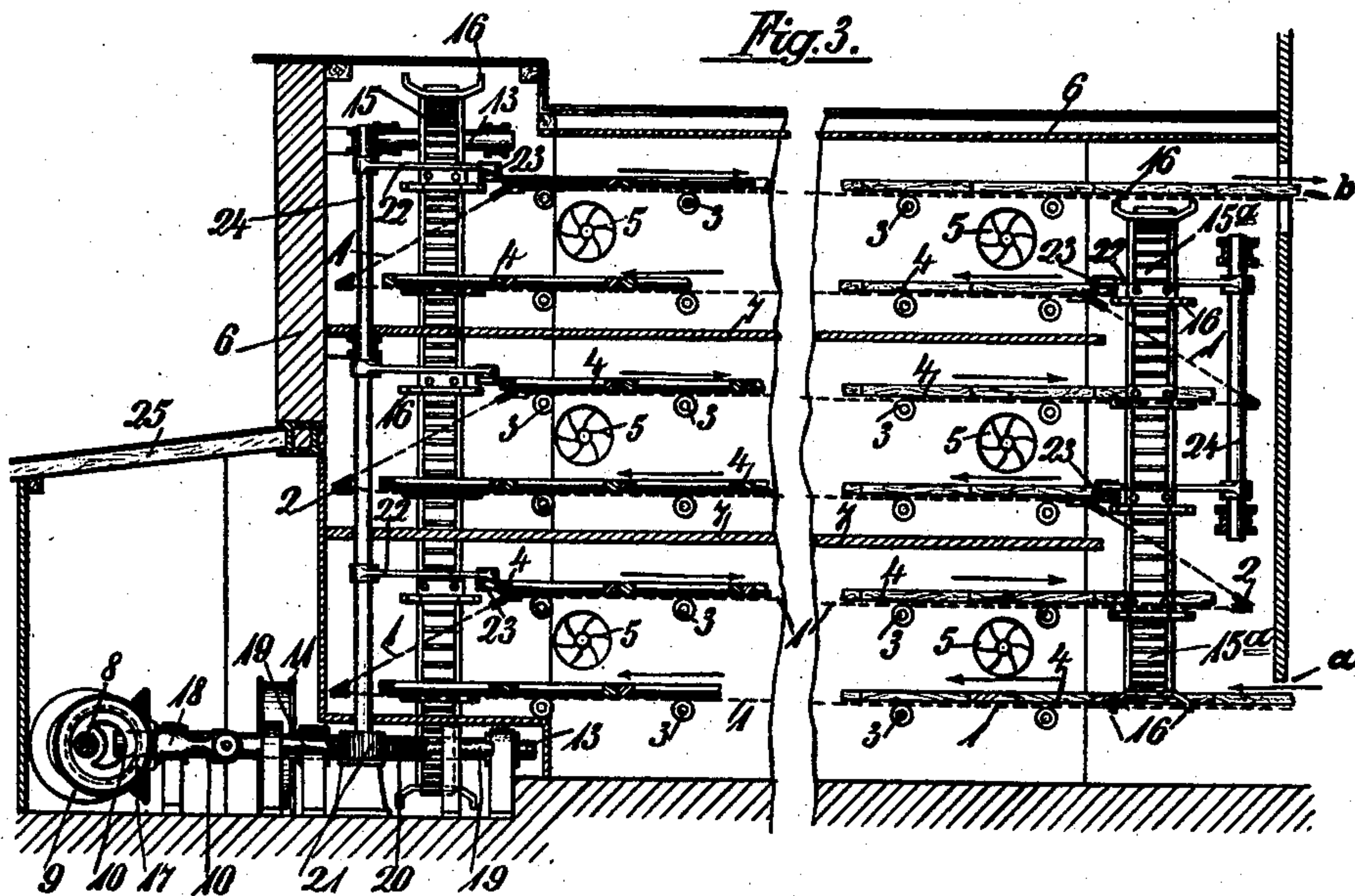
