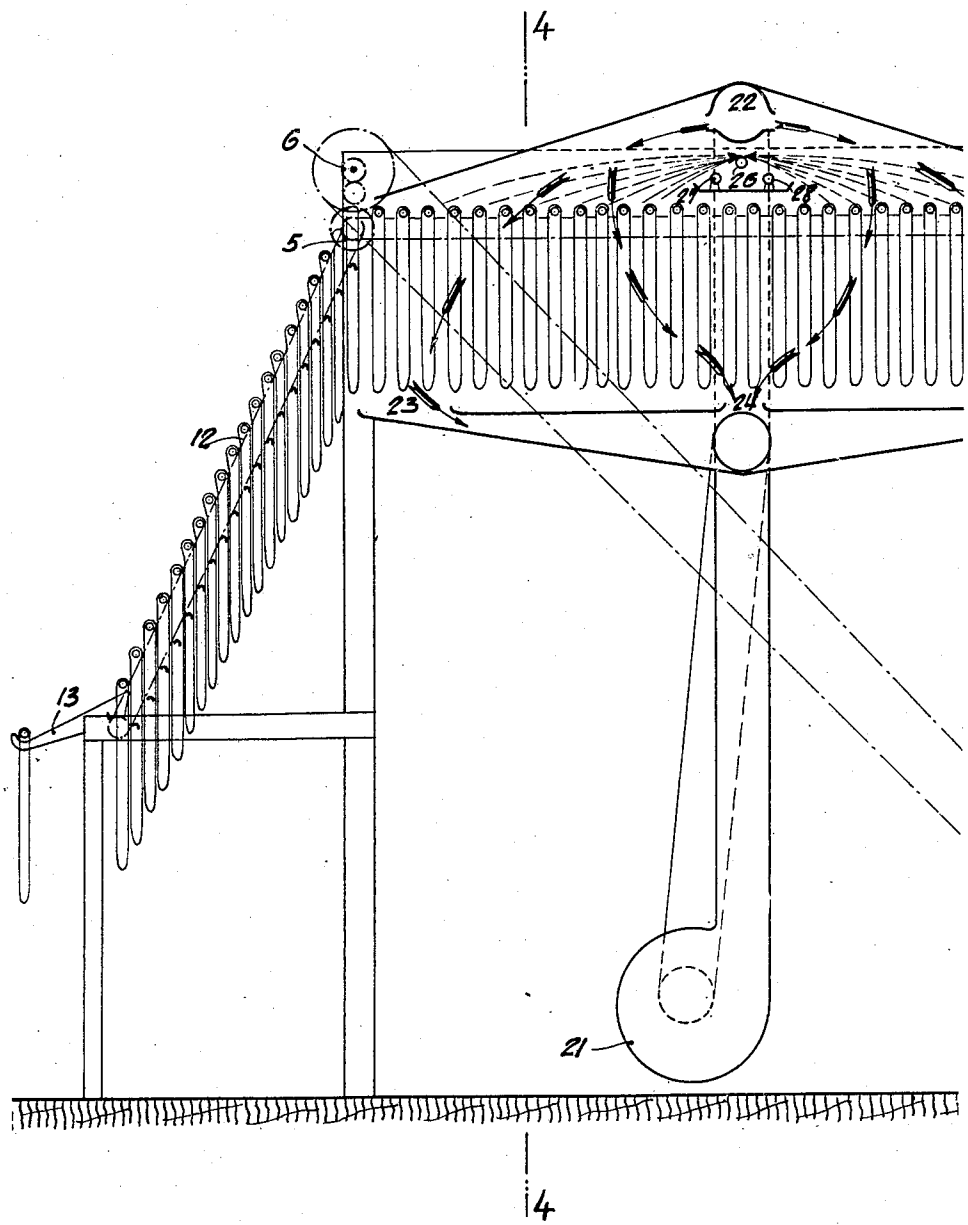
July 29, 1930. A. E. VILLEMEY 1,771,906

DRYING APPARATUS FOR SKEINS

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Fig. 