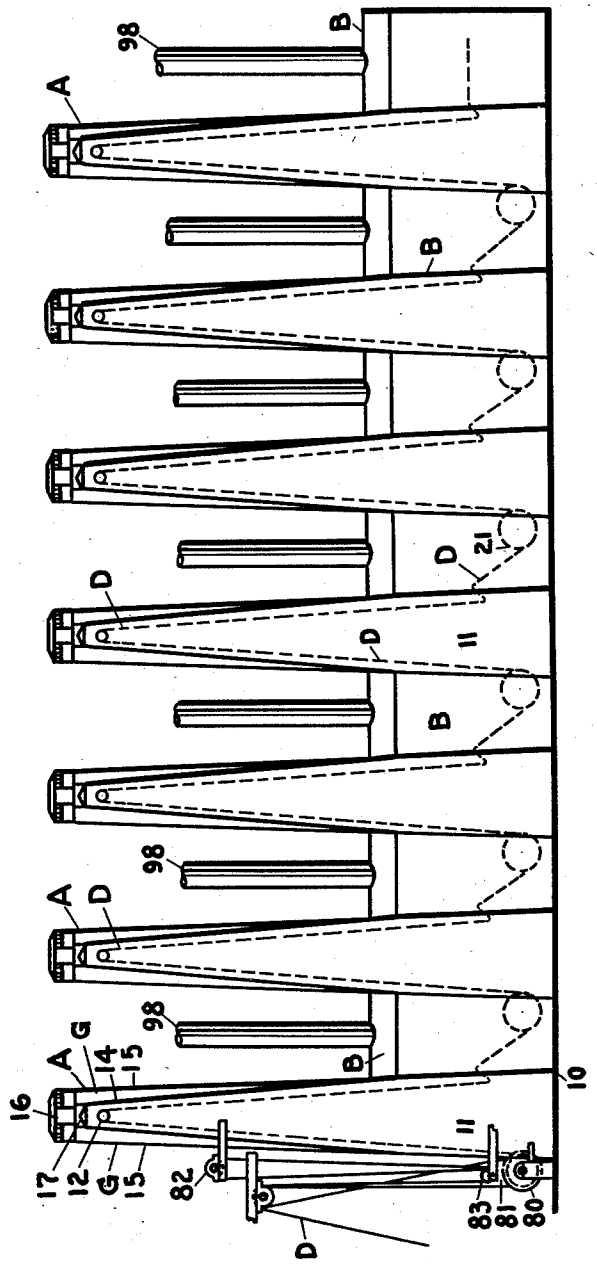
April 28, 1925. 1,535,447

C. W. AVERY

MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 1

Fig. 1



WITNESS:

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April 28, 1925. 1,535,447

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MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 2

MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Fig. 2

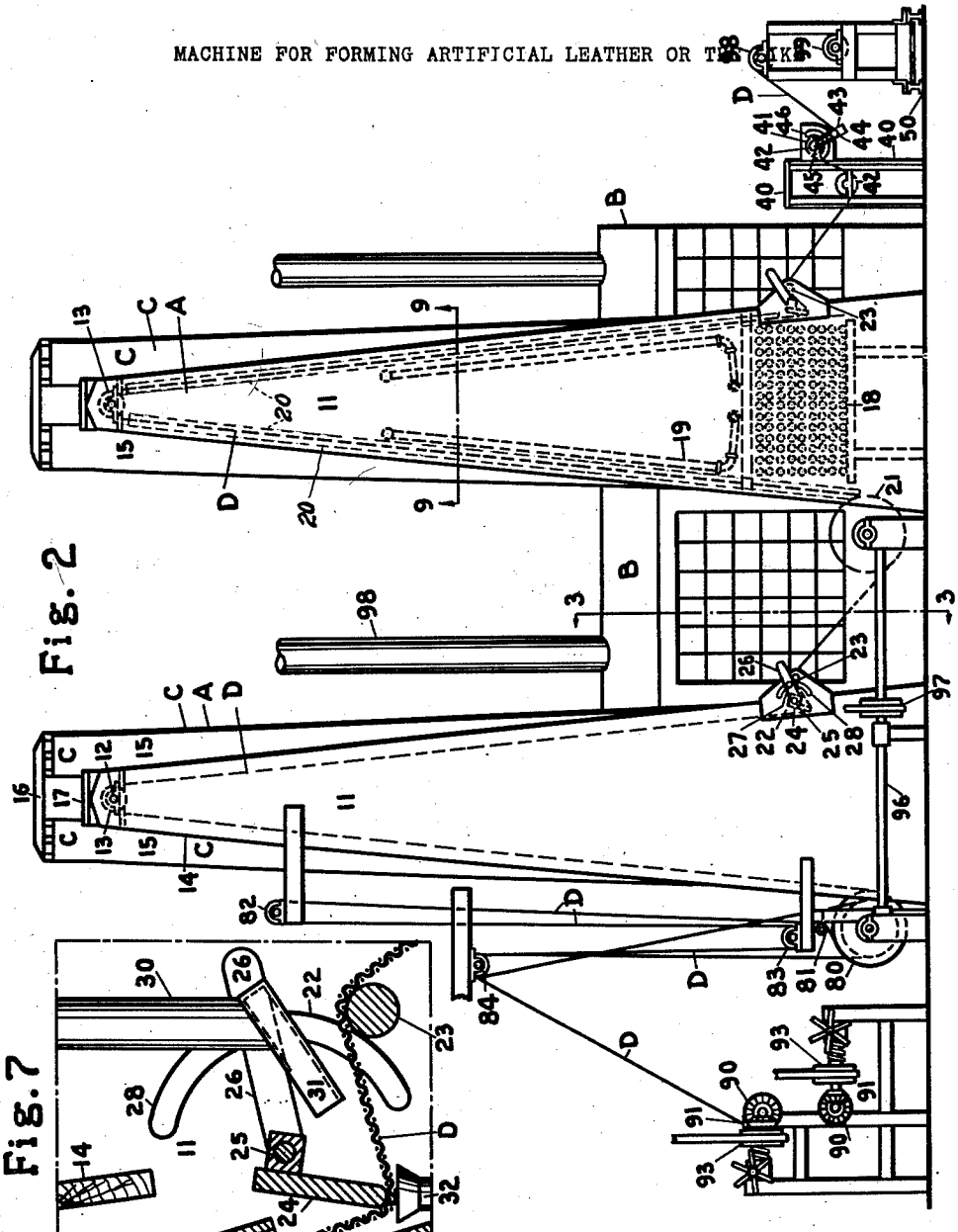

Fig. 7

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MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 3

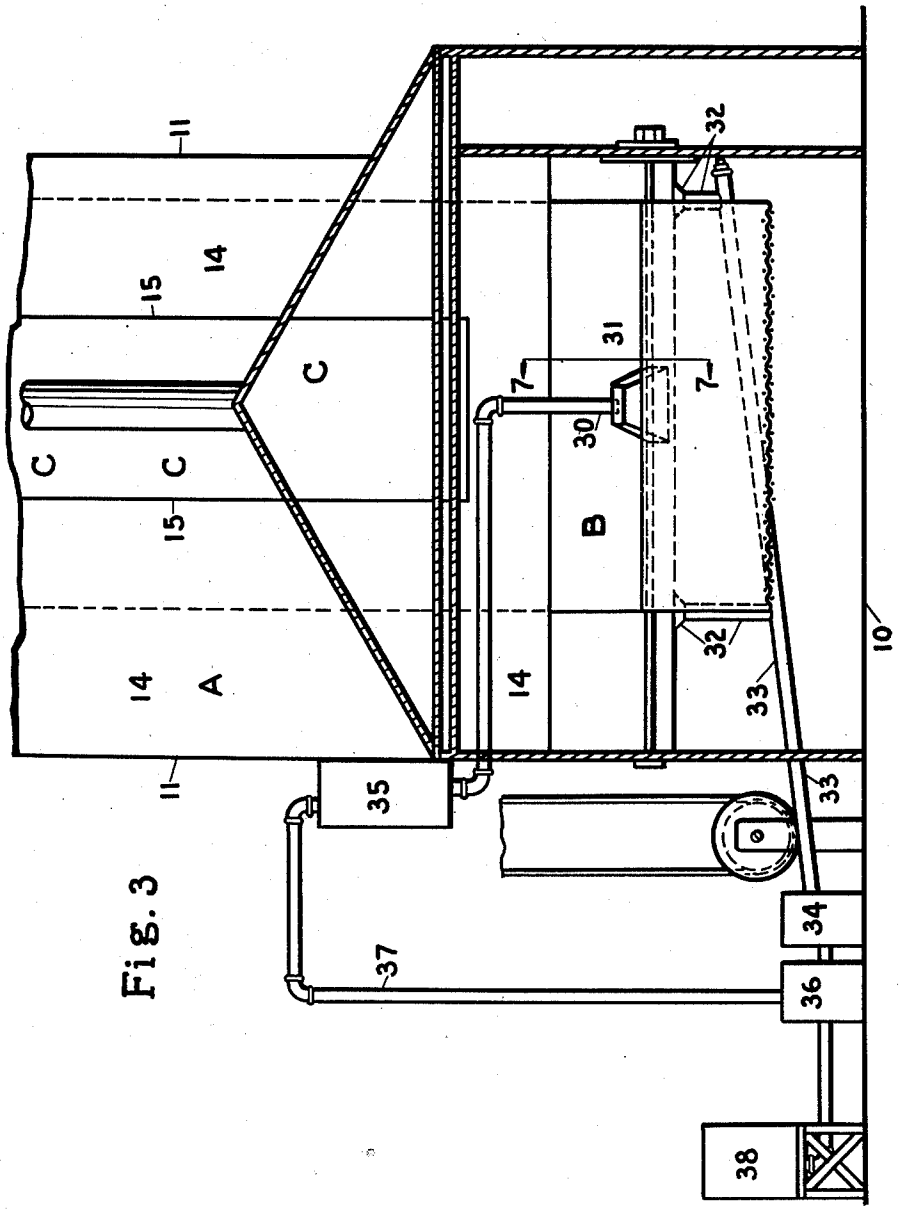

Fig. 3

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MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 4

