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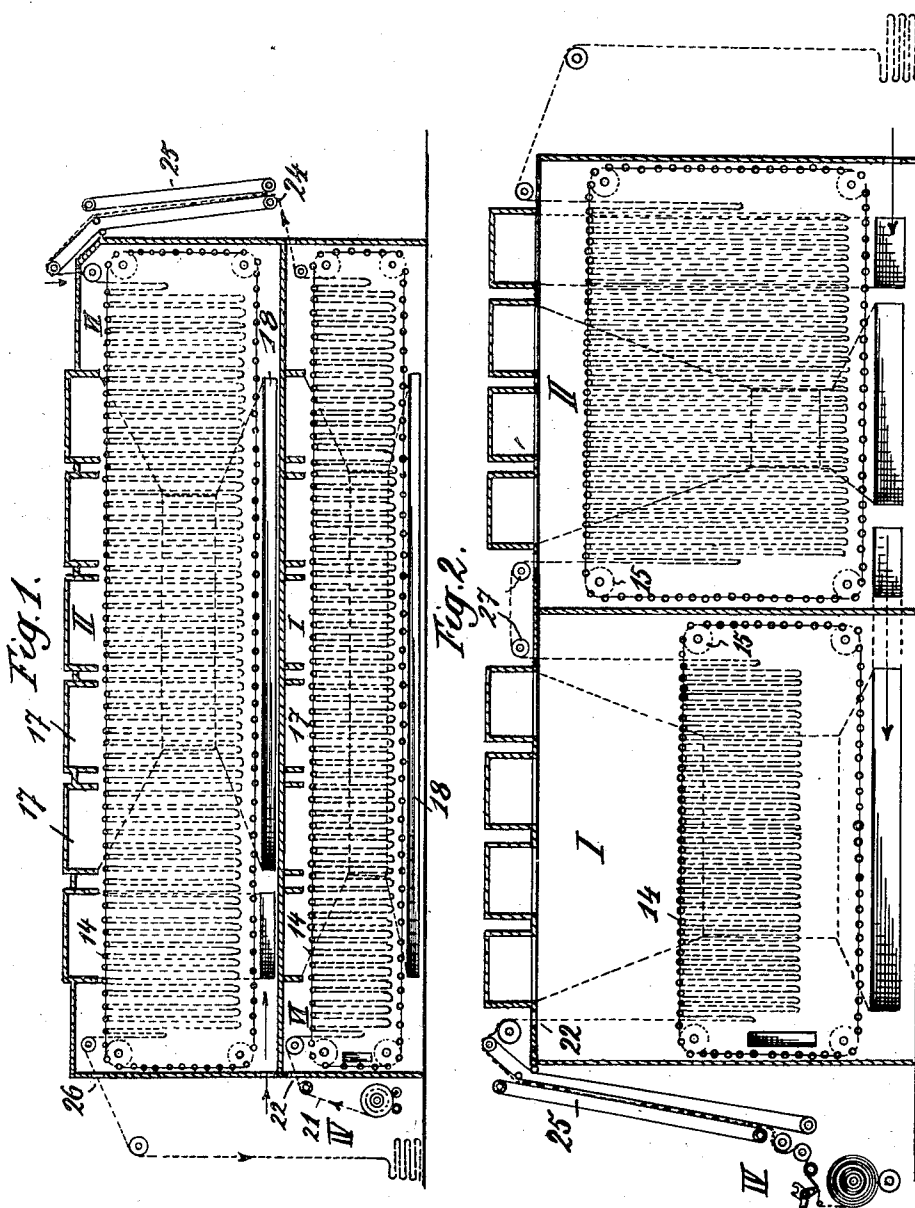
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1,987,250