1



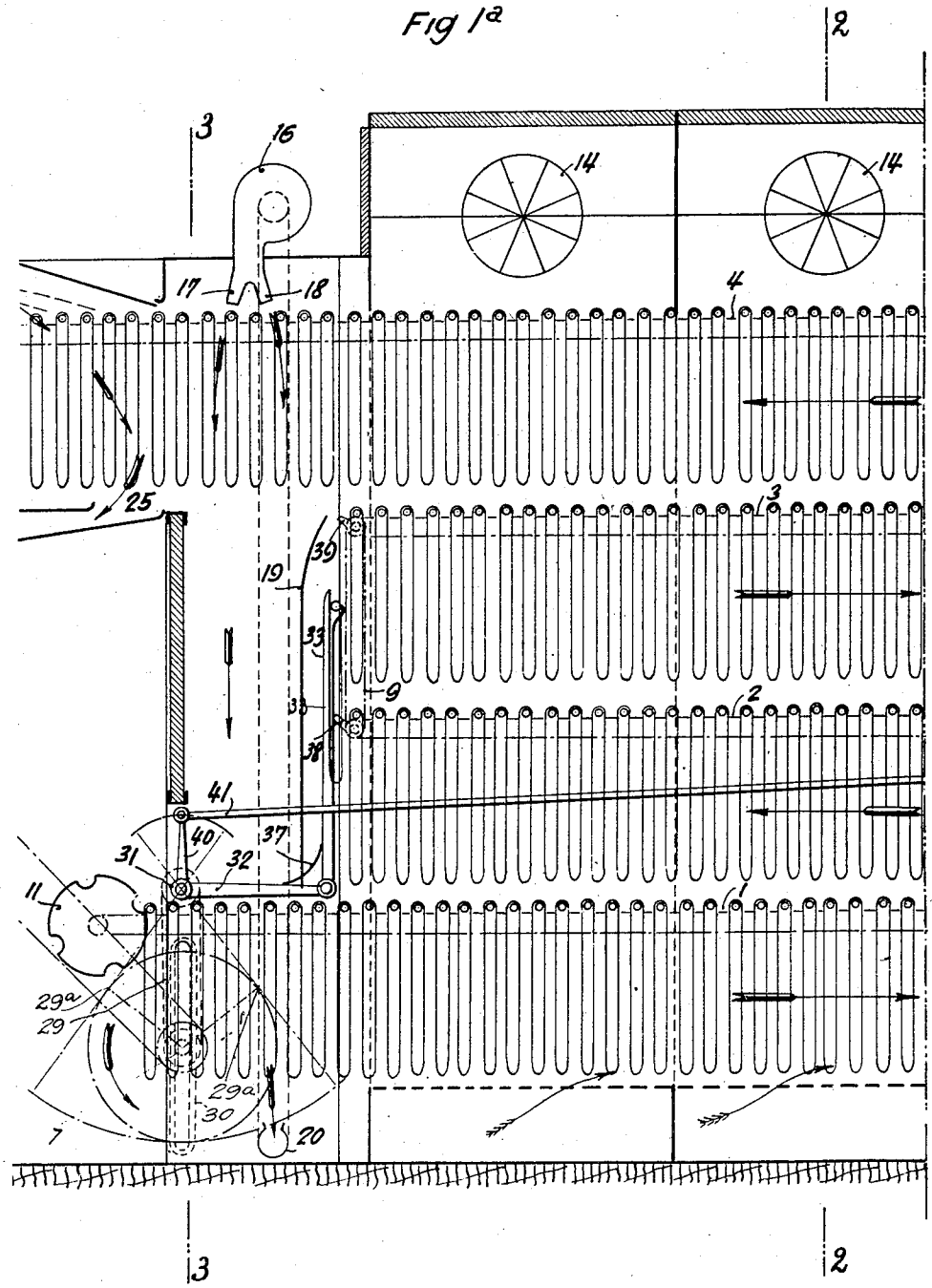
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DRYING APPARATUS FOR SKEINS

