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 APPARATUS FOR DRYING TEXTILE AND OTHER MATERIALS.
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958,469.

Patented May 17, 1910.

Fig. 1.

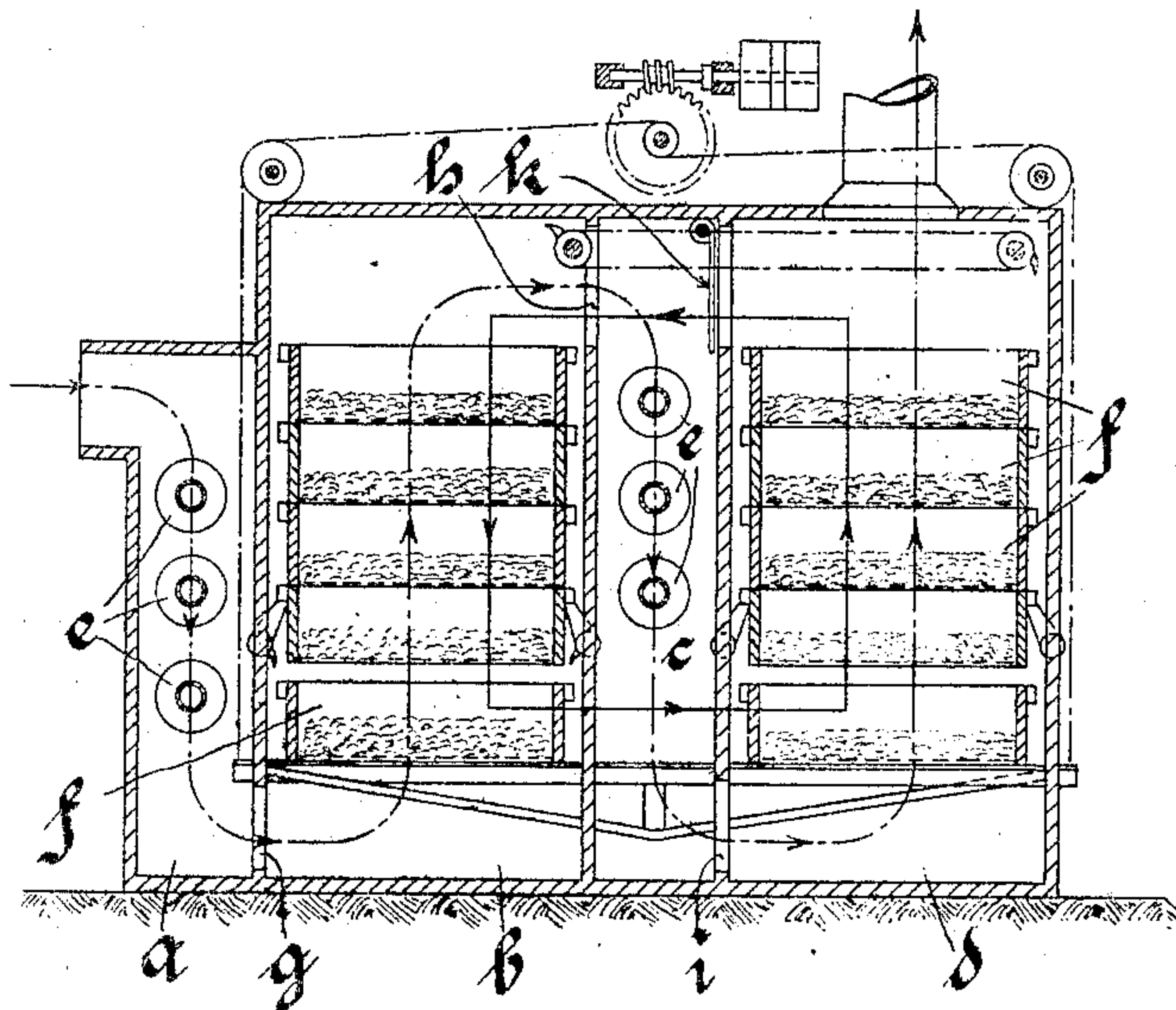
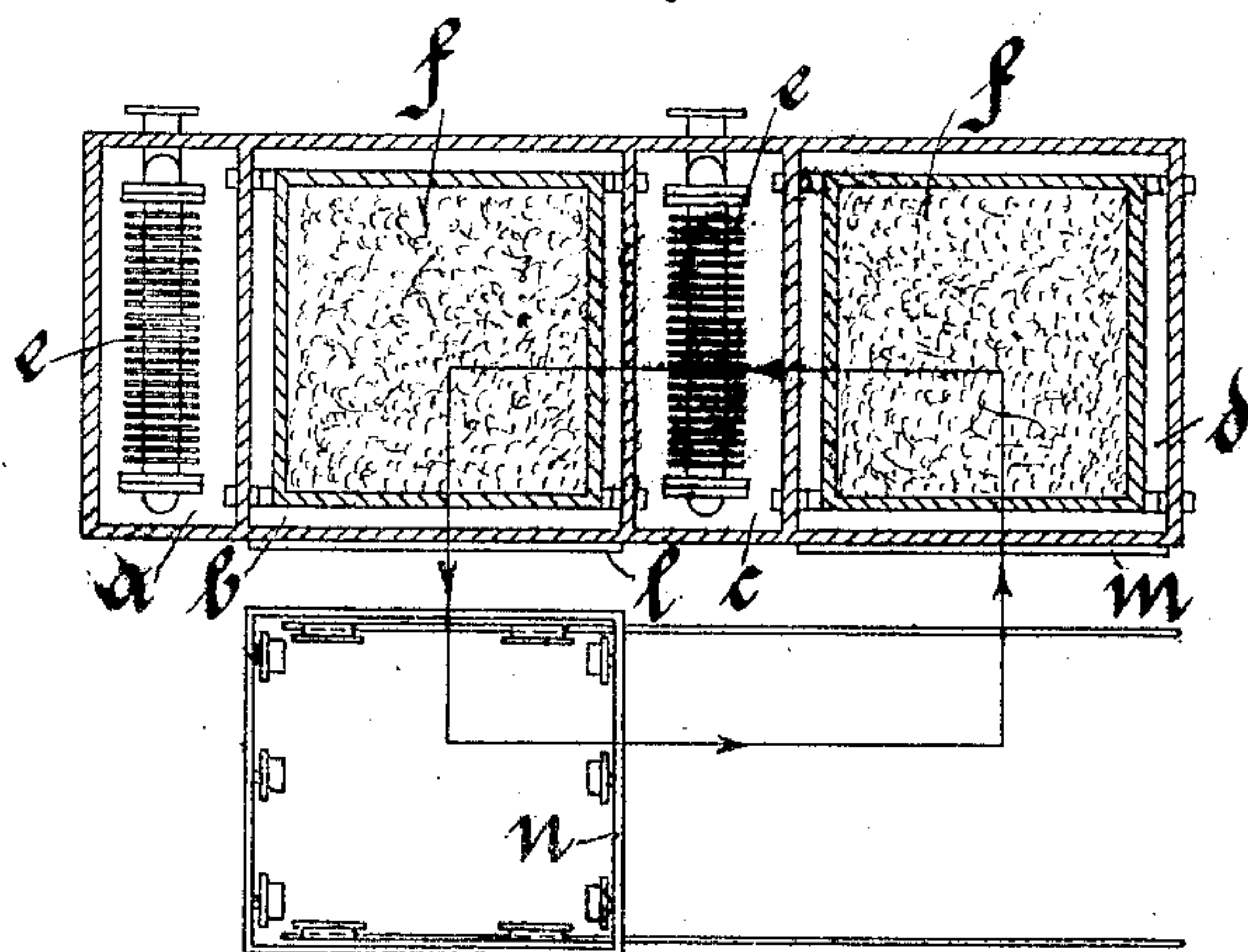