SUSPENSION DRYING APPARATUS

Filed March 14, 1933

7 Sheets-Sheet 1



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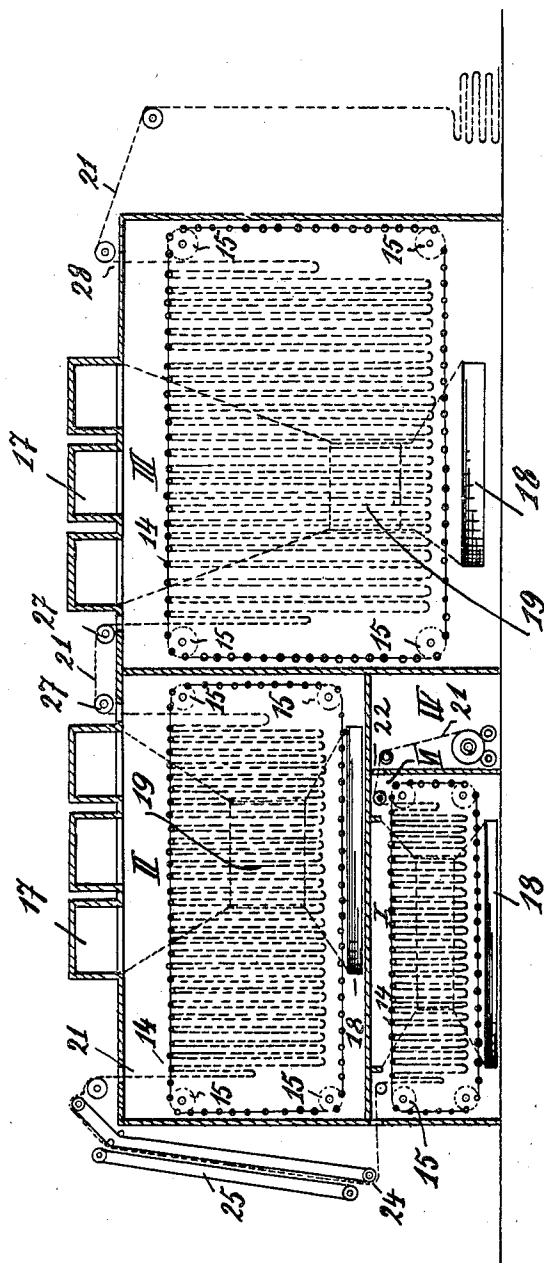
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Fig. 3.