Fig. 5

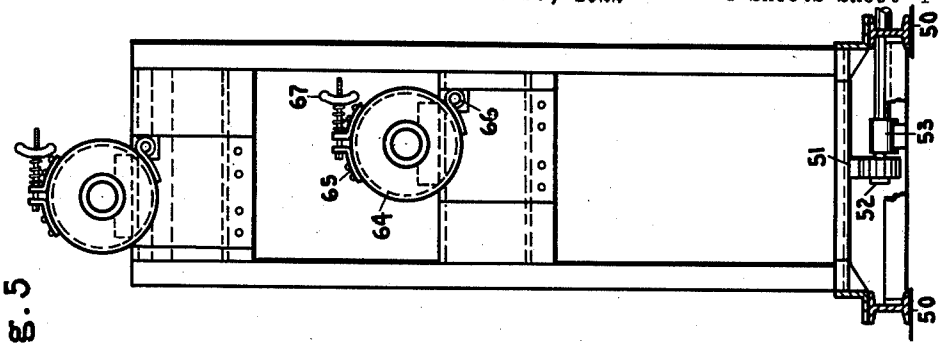

Fig. 4

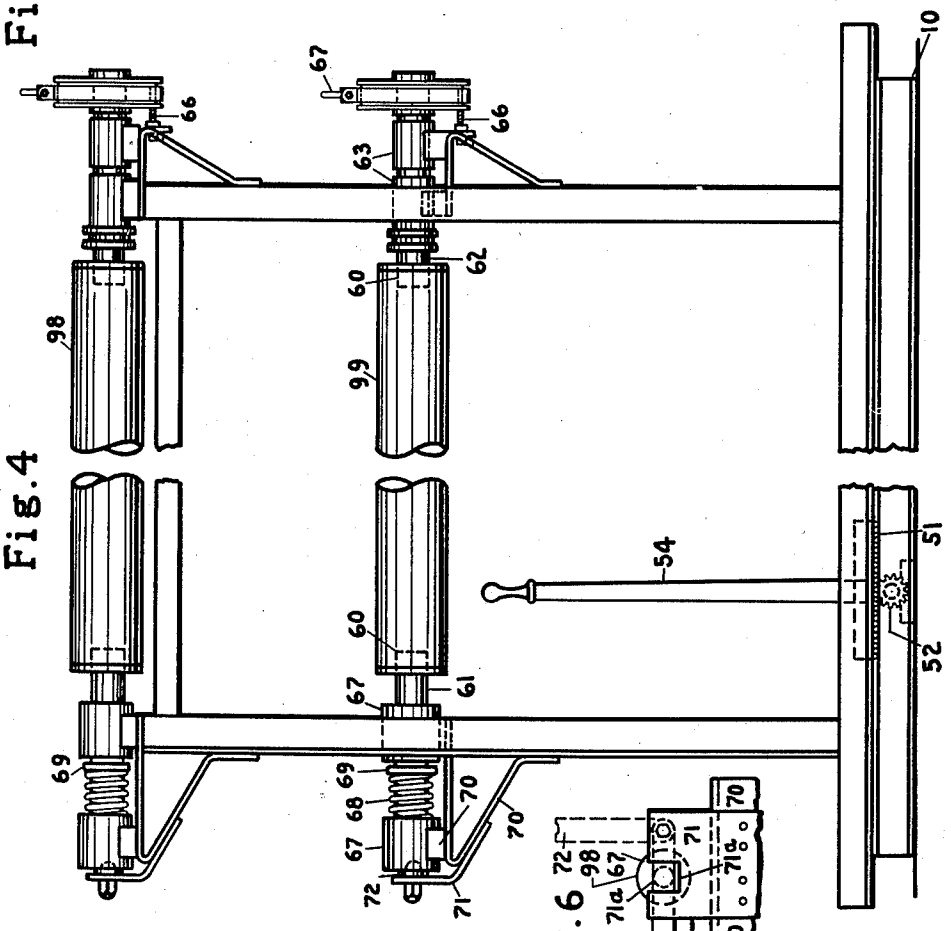

Fig. 6

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MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 5