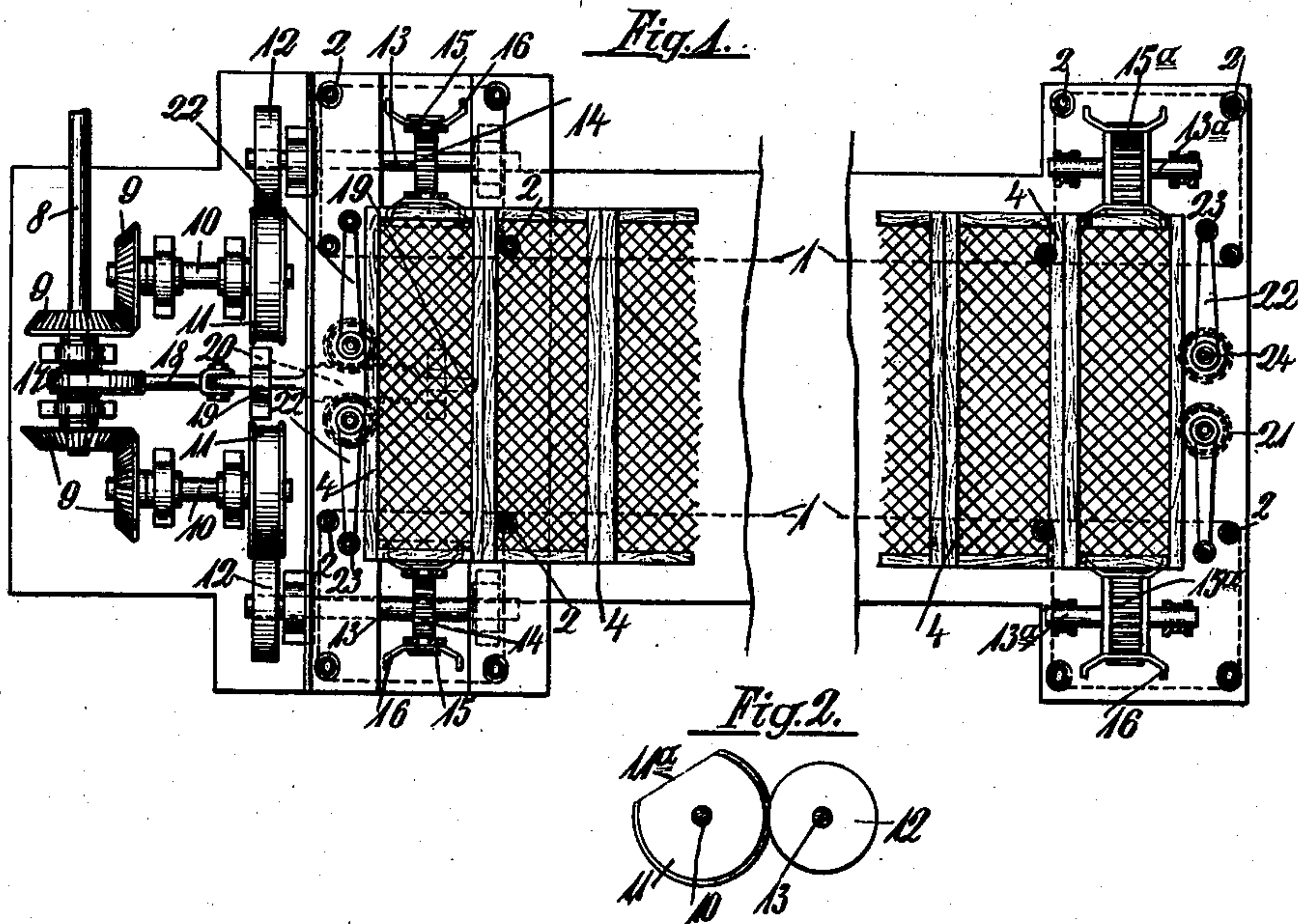