Fig. 2.



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APPARATUS FOR DRYING TEXTILE AND OTHER MATERIALS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ADOLF BOLEG, engineer, a subject of Württemberg, Germany, and now residing at No. 9 Burgstrasse, Rorschach, Switzerland, have invented new and useful Improvements in Methods of and Apparatus for Drying Textile and other Materials, of which the following is a specification.

Textile fabrics, such as wool, cotton and the like, are generally dried by means of warm air, which is forced or drawn through such material.

The manner in which the air is conveyed through the material that is to be dried is of essential importance in connection with the drying, and different processes are already known, all of which possess certain advantages, but have also great disadvantages.

For example, the method of conveying a current of air, heated by a source of heat, through material always remaining in the same place is a mistaken one. The material lying nearest to the source of heat is over dried, and loses in color and capacity for being spun, while the material which is farthest away from the source of heat is not uniformly dried. Moreover, the drying air is very imperfectly utilized, for which reason a drying installation working according to this process requires very much room and consumes a great deal of steam.

The so-called counter-current process is superior. According to this method, the material is conveyed in a number of layers counter to a current of air coming from a source of heat, and is withdrawn from the action thereof so soon as it is dry. This method is exceedingly economical, as it insures the thorough utilization of the drying air. Consequently, a drying machine working according to this method need be of but small dimensions, while the output is large and very little steam is required. As, however, on this method, it is the already cooled and moist air which penetrates the wettest material, while the material that is almost dry is swept by completely dry air, conveying the full heat applied by the source, the disadvantage arises that the material which is nearly dry suffers considerably from the action of the dry and highly heated air, and is injuriously affected in regard to color and capacity for being spun.

Another well-known process is that characterized by graduated drying and air heat-

ing. In this process the drying air is not heated by one, but by a number of sources of heat, and conveyed to the material in such a manner that the wettest material receives the heat from all the sources of heat, while the material that is almost dry is exposed to the influence of one source of heat only. This method is very favorable to the material to be dried, which is not injuriously affected in the least degree as regards color or capacity for being spun. This advantage of the method of graduated drying over the counter-current process is, however, attended by the serious drawback that the former method renders necessary a machine of very large dimensions, if the air is to be as effectively utilized, that is to say, the consumption of steam kept as low, as in the latter process.

A drying machine employed in the graduated process consists usually of a number of drying chambers. The exhaust air of the one chamber, after passing over suitable heating-devices, is conveyed as fresh air into the next chamber. If such a machine is to be made of small dimensions, it must necessarily possess very few drying chambers, which must accordingly contain a correspondingly larger number of layers of material. The drying in the different chambers is in this manner very imperfectly effected, as the material therein remains always in one and the same place, similarly as in the first-mentioned process. Thus not only is the air imperfectly utilized and the consumption of steam great, but the advantage of the graduated method, the prevention of injury of the material to be dried, is to a great extent lost.

The present invention relates to a drying process possessing all the advantages, without any of the defects, of the processes above described, and it has reference also to an apparatus for carrying out such process.

According to my invention, the current of air is first moderately heated by a source of heat, and is then conducted in counter-direction to the material, which has already been preliminarily dried. It is then raised to a high temperature by another source of heat, and thereupon conducted through the wet material which is caused to travel in the same direction. The circumstance that the current of air has to penetrate material between the first and the second source of heat only very slightly affects its drying

capacity, for this material has already been preliminarily dried and is warm, so that the current of air is far from being saturated with moisture and is scarcely cooled. There is thus conducted to the whole of the wet material a current of air which is highly heated by two sources of heat and is consequently very capable of absorbing moisture. The material being dried is then further conveyed in layers in the direction of the current of air. The progressive drying cannot injure the material, as it is effected by the air which has been already cooled and moistened by the wet layers of material.

The material to be dried is fed in the direction of the current of air as long as the air, which is gradually becoming cooler, can absorb moisture. When the current of air is saturated with moisture, that is to say, spent, the material is withdrawn from the action thereof, but is then immediately exposed to its influence again at the place at which it is only heated by one source of heat, being conveyed in counter-direction to it in layers, and then again withdrawn as soon as the drying is ended. The completion of the drying is thus effected in accordance with the economical counter-current system, but the injurious action of the latter process on the color and spinning capacity of the material is obviated, as in consequence of the division of the total source of heat, only moderately heated air is applied.