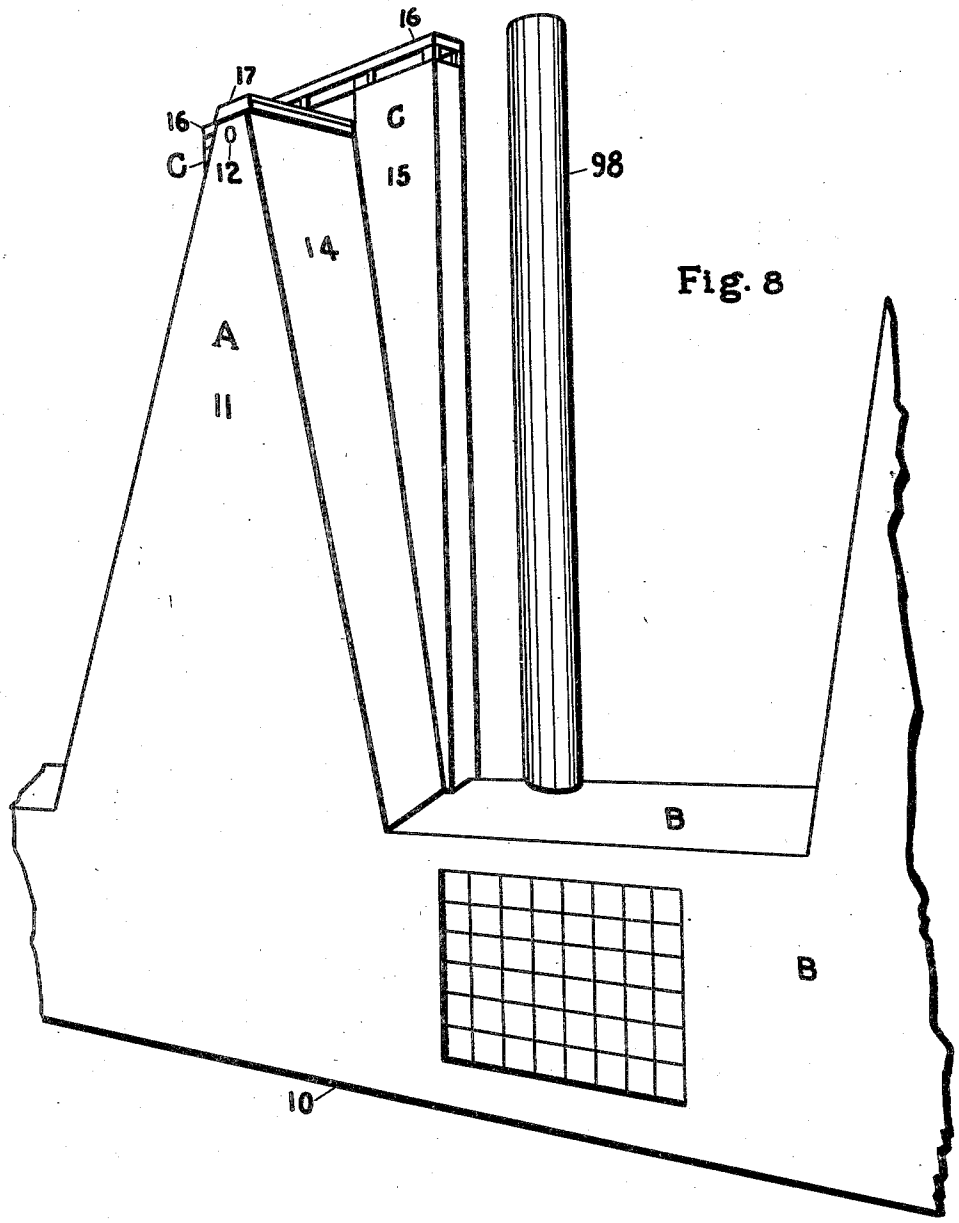

Fig. 8

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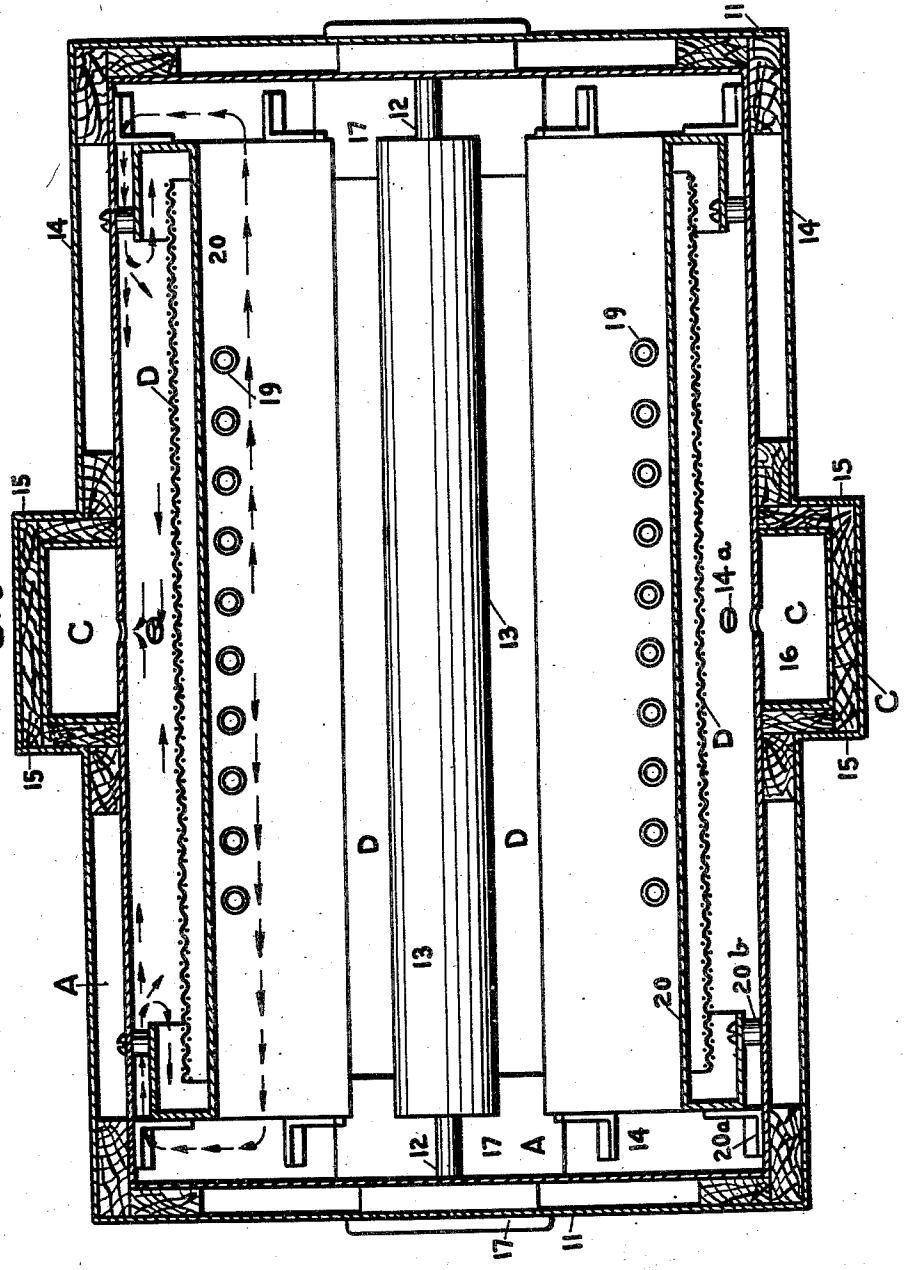
MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE

Filed Jan. 16, 1922 6 Sheets-Sheet 6

Fig. 9



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Patented Apr. 28, 1925. 1,535,447

UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING ARTIFICIAL LEATHER OR THE LIKE.