No. 847,786.

PATENTED MAR. 19, 1907.

O. KOEPFF.  
DRYING APPARATUS.  
APPLICATION FILED APR. 10, 1905.

2 SHEETS—SHEET 1.



Witnesses:  
E. O. Niedebrand  
M. F. Anderson.

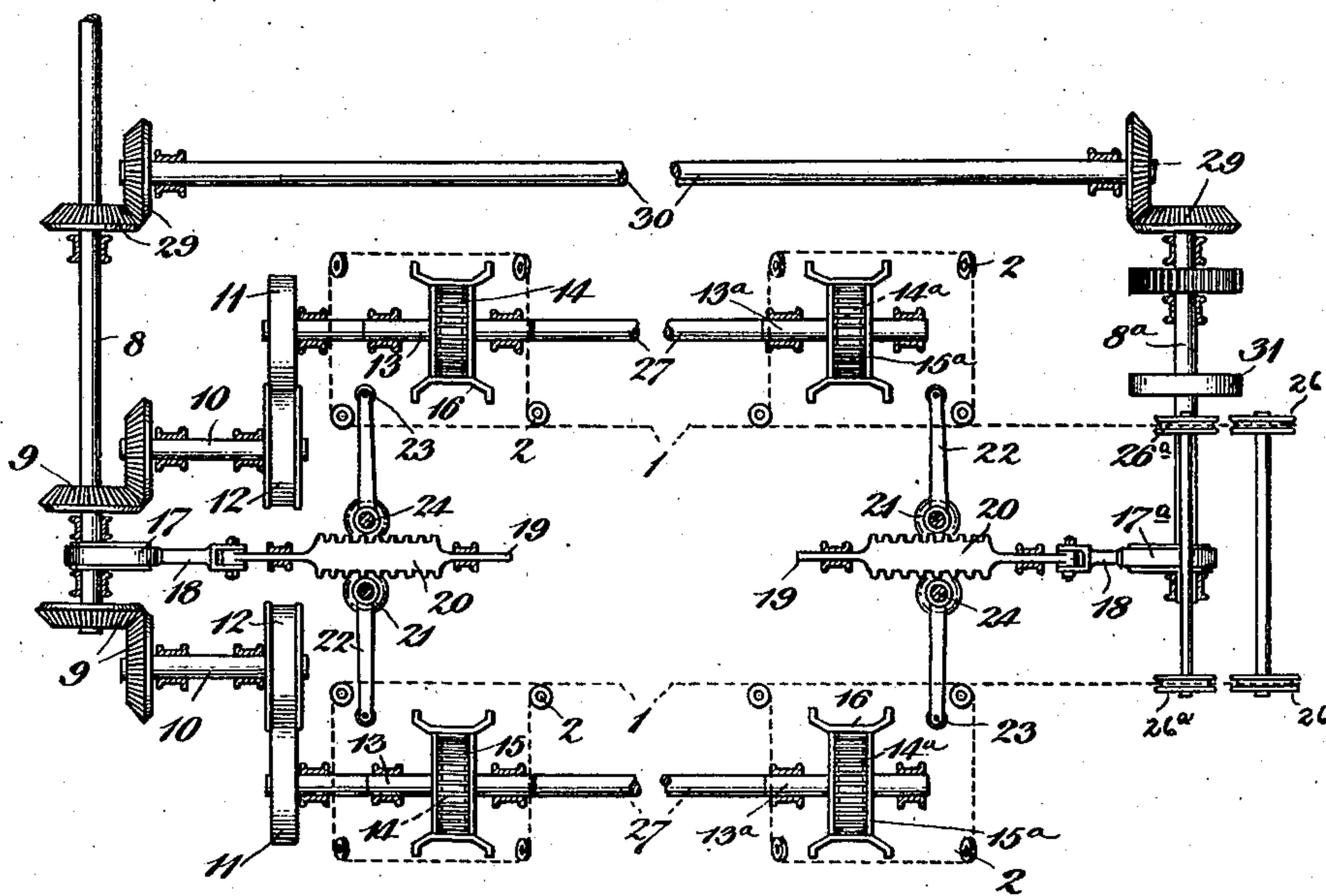
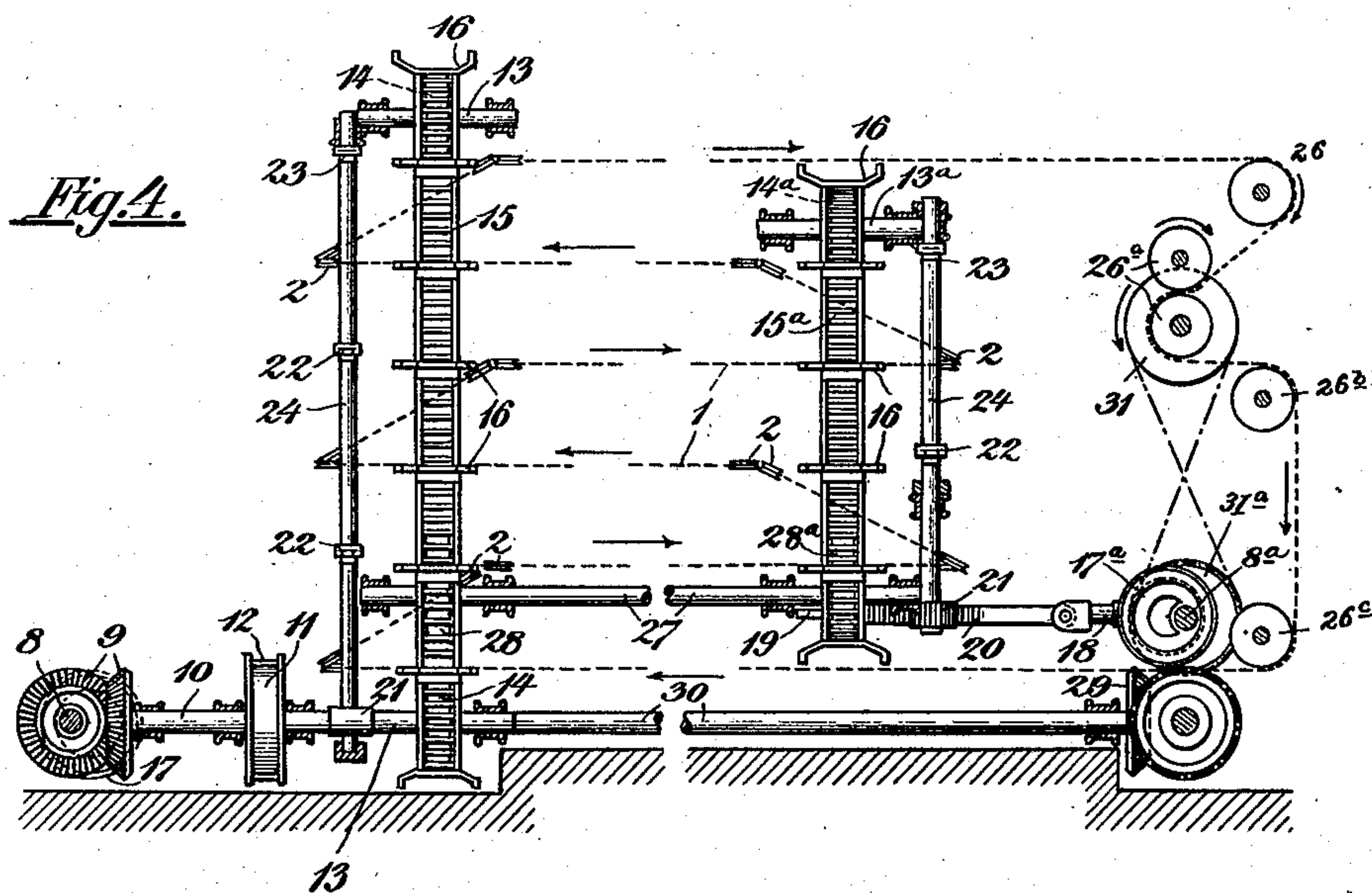
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2 SHEETS—SHEET 2.



