

May 21, 1935.

G. E. BAROZZI

2,002,170

DRYING APPARATUS

Filed Oct. 27, 1933

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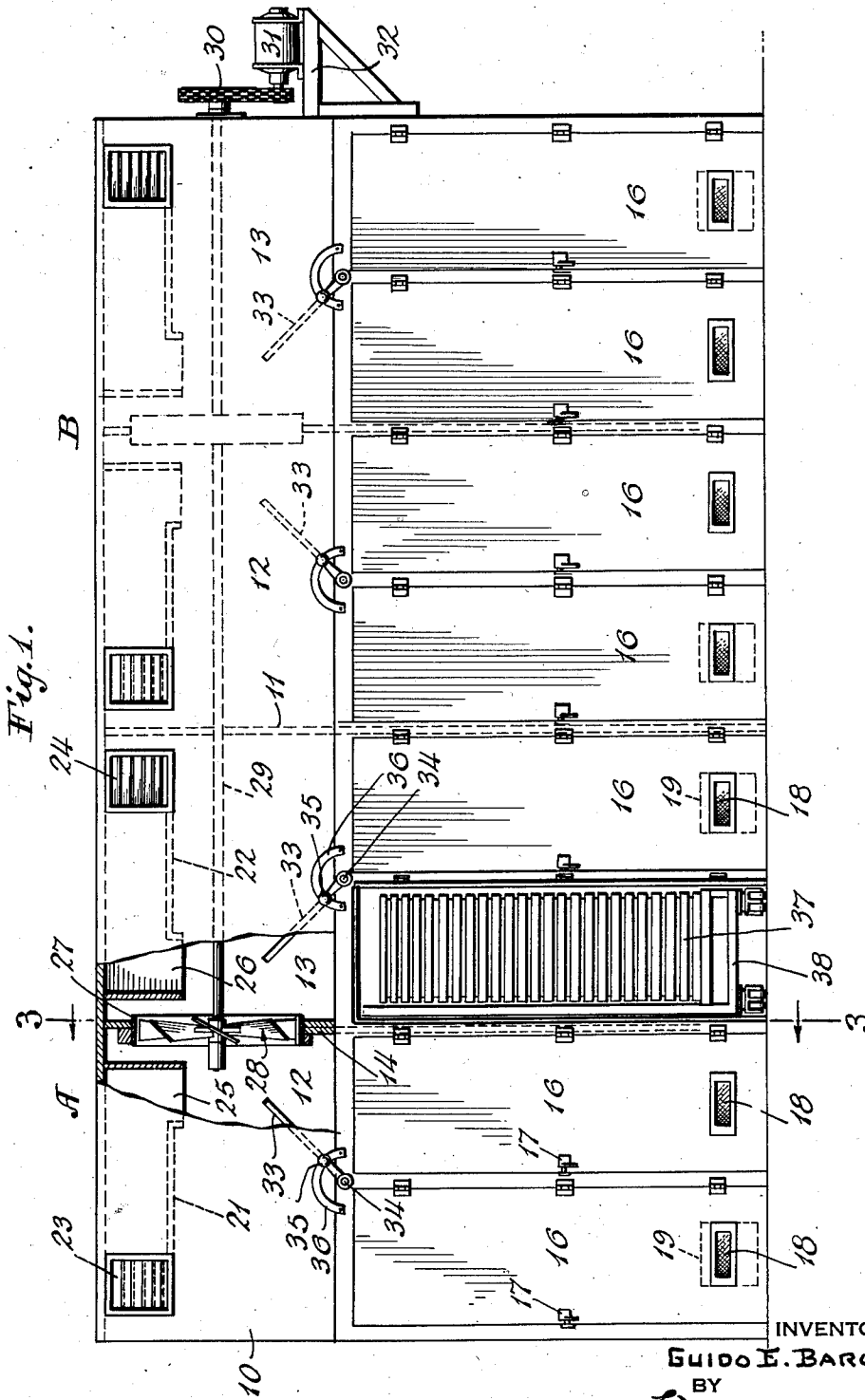


Fig. 1.

INVENTOR

GUIDO E. BAROZZI

BY

*Stika & Kekeluck*  
ATTORNEYS.