Application filed January 16, 1922. Serial No. 529,797.

To all whom it may concern:

Be it known that I, CLARENCE W. AVERY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in a Machine for Forming Artificial Leather or the like, of which the following is a specification.

The object of my invention is to provide a new and useful machine for forming artificial leather or the like of simple, durable and inexpensive construction.

A further object of my invention is to provide a machine for forming artificial leather wherein a strip of the cloth base may be successively coated with a number of coats of finishing material whereby the base may be fed into the machine at one end and the finished product drawn out at the other end.

A further object of my invention is to provide a machine for forming artificial leather wherein the base, which may be of fabric or any other suitable strip of pliable material, may be run through the machine and first coated with the finishing material, then warmed sufficiently to evaporate the liquids therein, then cooled and then rewound.

A further object of my invention is to provide improved drying or evaporating chambers wherein a maximum amount of material may be subjected to the action of heat while a minimum amount of floor space is used, and in connection with these chambers improved means for carrying off the gases due to the evaporation.

A further object of my invention is to provide improved means for applying the plastic finishing material to the fabric or base whereby the process may be continuous, and to provide in connection with this means devices for holding the cloth in the machine flat and to a desired course.

A further object of my invention is to provide an improved feeding device for the finishing material whereby a continuous flow of the finishing material may be insured.

A further object of my invention is to provide means for making the process of forming the leather continuous whereby the end of one roll of cloth may be fastened to the end of the preceding roll without delaying or stopping the action of the machine.

It will be understood that while this machine is here spoken of as being for the making of artificial leather yet it may be used in whole or in part for coating with plastic material strips of various kinds of pliable material.

With these and other objects in view, my invention consists in the arrangement, combination, and construction of the various parts of my improved device, as described in the specification, claimed in my claims, and shown in the accompanying drawings, in which:

Figure 1 is a side elevation of my improved machine.

Figure 2 is an enlarged side elevation illustrating only the end chambers for applying and drying the finishing material, together with the parts associated therewith.

Figure 3 is a vertical transverse sectional view taken on line 3—3 of Figure 2.

Figure 4 is an end elevation of the cloth support rack at the receiving end of the machine.

Figure 5 is a side elevation thereof.

Figure 6 is an enlarged detail view showing my improved roll mounting means in elevation.

Figure 7 is a vertical longitudinal sectional view taken on the line 7—7 of Figure 3.

Figure 8 is a perspective view of a portion of my improved device, and

Figure 9 is a horizontal sectional view taken on the line 9—9 of Figure 2.

Referring to the accompanying drawings I have used the reference numeral 10 to indicate generally the base or floor upon which my improved machine may be set. The device may be said to consist generally of a plurality of towers in which the material which has been coated may be dried, and in connection with each of the towers means for coating the material just prior to its entry into the tower. These towers I have designated generally by reference letter "A", and the space between the towers wherein the material is coated by reference letter "B".

The material is fed into the machine at the right-hand end of the device illustrated in Figures 1 and 2, then coated with finishing material, then conducted upwardly along one side of the adjacent tower, then

down the other side into the second or next succeeding chamber "B", etc., through the machine to the last of the towers "A". As the material comes out of the last tower "A" it is passed around a large roller and thence upwardly along the side of the tower and back down again to position adjacent to the floor before being rolled onto the rolls which are provided. This last mentioned course of the material is for the purpose of cooling it prior to its being re-rolled.

The towers "A" are constructed as follows in the form of my device herewith illustrated:

Side walls 11 have their edges inclined upwardly and toward each other to position adjacent to their top ends where a bearing 12 is formed for a roller 13. The front and rear walls 14 of the towers are inclined to correspond to the inclined edges of the ends 11, and each of these walls is formed in two parts which are separated from each other by a vertical flue section "C." The walls 11 and 14 in the form here shown are constructed of spaced sheets of sheet metal, which are separated and braced at the corners by strips of wood. The inner sheet metal portion of the walls 14 is extended across the flue "C" and communication is permitted between the tower proper and the flue section through a plurality of spaced openings 14^a. These flue sections are disposed adjacent to the central portions of the towers on their front and rear surfaces, and extend upwardly to position spaced above the top of the tower proper. The front and rear walls of these flue sections are substantially vertical while their side or end members 15, have one edge inclined to follow the inclination of the front and rear wall members of the tower. From the foregoing it will be seen that the flue members "C" may collect the gases formed by the evaporation within the tower and conduct them upwardly to position above the top of the tower proper. A common cap 16 may be provided for the flues of each tower or stack.

From the description of the foregoing parts it will be seen that when it becomes necessary to remove the top member 17 of the tower, the greater diameter of the air passages of the flues "C" will draw the products of evaporation up through those flues rather than permitting the major portion of such products to come out of the top of the tower direct. This additional height of the flues, therefore, makes it possible to repair, oil, or adjust the roller or material at the top of the tower mentioned, more readily than would be the case if the products of evaporation were allowed to escape entirely adjacent to the top of the tower proper.