*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

OTTO KOEPFF, OF GÖPPINGEN, GERMANY.

## DRYING APPARATUS.

No. 847,786.

Specification of Letters Patent.

Patented March 19, 1907.

Application filed April 10, 1906. Serial No. 254,878.

*To all whom it may concern:*

Be it known that I, OTTO KOEPFF, a citizen of the Kingdom of Württemberg, German Empire, residing at Göppingen, Württemberg, Germany, have invented certain new and useful Improvements in Drying Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to drying apparatus.

The object of the invention is in a ready, rapid, and even manner and without danger of injuring the material to dry gelatin, glue, paste goods, brewers' grain, bricks, woods, metal articles, and the like.

With the above and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts of a drying apparatus, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like characters of reference indicate corresponding parts, Figure 1 is a view in plan, partly in section, of an apparatus constructed in accordance with the present invention. Fig. 2 is a detail view. Fig. 3 is a view in vertical longitudinal section through the apparatus exhibited in Fig. 1. Fig. 4 is a view similar to Fig. 3, exhibiting certain features omitted in the latter figure and omitting others shown therein. Fig. 5 is a plan view, partly in section, exhibiting more particularly the mechanism for actuating the means for transferring the material to the different leads of the carriers.

The drying-chamber 6 is divided into a number of compartments by spaced horizontally-disposed partitions 7, that terminate short of one end of the chamber, so that the hurdles 4, lying in tiers or stages one above the other and carried by constantly-moving endless bands or carriers 1, may be raised from one stage to the next higher. The carriers 1 rest on carrying-rollers 3; and when transferred from one stage to the next higher are laterally guided by means of separate guide-rollers 2, with the object of enabling an unimpeded lifting of the hurdles from one stage to the other.

As will be seen from the drawings, the hurdles pass at *a* onto the leads of the carriers

lying in the lowermost part of the chamber 6 and pass at the uppermost tier laterally out again of the chamber at *b*. The hurdles must always be removed from the carriers on the zigzag motion thereof and at the end of the rectilinear movement, then raised to the level of the next stage, and again displaced laterally on the carriers.

The following apparatus serves for this: At the ends of the drying-room there are arranged hurdle-elevators consisting of endless guide-chains 15 and 15<sup>a</sup>, which carry radially-projecting forked material-supporting arms 16, that are arranged at regular distances apart equal to the height of the stages. Those guide-chains are moved periodically in such way that at the instant the supporting-arms 16 successively reach the level of the next stage a stoppage in the movement of the chains takes place, which is utilized for displacing laterally all of the hurdles raised by the elevators. The periodic movement of the elevators is secured from the main drive-shaft 8 by means of pairs of bevel-wheels 9, shafts 10, and pairs of friction-disks 11 and 12, the former of which are mutilated at one part 11<sup>a</sup> of their periphery in such manner that on the passage of these places on the disks 12 the latter remain stationary until the recessed part has been passed, as shown in Fig. 2. Toothed wheels 14 14<sup>a</sup> are mounted on the spindles 13 and 13<sup>a</sup> of the disks 12, which gear with the chains of the elevators 15 15<sup>a</sup> and operate these latter. The recesses 11<sup>a</sup> are located at such places that the elevators remain stationary at the moment when the arms 16 reach a height on a level with the stage or tier. The horizontal displacement of the hurdle then takes place in the following way: Cranks 22 are mounted on vertical shafts 24, lying at the same level as the hurdles in the various stages or tiers, which cranks have at their ends rollers 23, which on the rotation of the shafts 24 bear laterally against the hurdles and push these from off the supporting-arms 16 so far laterally that they again rest on the carriers 1, whereupon the shafts 24 are immediately turned back to their initial position, in which the cranks 22 lie so far to the side that they do not impede the lifting of the hurdles. The turning of the cranks 22 and shafts 24 to and fro is secured by means of toothed wheels 21, carried by the shafts 24 and double-toothed rack-bars 20, one at each end of the apparatus, gearing



with each pair of the wheels, which rack-bars by means of reduced extensions 19 are adapted for sliding movements in suitable bearings and are connected with eccentric-rods 18, which are retracted by means of eccen-  
 5 18, which are retracted by means of eccen-  
 trics 17, mounted on driving-shafts 8 and 8<sup>a</sup>, and transmit this movement to the rack-bars 20, by which the toothed wheels 21, shafts 24, and cranks 22 are actuated.

10 The driving mechanisms for the elevators and the cranks 22 are arranged at one side of the drying-room, as shown in Fig. 3, and in a chamber separated from the room and also closed. Hot air is introduced in any suitable  
 15 manner into the drying-room and is distributed by means of fans or blowers 5, arranged in a passage between each two tiers of hurdles in such way that the gelatin or the like to be dried is encountered by the air beneath  
 20 and above the hurdle. The fans or blowers 5 may be operated in any preferred manner, preferably by means of a cord or belt carried over all of the driving-belt pulleys arranged on the fan-axes outside the drying-room.

25 Motion is imparted from the shaft 8 to the shaft 8<sup>a</sup> by a shaft 30, the terminals of which carry beveled gears 29, meshing with similar gears carried by the shafts 8 and 8<sup>a</sup>, as shown in Fig. 5. The toothed wheels 14<sup>a</sup> and turn-  
 30 ing with the spindles 13<sup>a</sup> are driven by the link chains 15<sup>a</sup>, which in turn are driven by the toothed wheels 28<sup>a</sup>, mounted upon the spindles 27, and these latter receive their motion from the chains 15 by means of the  
 35 toothed wheels 28 engaging therewith.