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Fig 1a



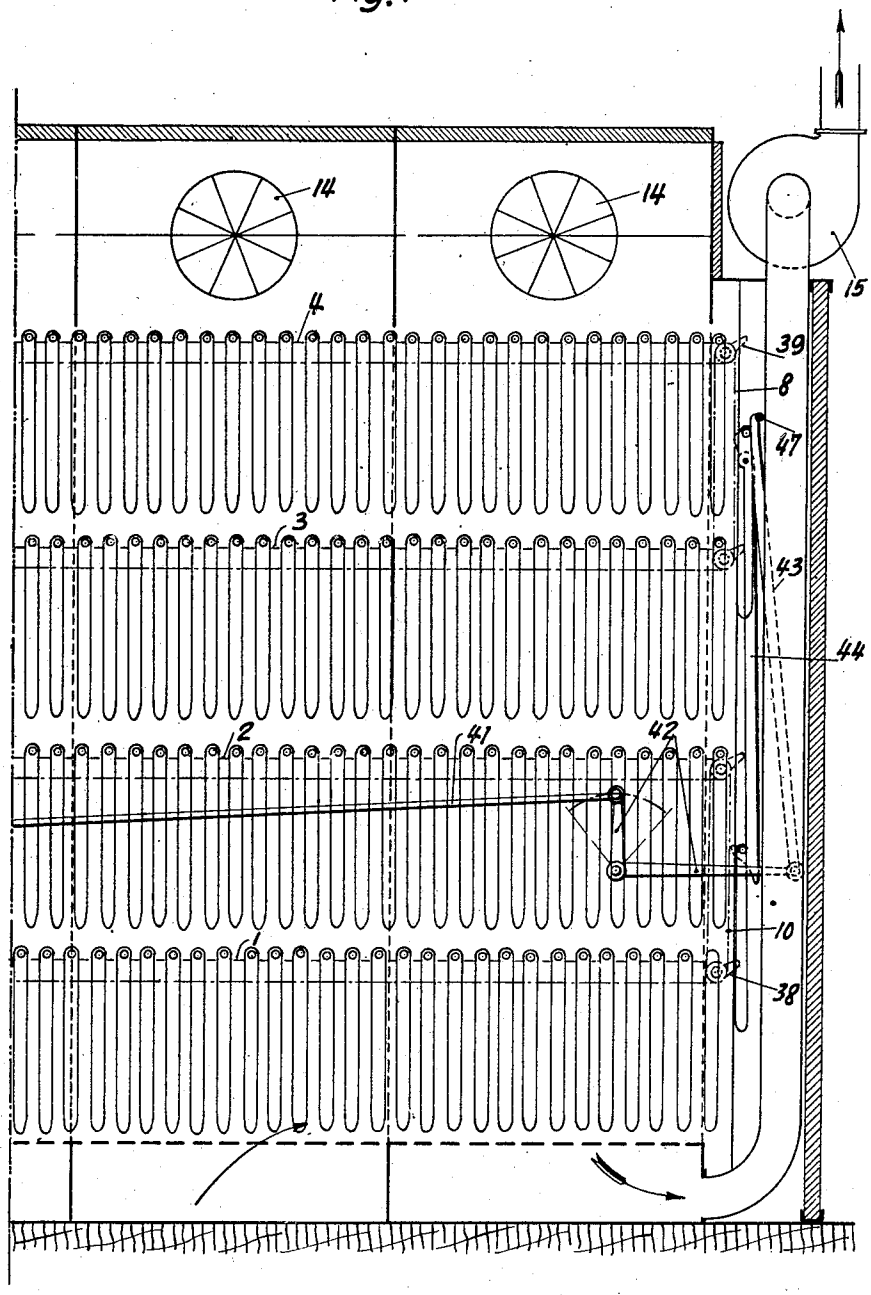
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Fig. 16