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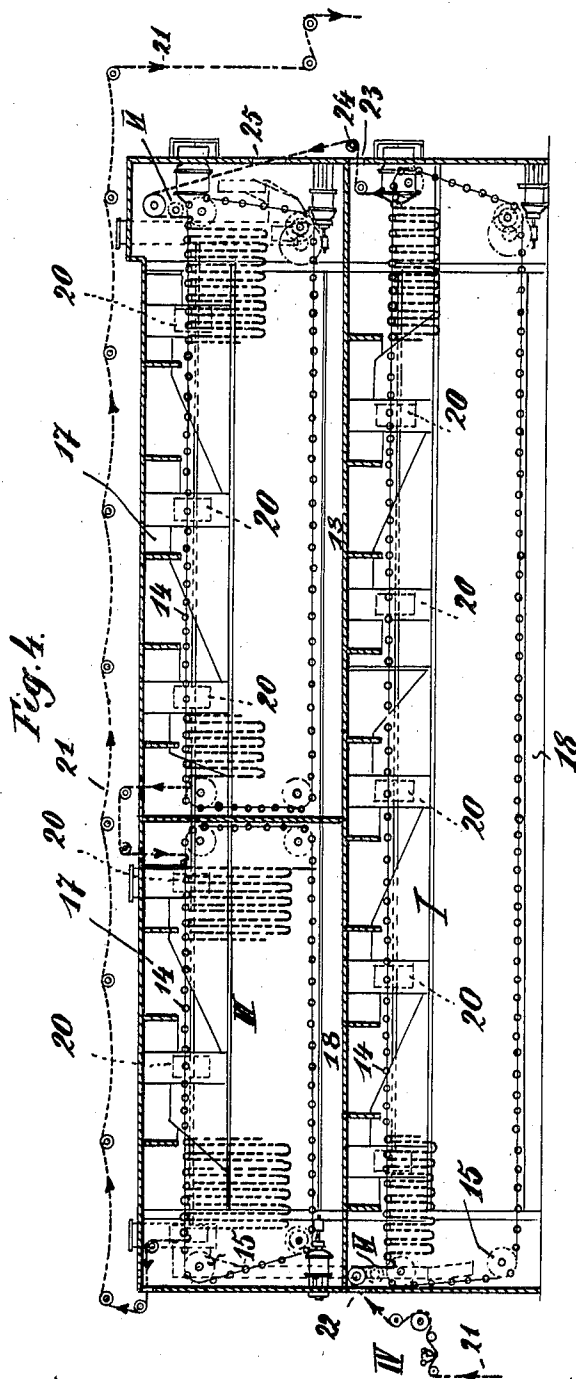
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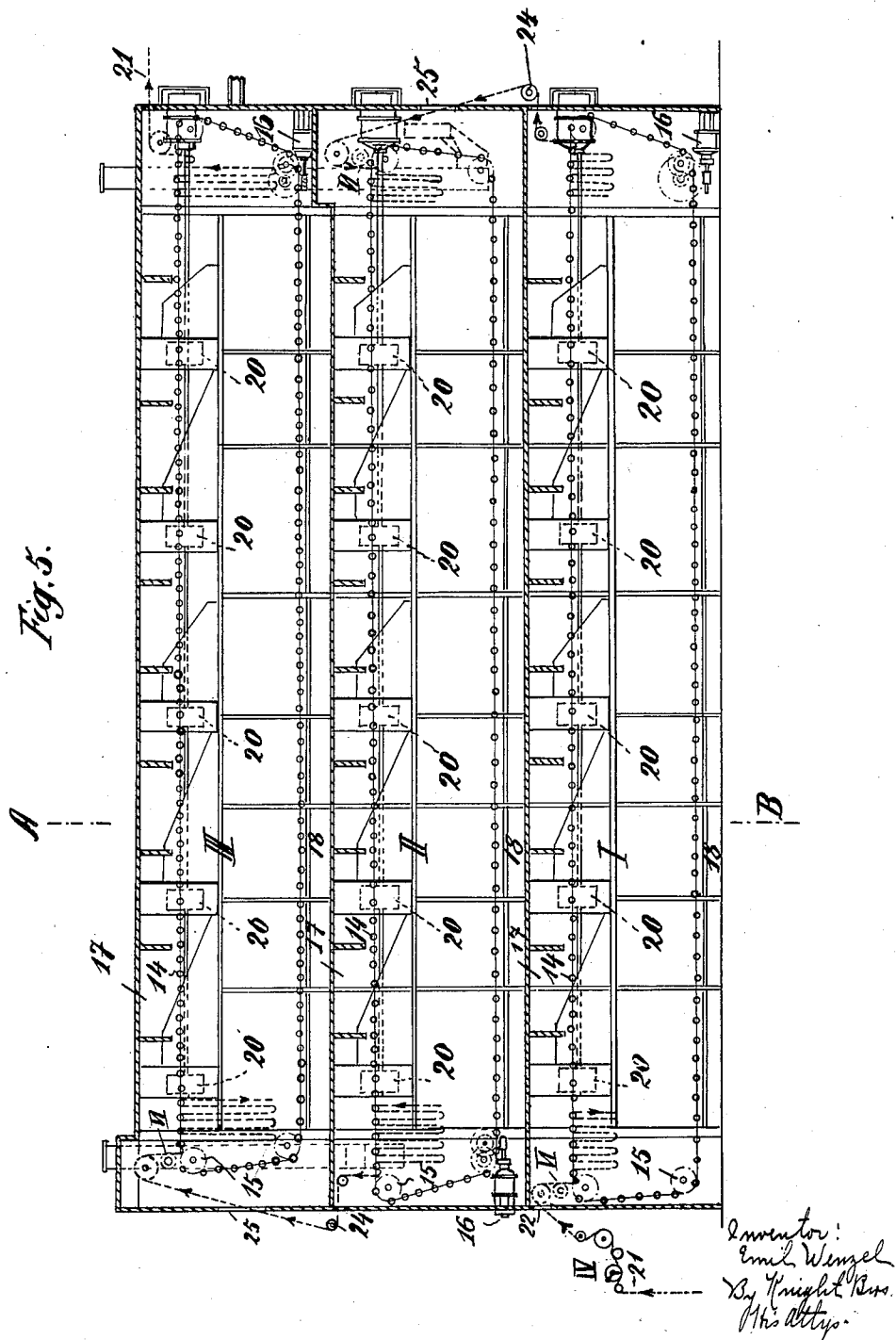
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SUSPENSION DRYING APPARATUS