Inside each of the towers "A" are a plurality of heating coils 18, which are indicated by the dotted lines in Figure 2. These coils are preferably arranged in close juxtaposition adjacent to the bottom of the tower, and portions of the coils are extended upwardly along the front and rear walls of the towers. Between the coils 18 together with their upwardly extending portions 19 and the front of rear walls 14 of the tower, is an apron 20 which is illustrated in Figures 7 and 9, and which is designed to protect the material from too great direct heat. This apron extends up to position adjacent to the upper roller 13 and down to position below the bottom of the roller 21. It is formed of a sheet of sheet metal in the form here shown, which has its side edges bent back upon themselves to form channels in which the edges of the cloth travel. This channel portion is supported in position spaced from the wall 14 by a number of angular brackets 20^a and spaced struts 20^b whereby the heated air from the heating elements may circulate between the brackets 20^a and the struts 20^b and then strike the surface of the cloth in position spaced from the edge thereof. By this construction I am enabled to substantially eliminate any tendency of the edges to crack or blister due to sudden overheating. This apron also tends to distribute the heat more evenly against the surface of the material. At the rear side, and adjacent to the bottom of each tower is a roller 21 over which the material is conducted into the next succeeding chamber "B."

For coating the material with the finishing materials I provide the following described means:

Adjacent to the lower forward portion of each tower, and below the bottom of the front wall 14, are a pair of brackets 22 which extend forwardly from the walls 11. Extended between the forward edges of these brackets is a bar 23 which has three functions, namely, to place the material under tension, to smooth the material, and to keep the material on a true course through the machine. Parallel with the bar 23, and rearwardly therefrom, is a blade 24 which is pivotally mounted between brackets 22 and 25. A lever 26 is fixed from movement relative to the blade 24, and has a bolt 27 therein adapted to co-act with a slot 28 in the brackets 22 whereby the lever 26 may be held in any of a plurality of adjusted positions. Adjustment of the lever 26 adjusts the angle of the blade 24 thereby varying the position of the lower edge of the blade relative to the bar 23. By referring to Figure 7 it will be seen that upward movement of the free end of lever 26 will swing the working edge of the blade 24 downwardly and toward the bar 23 thereby causing the material "D" to form a more acute angle as it passes around

the edge of blade and to come in contact with a greater portion of the periphery of the bar 23. Swinging of the end of the lever 26 upwardly, therefore, increases the tension on the material "D," while swinging the lever in the opposite direction has an opposite effect on the tension of the material.

Adjacent to the central portion of the chambers "B" is a vertical supply pipe 30 which extends downwardly to position above the material and between the blade 24 and the bar 23. A spout 31 is secured to the lower end of the supply pipe 30, and is designed to feed the finishing material from the pipe out on to the material "D". This finishing material will then be carried by the material "D" into contact with the blade 24 which has the double effect of forcing the finishing material, which passes under it, into the material "D", and of causing surplus material to run toward the end of the blade 24. The material which runs to the end of the blade 24 will roll off the edges of the material "D" into return spouts 32. These spouts 32 are connected to a return pipe 33 which runs down to a reservoir 34. The supply pipe 30 is connected to a gravity feed tank 35. A pump device 36 is arranged so that it may take the material from the reservoir 34 and then force it into the gravity feed tank 35 through a pipe 37. Adjacent to the pump 36 is a mixing vat 38 which is so connected with the pump 36 that the material from the mixing vat may be forced through the pipe 37 into the tank 35. At the receiving end of my improved machine I have provided devices for placing the material which is being coated under tension and for feeding the material into the machine on lines which may be adjustable relative to the longitudinal axis of the machine.

The tension device consists of a frame 40 which has forwardly extended brackets 41 secured to its opposite forward edges. Journalled in the frame 40 and in the brackets 41 are rollers 42 over which the material to be coated must travel. Journalled in the brackets 41 are arms 43 having a bar 44 extended therebetween whereby the vertical position of the bar 44 may be adjusted by swinging the arms 43. A locking device 45 is mounted on one of the arms 43 and adapted to co-act with a slot 46 to lock the arms 43 and thereby the bar 44 in any of a plurality of adjusted positions. Forwardly of the tension device is the feed roll carrying frame which is illustrated in detail in Figures 4 to 6 inclusively. This frame is mounted for transverse reciprocation on I-beams 50, and the lower portion of the frame has a rack bar 51 thereon which is adapted to co-act with a pinion 52 journalled in a bearing 53 which is fastened to the floor or foundation 10. The shaft carrying the pinion 52 is extended to position where a lever 54 may be secured thereto to rotate the shaft.

From the construction of the parts just described it will be seen that rotation of pinion 52 through swinging of lever 54 will cause the rack 51 to reciprocate thereby reciprocating the feed roll carrying frame. If desired the lever 54 may be ratcheted to the shaft carrying the pinion 52 so that the movement of the lever need only be through a comparatively small arc, and means may be provided for locking the lever in any of a plurality of adjusted positions.