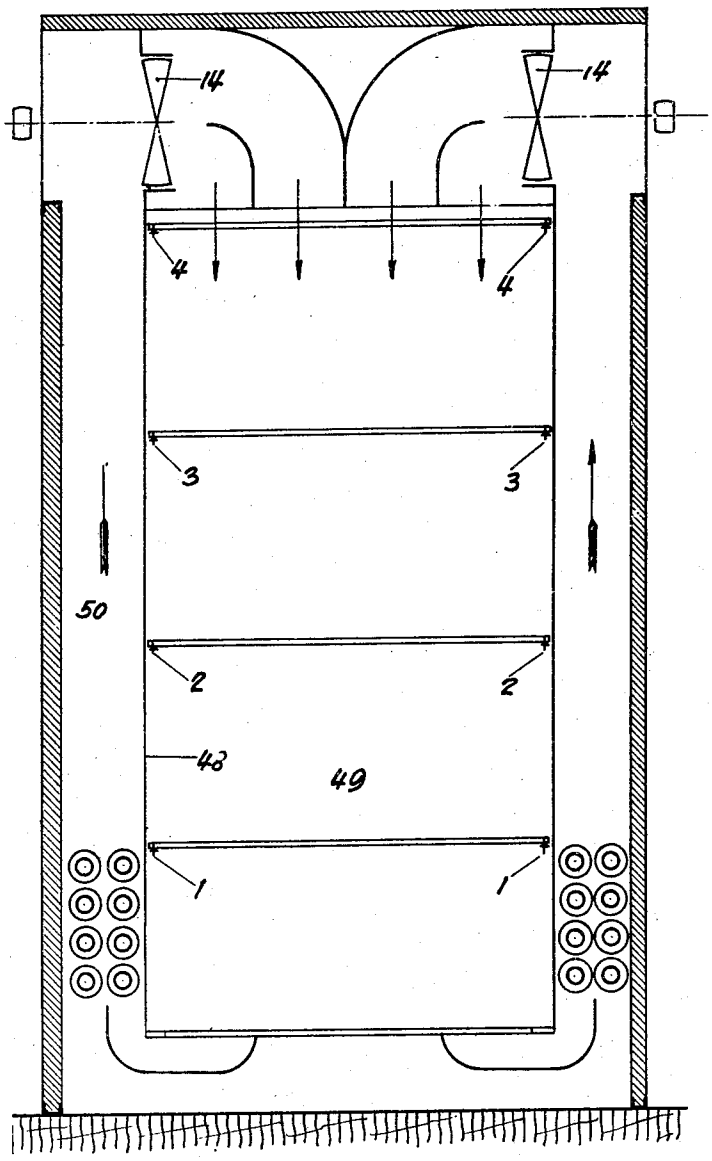
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Fig. 2



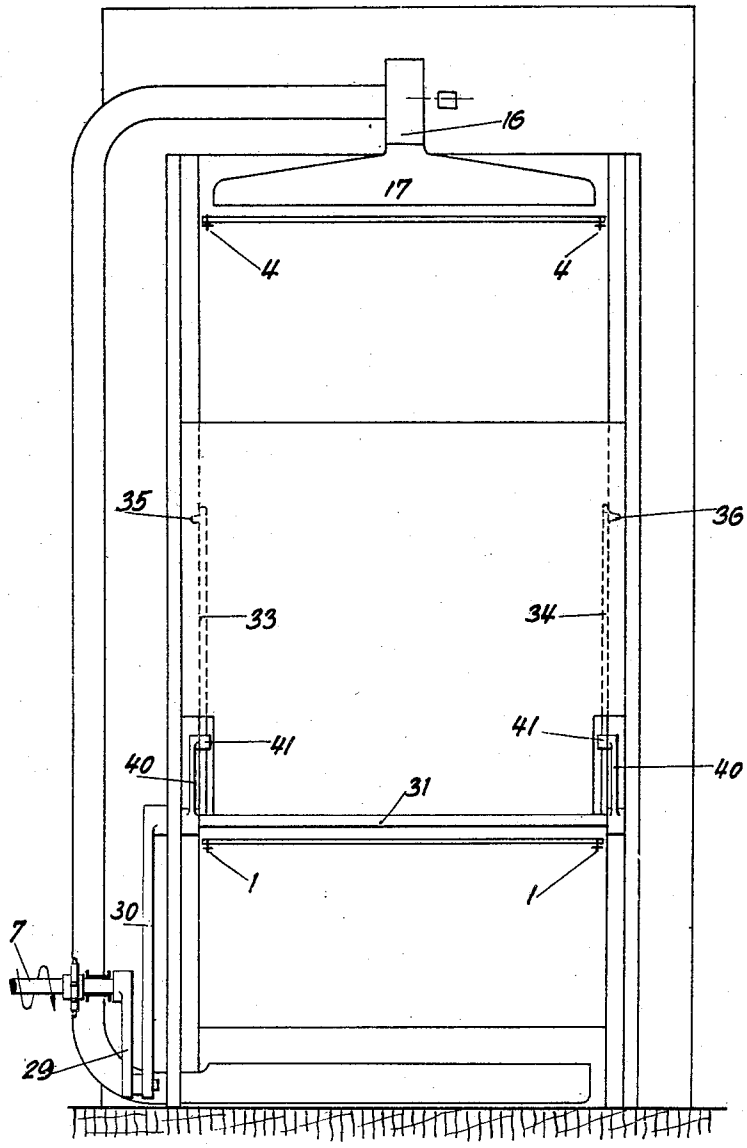
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Fig.3