Apparatus suitable for drying according to my new process is shown, by way of example, in the accompanying drawing, in which Figure 1 is a vertical section, and Fig. 2 a horizontal section.

A heating chamber *a*, a drying chamber *b*, a heating chamber *c*, and a drying chamber *d* are arranged adjacently to one another. The heating chambers *a* and *c* are furnished with heating-devices *e*, and in the drying chambers *b* and *d* superposed openwork or perforated receptacles *f* are provided. The heating chamber *a* communicates with the drying chamber *b*, by means of openings *g*, while the heating chamber *c* communicates with the drying chambers *b* and *d*, through the openings *h* and *i*. Moreover, an opening that is closed by a folding door or flap *k* is provided in the partition between the heating chamber *c* and the drying chamber *d*.

The current of air flows through the heating and the drying chambers in the direction indicated by the broken lines along which arrows are shown.

The drying chambers *b* and *d* are provided with doors *l* and *m*, through which the lowest receptacle *f* can be withdrawn from the chamber *b*, and after being refilled, wheeled on the truck *n* in front of the chamber *d* and introduced into the latter,

The receptacles *f* can be moved collectively downward in one chamber *b* and upward in the chamber *d* by means of any ordinary actuating mechanism suitable for the purpose.

The uppermost receptacle *f* in the chamber *d* can be introduced into the chamber *b* through the door by means of a suitable device, such, for example, as an endless chain.

The complete course or "circuit," as it were, traversed by the receptacles *f* is indicated by the full lines in which arrows appear.

The action of the apparatus is as follows: In the course of the continuous drying operation the material which is most nearly dry is contained in the bottom receptacle *f* in the chamber *b*. When this material is thoroughly dry, the bottom receptacle *f* is taken out of the chamber *b* through the door *l* and placed on to the truck *n*. The mechanism for operating the receptacles *f* now comes into action, raises the receptacles in the chamber *d* all together through a distance equal to the height of one of them, and introduces the top one into the chamber *b*. Hereupon the receptacles *f* in the chamber *b* are lowered through a distance equal to the height of one of them. Meanwhile, the dried material is removed from the receptacle *f* that is standing on the truck *n*, and wet material placed in this receptacle. The truck *n* is now wheeled in front of the chamber *d* and the receptacle *f* filled with wet material thereupon pushed into the chamber *d* through the door *m*. The truck is then wheeled back in front of the chamber *b* again, from which the now lowermost receptacle *f*, containing dry material, is removed, and so on. Thus in the chamber *b*, which is heated by a single source of heat, the drying-air flows in a contrary direction to that of travel of the material being treated, while in the chamber *d*, which is heated by two sources of heat, the air flows in the same direction as that in which the material being dried is traveling.

My new method is very favorable for the material to be dried, fully utilizes the drying capacity of the air, and consumes but little steam, and the apparatus employed in carrying it out need have only two drying chambers. The improved method, therefore, combines all the advantages of the counter-current and the graduated processes, without having any of the defects of those two methods.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent is:

1. Apparatus for drying textile and other materials, comprising two heating and two drying chambers arranged in alternation with each other and all in communication, and means for feeding the material in suc-

cession through said drying chambers in reverse directions, the passages between said four chambers being so located that the air-inlets from the heating chambers to the drying chambers are situated at the opposite end of the latter to the passages through which the material is passed by said feeding means, substantially as described.

2. Apparatus for drying textile and other materials, comprising two heating and two drying chambers arranged in alternation with each other and all in communication, a plurality of superposed perforated receptacles located in each drying chamber, and

means for feeding the receptacles upwardly 15 through the second drying chamber and downwardly through the first drying chamber, the air-inlets from the heating chambers to the drying chambers being located at the bottom of said latter chambers, substantially 20 as described.

In witness whereof I have hereunto signed my name this nineteenth day of May 1909, in the presence of two subscribing witnesses.

ADOLF BOLEG.

Witnesses:

ALBERT PHELIPS.

RANDALL ATKINSON.