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Jan. 8, 1935.

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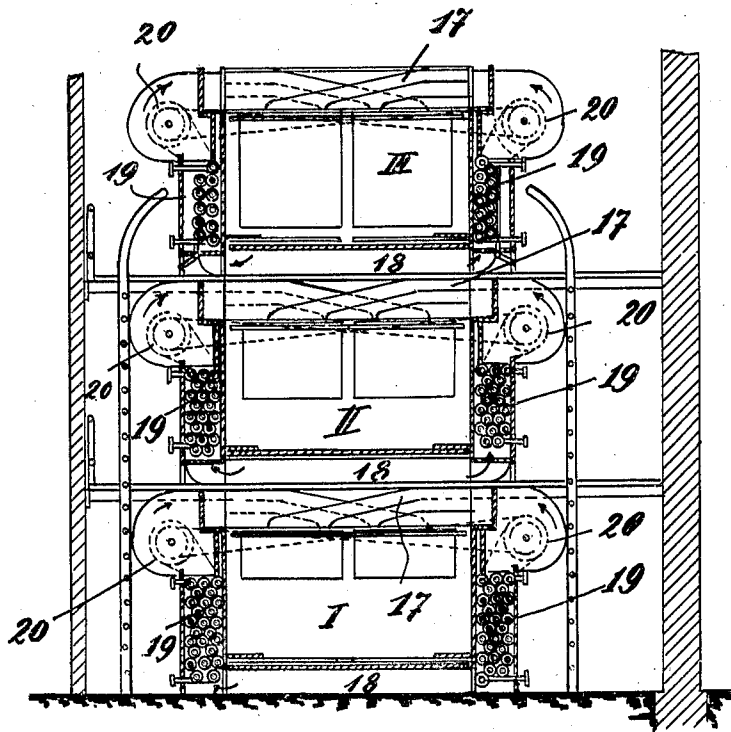
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SUSPENSION DRYING APPARATUS

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Fig. 6.