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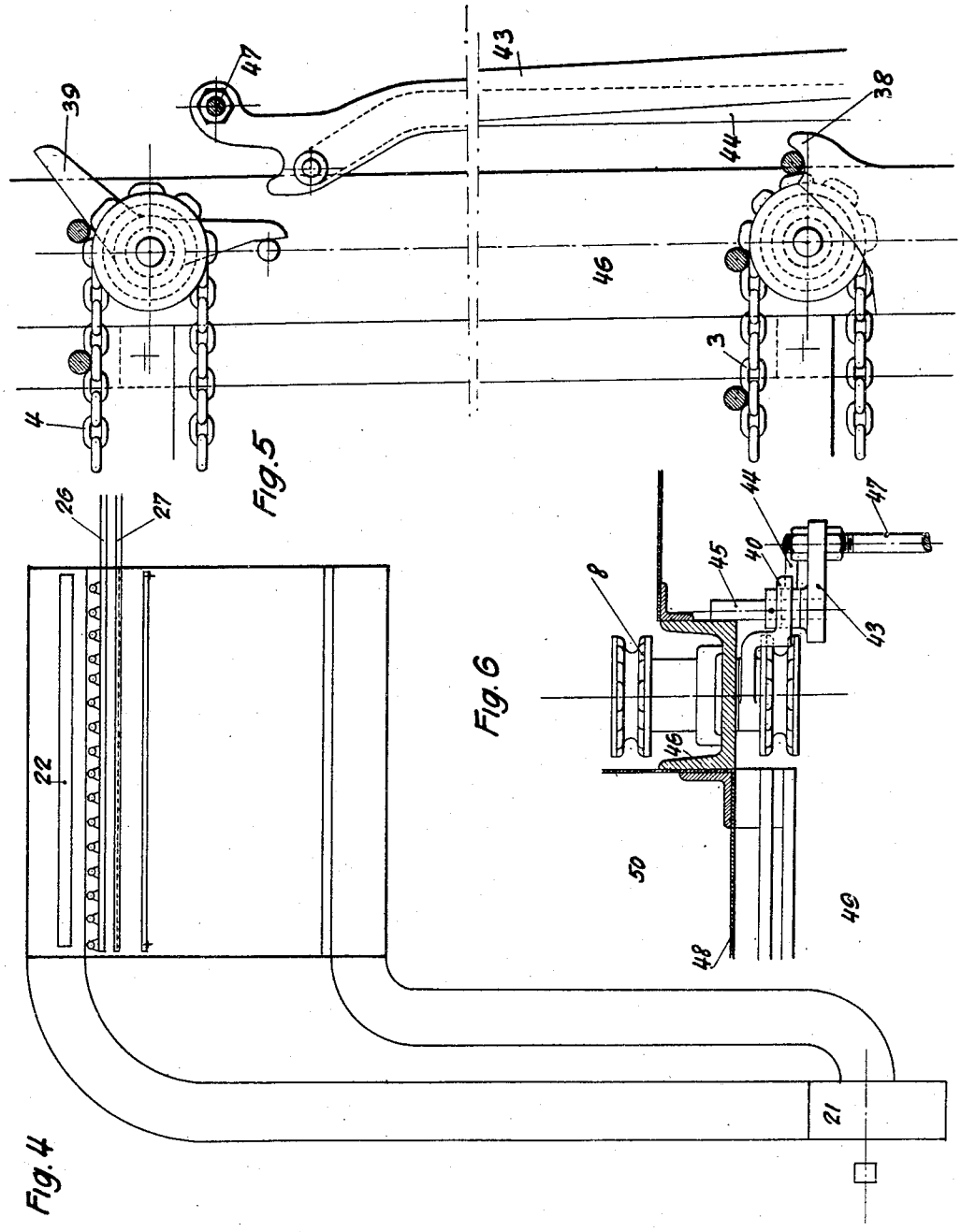


Fig. 4

Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE

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DRYING APPARATUS FOR SKEINS

Application filed January 10, 1929, Serial No. 331,661, and in France November 7, 1928.