Mounted on the feed roll carrying frame are a pair of feed rolls 98 and 99. In this connection it may be mentioned that the cloth or other material which is to be coated is in the form of machine here shown rewound on to a specially designed roller before being placed on the feed roll frame. Means may, of course, be provided to obviate this re-winding of the cloth, but such would not form a part of the invention disclosed in this application. The rolls which I use with this machine are provided with square sockets 60 which are indicated by the dotted lines in Figure 4, and which are designed to receive the square end of stub shafts 61 and 62. The stub shaft 62 is journalled in bearings 63 in one end of the frame and has a brake drum 64 secured to the end thereof. A band brake 65 is held from movement relative to the frame by the pin 66, and the pressure of the band brake 65 may be varied by means of a screw 67 adjacent to the upper portion thereof. The shaft 61 is loosely received in bearings 67 in the frame between which is disposed a coil spring 68; a collar 69 is fixed to the shaft 61 in such position that the pressure of the spring 68 will normally yieldingly tend to force the shaft 61 toward the central portion of the frame carrying the feed rolls and thereby into the squared sockets 60. The outer bearing 67 is supported on a bracket 70 which extends outwardly, and is provided with an extension bracket 71 which has a slot or recess 71^a in its upper central portion. Journalled in the extension 71 is a lever 72 which may be moved either to the position shown in dotted lines in Figure 6, or to the position shown in full lines where it will close the opening or recess 71^a.

If then a feed roll be placed on one of the pairs of shafts 61 and 62 in the manner illustrated in Figure 4, and it is then desired to remove the feed roll from the frame the following method is used:

The lever 72 is swung from its full line position to the dotted line position whereby the shaft 61 may be moved longitudinally in the bearings 67 against the pressure in the spring 68. Movement of this shaft permits the recess 60 to be freed from the end of the shaft

62 whereby that end of the roller may be swung out of line with the shafts, and the recess 60 at the opposite end freed from the shaft 61.

From the description of the parts heretofore mentioned it will be seen that if a roll of cloth or flexible material be placed upon one of the feed rolls, then rotation of the rollers within the machine will draw the cloth off from the feed roll and through the machine where it may be coated. When the cloth has been almost completely drawn off from one of the feed rolls then a second roll of cloth may be placed upon the second feed roll. The cloth from the first feed roll is then pulled completely off the roll, but held against the pull of the machine by the operator with a resistance as near as possible equal to the resistance given to the roll by the appropriate brake band 65. If the end of the cloth on the second roll be now unrolled for a short distance it will be seen that the two ends may be sewed together without interfering with the continued operation of the machine.

As soon as the end of the first roll has been sewed to the end of the second roll, then operators wind up the second roll until the slack in the cloth has been taken up, which will then permit the cloth to be fed off the second roll in the same way as it had been fed off the first roll, and without interfering with the continued operation of the machine. It will be noted that the tension devices provided, together with the devices for spreading the coating material will not interfere with the progress through the machine of material which has a seam made with an ordinary sewing machine.

At the discharge end of the last tower "A" is a roller 80 over which the cloth travels, and which has a small roller 81. The cloth travels beneath the roller 80, then forwardly of the roller 81, then up over a roller 82 disposed near the top of the tower, thence downwardly around a roller 83 adjacent to the roller 80, thence upwardly of a roller 84, and thence downwardly to a re-winding roller frame. It will be understood that the purpose of these last turns of the cloth is to allow the cloth to thoroughly cool before it is re-wound on to a roller.

There are a pair of re-winding rolls similar in construction and mounting to the feed rolls, that is, these rollers are capable of being readily detached in the same way.

At one end of each of the re-winding rolls is a bevel pinion 90 which is in turn connected to a bevel pinion 91, (see Figure 2), which is in turn connected through a spillway device to a pulley 93. The spillway device is of ordinary construction and will not be here further described. In connection with the spillway device it may be mentioned that the drive is such through the pulley 93 that the rolls will rotate when the cloth is first started on them at sufficient speed to wind the cloth at substantially the same speed that the cloth is moving through the machine. As the roll commences to increase in diameter due to the greater amount of cloth thereon, the rotation of the roll will be retarded due to the speed of the cloth through the machine and the spillway device will permit the roll to revolve at the necessary speed while keeping the cloth under some tension at all times.

When the roll has received substantially all the material belonging to one roll then the following method is used for switching the cloth to the other roll, so that the first roll may be removed. It will be recalled that the rolls of cloth are run through this machine continuously with their ends sewed together, and I prefer to re-wind these rolls after they have been coated into rolls comprising the same length of cloth. Therefore, when it is desired to change from one of the re-winding rolls to the other, which will be at a time when the seam in the material is between the re-winding roll and the roll 84, then the operators grasp the cloth between the roll 84 and the seam and pull on it to maintain a tension thereon substantially equal to the tension which would be placed thereon by the rotation of the re-winding roll. The thread at the end of the seam is then cut, and the pieces of material ripped apart. The free end of the cloth coming from the machine is then held by the operator under tension until it may be drawn across the second re-winding roll so that rotation of the latter may enable the operator to start the material to winding on the roll. As soon as the rotation of the re-winding roll has taken up the slack in the cloth, then the operation of the machine continues as before. As soon as the second re-winding roll has started normal operation, then the first re-winding roll may be removed to a place of storage or other place where it is to be used. If desired the material coming from this machine may be run through a press to print a pattern on its surface. It may be here mentioned that when the material has been wound on the re-winding roller it is then ready for use unless it is desired to print a pattern on the face of it.

Between each of the towers "A" are the chambers "B" which have heretofore been mentioned and which may be provided with windows in their end walls whereby the material within the structure may be inspected from the outside. In this connection it may be mentioned that the coating material used is in many cases dissolved in ether so that the fumes of this ether and some of the other chemicals are dangerous on account of fires and their effect on the operators. These chambers "B" thereby permit inspection of

the material without subjecting the operators to the continuous exposure to the fumes of the coating material. Stacks 98 are provided in the top of each of the chambers "B" for the purpose of carrying away a considerable proportion of the fumes in the chamber.