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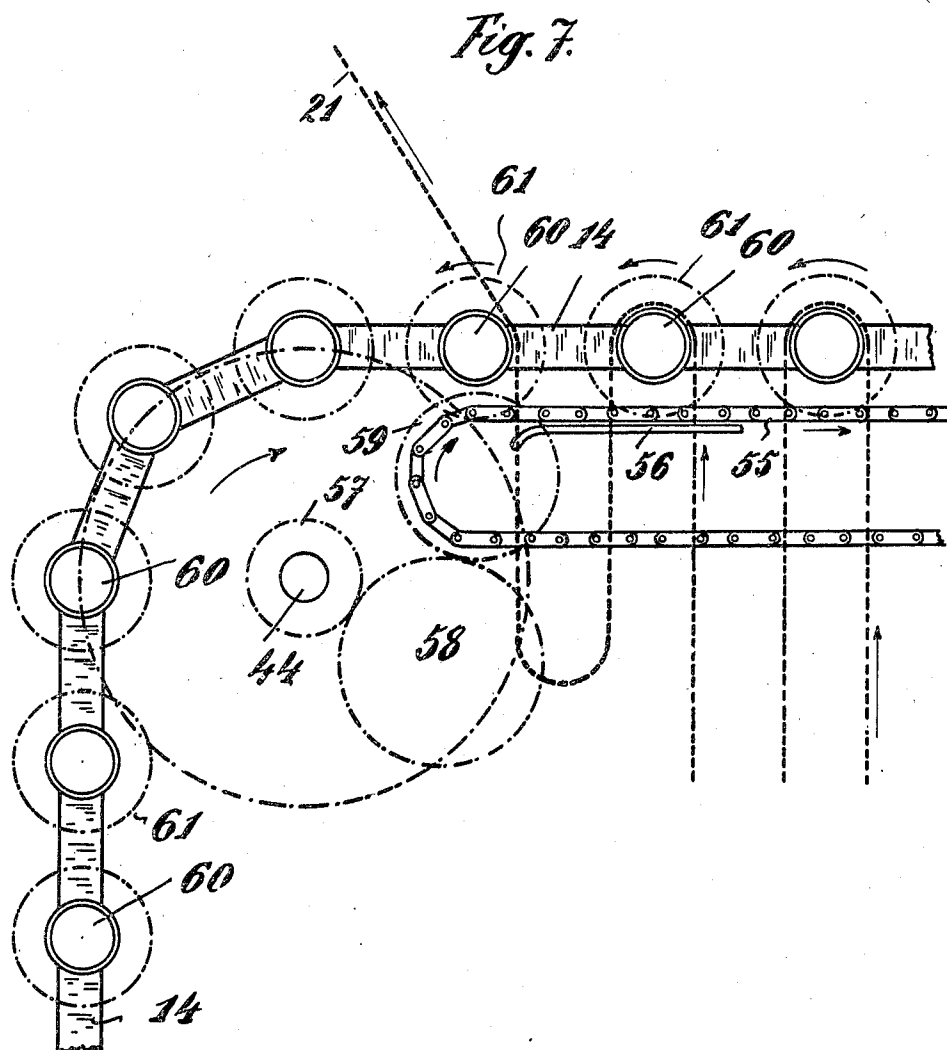
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SUSPENSION DRYING APPARATUS

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7 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

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SUSPENSION DRYING APPARATUS

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Application March 14, 1933, Serial No. 660,760
In Germany July 7, 1932

3 Claims. (Cl. 34—12)

The invention relates to suspension drying apparatus for woven material which comprise more than one drying stage, and which are intended primarily for the drying of light and sensitive materials such as crepe-like artificial silk and the like.

I have found that the shorter the loops of the apron in the apparatus are selected, the finer the goods turn out and that the lower the drying temperature employed, the better the quality of the goods and its saving. These requirements, however, viz. short loops in the drying apparatus and low drying temperatures are unsatisfactory in economical respects. My invention therefore has for its object to apply the results of practical experience regarding these requirements and bring them into accord with one another, that not only are the goods of the best possible quality and are saved to the greatest possible extent during the drying operation, but also the operation is an economically satisfactory one. I attain these advantages in the first place by employing a drying room which is subdivided by partitions so as to form several independent drying chambers with a rod chain running in each of these chambers, in all cases at a lower speed than the chain of the preceding chamber, so that the length of the loops increases from chamber to chamber. I further provide means for obtaining a decrease of temperature in the subsequent drying chambers. By these two features I attain the best possible conditions for satisfactory and economical drying of the goods.

My invention further provides a heating of each individual drying chamber independently of that of the other chambers, the heating air of each chamber independently circulating therein, while independent measuring instruments are provided in each chamber which regulate the temperature and moisture therein. In this manner these conditions can be controlled and surveyed separately in each drying chamber.

Furthermore, the heating air of each subsequent drying chamber may be fed to each preceding chamber at an elevated temperature and drawn off from the first drying chamber together with the moisture carried with it. It is to be understood, however, that it is not absolutely necessary to lead the heating air from one chamber to the next preceding one, but each chamber can of course be heated and ventilated independently of the remaining chambers, the circulation of the air in both cases securing the same perfect and economical drying effect.