This invention relates to an apparatus for drying skeins, of the type in which the skeins are conveyed in a continuous manner by endless chains, the new apparatus being characterized by different devices mainly designed to realize a large output in requiring the smallest possible space and without any danger or inconvenience for the skeins or for the material from which they are made. These devices serve further for the purpose to improve the thermic efficiency, this latter purpose being already partly attained by the reduction of the space required wherefrom results diminishing of the losses of heat by radiation.

The first device mentioned above is a mechanism which permits of superposing a great number of rows of skeins, this simple and reliable device serving to make pass from one story to the next higher one the sticks carrying the skeins.

The second device is designed to cool the skeins at the delivering end and it utilizes the air from cooling to heat the skeins at the admission end of the apparatus so that not only the heat which otherwise would be carried away by the skeins is recovered but the drying chamber is insulated in a very simple manner from the outer side and from the moistening device, if there is any.

The third device is the moistening device arranged above the head of the workman in attendance, and this third device can be much shorter than such devices in a commonly used machine, owing to its kind of operation. Thanks to these two circumstances this moistening device does not at all enlarge the space required by machines with little or medium output and it enlarges the same only very little in the case of machines with great output. The device is characterized by the fact that the skeins are in the same submitted not only to the action of moist air circulating in the device and so that it comes into close contact with the skeins but are further submitted to the action of jets of sprayed water and to jets of steam which strike the material directly. The symmetrical arrangement of these jets and the rotating movement of the sticks which carry the skeins ensure a regular action on the entire length of the skeins.

The fourth device permits the alteration of the intervals between the sticks in accordance with the nature of the skeins so that the best efficiency and the greatest regularity of drying are obtained. The mechanism which makes the sticks pass from one story to the other is characterized.

1. By hooks which grip the stick deposited by the chains upon stationary stops and carry this stick slightly higher than the next upper chains and in redescending deliver the stick onto hinged stops which make it slide or roll onto the higher chains;

2. By a mechanism of connecting rods and of levers located in the drying chamber and arranged so that they communicate to said hooks a common ascending and descending movement;

3. By an external rapid returning mechanism which acts upon the levers, in order that the sticks ascend more slowly than they descend. The internal arrangement of the connecting rods and of the levers ensures that the mechanism does not enlarge the space required by the chamber, and that it does not cause leakages of hot air nor losses of heat by radiation.

The cooling and recuperating device is characterized by a fan which blows from above to below onto the skeins which are coming out, by a conduit which sucks off the air from below the skeins in order to make it flow from above to below on the skeins which arrive, and by a conduit which then collects this air to return the same to the suction fan.

The moistening device is characterized:

1. By a fan which blows into a horizontal tube above the skeins and having two slots which direct the air forward and backward in almost horizontal direction;

2. By a bottom plate which has three transverse apertures one at the middle of the length of the compartment, and the two others at the ends, these three apertures being connected to the suction side of the fan so that each of the two jets of air of the upper pipe is subdivided into two jets which traverse the sheet of skeins obliquely to the front and to the rear, thus resulting in a very inti-

mate contact of the air with the skeins;

3. By a pipe with a row of atomizers mounted under the upper pipe, one-half of said atomizers ejecting to the rear and the other half to the front so that the skeins are moistened by the air on their two faces and at different angles;

4. By one or two steam tubes situated under the row of atomizers and blowing in upward direction so that the steam is admixed with the atomized water and with the air blown through the slots of the upper pipe;

5. By a rotating movement of the sticks attained by means known per se.

An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:

Figs. 1, 1[a] and 1[b] together show a vertical section through the apparatus, Figs 1[a] and 1[b] showing the right hand continuation of Fig. 1.

Figs. 2, 3 and 4 are cross sections on the lines 2—2, 3—3 and 4—4 respectively of Fig. 1,

Figs. 5 and 6 show constructional details.