An advantage of my improved machine arises from the fact that the parts are so arranged that roll after roll may be run through the machine and coated without stopping the operation of the machine. It will, therefore, be seen that the regularity and uniform quality of the material may be greatly enhanced, and that there will be a minimum amount of waste, due either to imperfect coating or to hardening of the coating material in the coating chambers. In this connection it will be noted that the feeding and mixing devices for the coating material are to be so arranged that the operation thereof may be continuous, and that the opportunity for the coating material to dry and harden is reduced to a minimum.

A further advantage resides in the use of my improved machine from the fact that material may be fed into the machine at one end, and will come out of the other end with all of the necessary coatings thereby making it unnecessary to wind and re-wind the rolls of material a considerable number of times during the various coating operations necessary to complete the product. It will be noted that I use seven towers in my preferred form of device so that seven different successive coats of material may be applied during the progress of the material through the machine, (and this number of coatings is sufficient for the manufacture of ordinary artificial leather). With my construction I am also able to cut off the heat and coating material from one or several towers without materially affecting the operation of the machine, so I can give the material any desired number of coatings from one to seven.

A further advantage resides in the use of my improved machine due to the automatic centering devices whereby the material fed into the machine will travel on a straight line through the entire machine so that it may be smoothly wound on to the re-winding rolls, and so that there may be no interruption to the operation due to the cloth running off of the rolls. This centering of the material is accomplished by the use of the fixed bars 23 which extend across the structure adjacent to the lower receiving side of the towers, and these bars also operate to spread cloth so that it will be flat, thereby insuring that the coating thereon will be uniform.

In connection with the means for causing the material to run on a given line through the machine it may be mentioned that the cloth which is on the feed rolls is quite often irregularly wound. In order to keep this cloth on a given line when it enters the machine means are provided for moving the feed rolls longitudinally so that the one edge of the cloth may be held to a given line in spite of these irregularities in the rolling of the cloth thereby insuring that the cloth will enter the machine at the desired place. In order to move the feed roll frame longitudinally the lever 54 may be moved to the proper place to position the feed roll where the cloth will properly feed into the machine. In this connection attention is also called to the adjustment on the brake band 65 whereby the tension on the feed rolls may be varied to meet the requirements of the machine.

In connection with my improved machine it may be mentioned that the feeding devices for the coating material are so arranged that any of them or all of them may be cut off whereby any desired number of coatings may be given to the material up to the number of towers used. The use of the vertical towers has several advantages among which may be mentioned the economy of floor space, the superior arrangement of the parts for drying the coated material and the fact that the major portion of the fumes of evaporation may be discharged by using comparatively short or no stacks above the top of the building in which the structure is housed. This structure further makes it possible to use what may be said to be two rollers for each of the evaporating towers, thereby simplifying the construction and lessening the possibility that the machine will get out of order.

In connection with the driving of my improved machine, means are provided such as the shaft 96 which may be connected with any suitable source of power and then connected by a plurality of belts 97 with the desired rolls of the machine to thereby impart rotation thereto at a predetermined speed.

Some changes may be made in the arrangement and construction of the various parts of my improved device without departing from the spirit of the invention therein and it is my intention to cover by my claims such changes as may be reasonably included within the scope thereof.

I claim as my invention:

1. In a device of the class described, an evaporating chamber comprising a tower having upwardly converging front and rear walls, means for moving a strip of coated fabric along adjacent to said walls, a heating element disposed at the bottom of the chamber, and means interposed between the fabric and the heating element adapted to limit the application of, and distribute evenly the heat to the fabric, said tower having a vent formed adjacent to the top thereof

whereby the products of evaporation may be drawn upwardly through the chamber.

2. In a device of the class described, an evaporating chamber comprising a tower constructed to decrease gradually in cross sectional area toward the top, and a flue formed adjacent to the said tower and communicating therewith, said flue being shaped to increase in cross-sectional area from the bottom to the top thereof.

3. In a device of the class described, an evaporating chamber comprising a tower constructed to decrease gradually in cross-sectional area toward the top, and a flue formed adjacent to said tower and communicating therewith, said flue being shaped to increase in cross-sectional area toward the tower, and being extended to position spaced substantially above the top of the tower proper.

4. In a device of the class described, an evaporating chamber comprising a tower having upwardly converging front and rear walls, flues formed integral with said walls having their sides fitted to said walls and having their respective front and rear walls vertical whereby said flues increase in cross-sectional area toward the top, means for moving a strip of coated flexible material along adjacent to said walls, and a heating element at the bottom of the chamber, said flues having a vent at the top thereof whereby products of evaporation from the material being treated may be discharged through said openings.

5. In an oven for a machine for coating cloth to form artificial leather and the like, a tower having a chamber formed with end walls converging upwardly, means for causing the coated cloth to travel along adjacent to said walls, heating units disposed in the bottom of the chamber and an apron supported between the heating units and said walls in such position that the heated currents of air from the heating units must pass around the edge of said apron to strike the surface of the cloth.

6. In an oven and machine for forming artificial leather, a chamber having upwardly converging end walls, an apron disposed in position spaced from and parallel with the inner surfaces of said walls, the edges of said apron being bent back upon themselves to form channel members spaced from said walls, heating units disposed in the bottom of said chamber, and means for causing a strip of flexible material to travel between the apron and said walls with its edges within said channels whereby the major portion of the heated air currents from said heating units may be caused to strike the central portion of one surface of the strip of pliable material.

Dated: January 6, 1922.

CLARENCE W. AVERY.