Furthermore, in order to obtain a satisfactory

guidance of the apron, my invention provides positively driven guide rollers, spreading devices and the like between each two drying chambers. In addition, the individual supporting rollers or rods of the rod chains may be set in rotation by separately driven additional chains in such a manner that every loop of the apron during its passage through each drying stage is turned once on half its length.

For the formation of the loops my invention further provides in each drying chamber a revolving feed roller the drive of which is alternately accelerated and retarded, in order to bring the feed motion into accord with the motion of the rod chain.

Finally, I have found it particularly suitable in practice to dispose either two drying chambers and thus two drying stages above one another, or, in addition, to subdivide the one of these two drying chambers so that three drying chambers and thus three drying stages are obtained, which are lodged only on two stories. These three drying chambers may further be disposed on three stories above one another, each story forming a drying stage. These various arrangements depend upon the material to be treated, the space at disposal and other special circumstances.

In order that my invention may be clearly understood and readily carried into effect, several embodiments of the same are illustrated by way of example in the accompanying drawings in which

Figure 1 shows a two-stage drying apparatus, the chambers of which are arranged in superposition,

Figure 2 shows a two-stage drying apparatus with the drying chambers arranged side by side.

Figure 3 is a three-stage drying apparatus comprising two superposed chambers and a side chamber,

Figure 4 is a three-stage drying apparatus comprising a lower and two upper drying chambers,

Figure 5 is a three-stage drying apparatus comprising three superposed chambers,

Figure 6 is a vertical section on line A—B of Figure 5,

Figure 7 is an elevation showing details of the drive of the rod chains, on enlarged scale,

Figure 8 is an elevation of the loop forming means, likewise on enlarged scale, and

Figure 9 is a section on line C—D of Figure 8.

Referring to the drawings, I, II, III denote the drying chambers of the apparatus which are disposed in series. In each of the drying chambers I, II, III runs an endless rod chain 14 on guide

rollers 15, each rod chain being driven by an electric motor 16, see Figures 4 and 5, so that the speed of each chain can be regulated independently.

5 Drying air is supplied to each of the drying chambers I, II, III through hot air channels 17 and is drawn off by suction channels 18. The drawn-off air passes through heating devices 19 and is introduced again through further channels 17. The circulation of the air is effected by
10 blowers 20, see Figures 4, 5 and 6. In addition, the individual chambers are interconnected by further suitable passages in such a manner that the drying air successively passes through the
15 three drying chambers. The air first enters the chamber III at a comparatively low temperature, passes then to chamber II at elevated temperature, and, finally, passes through chamber I at the highest admissible temperature. In practice,
20 the initial temperature at the exit of the apron advantageously will be not higher than 35-40° centigrade, while the final temperature, that means the temperature prevailing at the place of entrance of the wet apron in the drying apparatus, may amount to 90° C. and more.

25 The oncoming apron 21 passes through a suitable draining device IV, Figure 1, and enters chamber I at 22, where it is fed through the intermediary of a loop-forming device VI, hereinafter described in detail, to the rod chain 14. The speed of the rod chain is timed relatively to that of the loop-forming device in such a manner that comparatively short loops are formed.
35 After having passed through chamber I and having been exposed therein to the effect of the drying air, the apron leaves chamber I at 23 and is led on guide rollers 24 and an inclined guide web 25, which may be fitted with any suitable known spreading device, to the drying chamber
40 II. The apron leaves this chamber at 26 and then is disposed outside the apparatus. If three drying chambers are provided as illustrated in Figures 3, 4, 5, and 6, the apron 21 still enters the drying chamber III on guide rollers 27 and
45 leaves it at 28, where it is collected. The driving devices for the individual chains 14 are timed relatively to one another in such a manner that the length of the loops increases from chamber to chamber, as will be seen from the drawings.