The apparatus or machine illustrated in the drawings comprises four stories formed by four pairs of endless chains 1, 2, 3 and 4. Any other number of stories might however be selected. It is advisable to provide an even number of stories, although an odd number of stories might be provided, for instance when the skeins are to be admitted at one end and delivered at the other end. These endless chains 1, 2, 3 and 4 are made of round irons, and they are guided at the upper side by flat irons shown in Figs. 5 and 6. Any other type of chains with suitable guides might however be used. The chains move continually, the upper chains 4 being driven by their pinions 5 which are driven in their turn by gears mounted on either side of a shaft 6 driven from the main shaft 7. The gears are change-speed gears so that the spacing between the sticks may be altered.

The chains 4 drive the chains 3 through the intermediary of chains 8 on the outer side of the chamber, as shown in Fig. 6. The chains 3 drive the chains 2 through the intermediary of chains 9 and the chains 2 drive the chains 1 through the intermediary of chains 10. For the chains 8, 9 and 10 any other convenient mechanism may be substituted, for instance shafts, gears or chains being driven from the shaft 6 or from the main shaft 7. The chains 1, 2, 3 and 4 move in the direction indicated by the arrow lines, so that the chains 1 introduce the skeins into the apparatus and the chains 4 discharge the same. The outer pinions of the chains 1 are each rigid with a wheel 11 having notches. The ends of the sticks carrying the skeins are deposited into the notches of the wheels 11 and by the rotation of these wheels the sticks are deposited on the chains 1. The outer pinions 5 of the chains 4 are rigid with pinions driving two inclined chains 12 which have hooks onto which the sticks are deposited by the moving chains 4, these hooks of the chains 12 depositing the sticks upon guides 13 from which the attendant takes off the sticks to remove the skeins.

The heating and ventilation are ensured by helical fans 14 which force the air from above to below through the ranges of skeins, and by heating batteries located in the compartments connected at the one end to the lower portion of the chamber and at the other end to the suction of each fan. This device is known per se and any other suitable device might be substituted for the same. The evacuation of the moist air is ensured by a fan 15 which sucks the air from the bottom portion of the extreme compartment. The fresh air flows in through apertures in the first heating compartment at the opposite end. These apertures are regulated so that there is no pressure in the drying chamber but a slight vacuum so that no hot air can get lost during the admission and discharge of the skeins, while at the entrance a little quantity of air will flow in coming from the cooling and recuperating circuit.

The cooling and recuperating device comprises a fan 16 which, through its two arms 17 and 18 slightly inclined the one with regard to the other, blows the air through the one arm somewhat towards the front and through the other arm slightly towards the rear, so that the air flows against the skeins on the two faces of the same. This air which is heated by the contact with the skeins traverses the upper story and descends through the free space formed in the drying chamber by the partition 19, whereupon it traverses the skeins of the lower story flowing out through a slit tube 20 connected with the suction of the fan. The air circulated by this fan in a close circuit cools the skeins which are going to be discharged but heats those which enter.

The moistening device, comprises a fan 21, which blows against the skeins through the tube 22 and sucks in the air through the openings 23, 24, 25 so that the air must circulate through the skeins as indicated by the arrow lines. On a tube 26 the atomizers are mounted. 27 and 28 are steam tubes. The jets of atomized water are indicated in Fig. 1 by dash lines. Under the tube 22 and under the tubes 26, 27 and 28 a cup is arranged designed to collect the thick drops which might be formed, specially at the starting of the apparatus. These drops are therefore prevented from dropping on the skeins which otherwise would be moistened too much at certain points. Between the apertures 23, 24 and 25 are two cups formed by the lower wall of the compartment so that water from con-

densation is prevented from flowing into the fan.

The three cups have suitable discharge orifices. To make the sticks rotate devices of known type are used, but this turning movement is not necessary when the heating and ventilating system is used as shown, as the upper portion of the skeins which receives the largest quantity of moisture is also that which has been most dried by being directly exposed to the action of the current of hot air.