The carriers 1 may be operated in any suitable manner and maintained in a stretched condition by means of any suitable tensioning mechanism. In this instance the car-  
 40 riers are shown as passing around idlers 26, thence between idlers 26<sup>a</sup>, and thence around idlers 26<sup>b</sup> and 26<sup>c</sup>. The shaft that carries one of the idlers 26<sup>a</sup> also supports a pulley 31, which is engaged by a belt that passes around  
 45 a smaller pulley 31<sup>a</sup>, mounted on the shaft 8<sup>a</sup>, the latter being driven by the eccentric 17<sup>a</sup>.

The elevators and crank mechanisms for lifting and displacing the hurdles arranged at both ends of the drying-room are so connect-  
 50 ed with one another that the lifting of all the hurdles takes place simultaneously and also all the hurdles lying on the supporting-arms 16 are simultaneously displaced.

The size of the drying-room and number of superimposed drying-chambers and stages or tiers arranged therein is determined substan-  
 55 tially by the general constitution or condition of the material to be dried and to the desired degree of drying.

60 It is evident that for lifting the material to be dried from one stage or tier to the next and also for laterally displacing the same other means than those hereinbefore set forth may of course be employed.

65 Having thus fully described my invention,

what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In drying apparatus, a plurality of carriers having leads disposed in successive planes, means for elevating material to the  
 70 successive leads, and means for transferring material from the elevating means to the succeeding leads.

2. In a drying apparatus, a plurality of endless conveyers having leads disposed in  
 75 successive planes, means for elevating material to the successive leads, and means for transferring material from the elevating means to the succeeding leads.

3. In a drying apparatus, a plurality of  
 80 carriers having leads disposed in successive planes, intermittently-operating means for elevating material to the successive leads, and means for transferring material from the elevating means to the succeeding leads.

4. In a drying apparatus, a plurality of carriers having leads disposed in successive  
 85 planes, means for elevating material to the successive leads, means for transferring material from the elevating means to the suc-  
 90 ceeding leads, and means for applying heat to the material.

5. In a drying apparatus, a plurality of endless carriers having leads disposed in suc-  
 95 cessive planes, a plurality of elevators provided with material-supporting members, and means for causing the movement of the elevators to be stopped as the supporting members reach the successive planes occu-  
 100 pied by the leads of the carriers.

6. In a drying apparatus, a plurality of endless carriers having leads disposed in suc-  
 105 cessive planes, a plurality of elevators provided with material-supporting members, means for causing the movement of the ele-  
 110 vators to be stopped as the supporting members reach the successive planes occupied by the leads of the carriers, and means for transferring material elevated by the supporting members from preceding leads of the carriers  
 115 to succeeding leads.

7. In a drying apparatus, a plurality of endless carriers having leads disposed in  
 115 parallel successive planes, a plurality of elevators provided with material-supporting members, means for causing the movement of the elevators to be stopped as the support-  
 120 ing members reach the successive planes occupied by the leads of the carriers, and means for transferring material elevated by the supporting members from preceding leads of the carriers to succeeding leads.

8. In a drying apparatus, a plurality of endless carriers having leads disposed in suc-  
 125 cessive planes, a plurality of elevators provided with material-supporting members, means for causing the movement of the ele-  
 130 vators to be stopped as the supporting members reach the successive planes occupied by the leads of the carriers, means for trans-



ferring material elevated by the supporting members from preceding leads of the carriers to succeeding leads, and means for supplying a drying medium to the material  
5 being treated.

9. A drying apparatus embodying endless carriers disposed in a plurality of planes, and a plurality of elevators provided with material-supporting members coacting with  
10 the carriers.

10. In a drying apparatus embodying endless carriers disposed in a plurality of planes,

a plurality of elevators provided with material-supporting members coacting with the carriers, and means for transferring elevated  
15 material from the supporting members on to the successive leads of the carriers.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

OTTO KOEPFF.

Witnesses:

RUDOLF BRECHT,  
MAX KORBNER.