50 The arrangement and number of the drying chambers depends on the one hand upon the nature of the material to be dried and on the other hand upon the space at disposal. In the apparatus illustrated in Figures 1 and 2 two drying chambers I and II are provided, which in Figure 1 are disposed one above the other, while in Figure 2 these two chambers are situated side
55 by side. Figure 3 shows a modification in which the drying chambers I and II again are situated one above the other and chamber III is located laterally. In the embodiment shown in Figure 4, the drying chambers are disposed on two stories above one another, the upper chamber being subdivided so that in the lower story is situated the chamber I and in the upper story chambers II
60 and III. Finally, Figures 5 and 6 show the three drying chambers in superposition.

65 It is to be understood that the structures illustrated are only examples for the practical embodiment of my improved apparatus, and are not to be regarded in a limiting sense, since the local conditions and the nature of the goods to be dried may require various other constructions all coming within the scope of my invention.

70 As will be seen in Figures 8 and 9, the loop-

forming device VI comprises a feed roller 41 which is mounted in arms 42 and travels on a circular orbit about a sleeve 43 which forms a bearing for a shaft 51. This circular motion is derived from the shaft 44 of the rod chain drive
5 which, through a pair of spur wheels 45, drives a shaft 46. The latter has mounted on it an elliptic spur wheel 47 which is in mesh with an elliptic companion wheel 48 rigid to one of the arms 42 and revolving on the sleeve 43. The feed roller 41 carries a pinion 49 in mesh with
10 a wheel 50 rigid to a shaft 51. The latter further carries on the outer side of the machine frame a sprocket wheel 53 which is actuated by a driving chain (not shown).

15 During the circular rotary satellite motion of the feed roller 41, the pinion 49 rolls on the wheel 50 and imparts to the feed roller a rotary motion which can be adjusted, as the wheel 50 can be driven by the sprocket wheel 53 in one direction or the other. By the feed roller 41
20 executing alternatively a retarded and accelerated rotary motion the formation of the loops takes place in the correct relation to the travelling motion of the rod chain 14. A flap 54 serves
25 to obturate the drying chamber as tightly as possible.

Underneath every rod chain 14 is arranged another chain 55 (not shown in Figures 1 to 6), as shown in Figure 7. This chain runs along guides
30 56 of U-shaped section and is driven from shaft 44 of the rod chain drive through the intermediary of a gearing 57, 58, 59. The gear wheels 57, 58, 59 are exchangeable so that the speed of the chain can be varied. Each rod 60 of the chain
35 has rigid on it a sprocket wheel 61 which is in mesh with the chain 55. By suitably adjusting the ratio of transmission a rotary motion thus can be imparted to the chain rods or rollers 60 and this motion can be adjusted in such a manner that
40 during the passage of the apron through the drying chamber each loop is turned once on half its length.

45 It will be seen from the foregoing explanations in what manner the ideas of my invention can be realized, in order to obtain both economical operation and a satisfactory product, even if a difficultly treatable material such as artificial crepe silk or the like is dried. The invention is not confined, however, to the embodiment illustrated
50 and described, but various modifications can be made as to the construction and arrangement of the individual drying chambers, without leaving the scope of my invention.

55 What I claim is:—

1. In a drying apparatus of the class described, a plurality of closed drying chambers, an endless rod chain in each drying chamber for serially conveying material in loops through said chambers, and means for driving said rod chains in
60 each succeeding chamber at a speed lower than that in the preceding chamber whereby loops of material of increasing length are formed in the successive drying chambers.

2. In a drying apparatus of the class described, 65 a plurality of closed drying chambers, an endless rod chain in said drying chamber for serially conveying material in loops through said chambers, guiding rollers and spreading devices between successive drying chambers, means for driving said rollers and said spreading devices, and means for driving said rod chains in each
70 succeeding chamber at a speed lower than that in the preceding chamber whereby loops of ma-

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terial of increasing length are formed in the successive drying chambers.

5 3. In a drying apparatus of the class described, a plurality of closed drying chambers, an endless rod chain in each drying chamber for serially conveying material in loops through said chambers, and means for driving said rod chains in each

succeeding chamber at a speed lower than that in the preceding chamber whereby loops of material of increasing length are formed in the successive drying chambers, said successive drying chambers being maintained at successively lower temperatures.

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