The mechanism which makes the sticks pass from one story to the other consists of a crank handle 29 (Figs. 1 and 3) on the main shaft 7, designed to conduct a link lever 30 keyed on the end of a transverse shaft 31. This shaft carries in the chamber two levers 32 on which connecting rods 33 and 34 with hooks are mounted, the heads 35 and 36 conducting the connecting rods towards the wall of the chamber. Each lever 32 carries a spring 37 pressing the connecting rods 33, 34 against the wall of the chamber. The sticks having been deposited by the chains 2 upon stationary stops 38, the connecting rods 33 and 34 at their descending movement will move away from the wall of the chamber so that their hooks encounter the stick whereupon, moving upward, they grip the stick and lift it to above the chains 3 in lifting the hinged stops 39 which drop back at once. When they descend the connecting rods 33, 34 leave the stick on these stops 39, whence it slides or rolls upon the chains 3.

The rapid return movement is effected by the crank 29 keyed on the main shaft 7 and of which the pin engages in the slot in the lever 30 keyed on the shaft 31. The arrangement of the levers 40 and 32 carried by this shaft shows that the movement of the hooked rods, which raise the sticks from one story to the other, is effected whilst the pin of the crank 29 passes through that section of its circular path situated below the tangential points 29^a—29^a whereas the descent of these hooked rods corresponds to the much shorter path situated above these tangential points. The duration of the lowering movement of the hooked rods is therefore much shorter than the duration of the raising movement which favors the work, as the descent is carried out empty, whereas during the ascent the rods carrying the sticks rise with a slow gentle movement.

The levers 32 are situated in an enlarged portion of the chamber so that they can move between the wall of the chamber and the chains 1.

The transverse axle 31 carries also two levers 40 which act upon connecting rods 41 designed to operate elbow levers 42 which carry connecting rods 43 with hooks, to which other connecting rods 44 are hinged which have each a hook and are hanging down. The connecting rods 43 are guided along the wall 46 each by its head 45 (Figs. 5 and 6) and they convey the sticks from the chains 3 to the chains 4, the connecting rods 44 conveying said sticks from the chains 1 to the chains 2.

As can be seen the connecting rods 41 extend in the plane of the chains, i. e. between the skeins and the wall. The levers 42 are of such dimensions that they can supply the desired course without striking the chain 1 nor the chain 2.

Figs. 5 and 6 show mechanisms which are merely diagrammatically illustrated on the other figures; for instance the chains 3 and 5 with their pinions and their guides formed by two flat irons, the pinions of the outer chain 8, one of the stationary stops 38, one of the hinged stops 39 adapted to pivot around the sleeve of the support of the sprocket wheels or pinions, connecting rods 43 and 44, the head 45 which guides the connecting rods 43 along the upright arms 46. These figures show further how the connecting rods 43 are stayed by a rod 47 which prevents displacement in transverse direction.

These figures show further how a drying chamber and its framework are constructed. 48 is one of the inner partitions which separate the drying chamber 49 from the heating compartment 50.

I claim:—

1. An apparatus for drying skeins, comprising in combination several sets of pairs of endless chains each set forming a story, the several stories being arranged the one above the other, sticks for carrying said skeins, notched wheels adapted to receive the ends of said sticks carrying the skeins and to convey said sticks to the chains of the lower story, hooked bars adapted to seize the sticks at the end of the path of the chains of each story and to convey and lift said sticks onto the chains of the next higher story, lever systems operating said hooked bars, a common shaft actuating said lever systems, a slotted lever keyed on said shaft, a crank keyed on the main shaft, and a crank pin of said crank engaging in the slot of said lever.

2. An apparatus as specified in claim 1, comprising in combination with the sets of pairs of chains conveying the sticks which carry the skeins, a cooling and recuperating device having two orifices inclined in opposite directions adapted to blow air first onto the entering skeins and then onto the skeins which are being discharged.

3. An apparatus as specified in claim 1, comprising in combination with the sets of pairs of chains conveying the sticks which carry the skeins, and with a cooling and recuperating device adapted to blow air onto the skeins which enter and which are discharged, a moistening device behind said cooling device comprising a fan producing an air current circulating in a closed circuit, a

tube having two slots above the skeins to supply said air for the cooling device, three suction apertures under the skeins for sucking in said air and for returning it to said fan, a tube having atomizing nozzles under said tube with two slots adapted to distribute jets of sprayed water in both directions in a horizontal plane, and a steam ejecting tube under said atomizer tube ejecting steam in upward direction.

In testimony whereof I affix my signature.

ALBERT EMILE VILLEMEY.