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G. E. BAROZZI

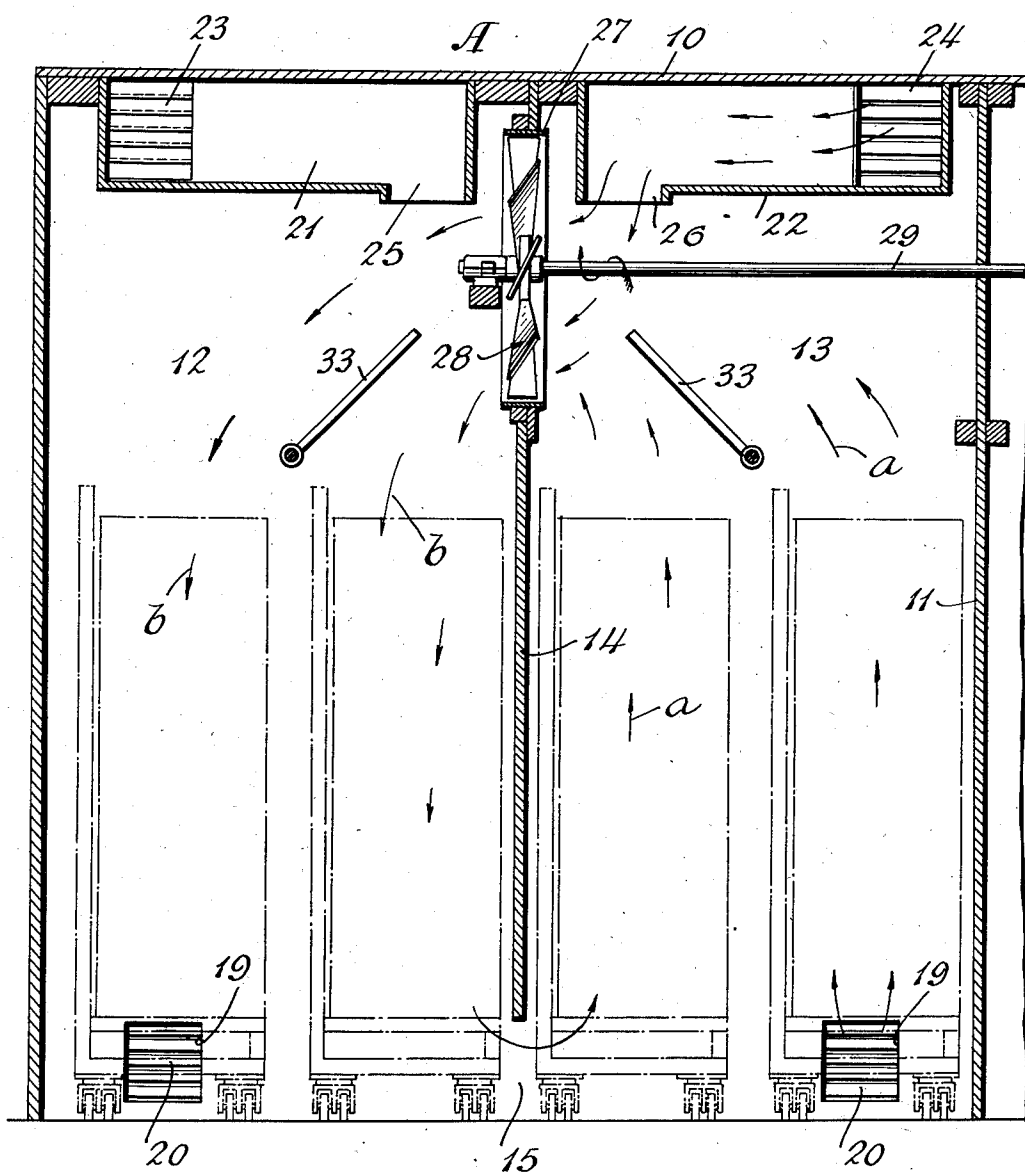
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Fig. 2.



INVENTOR  
GUIDO E. BAROZZI

BY  
*Stka & Kehlens*  
ATTORNEYS.

May 21, 1935.

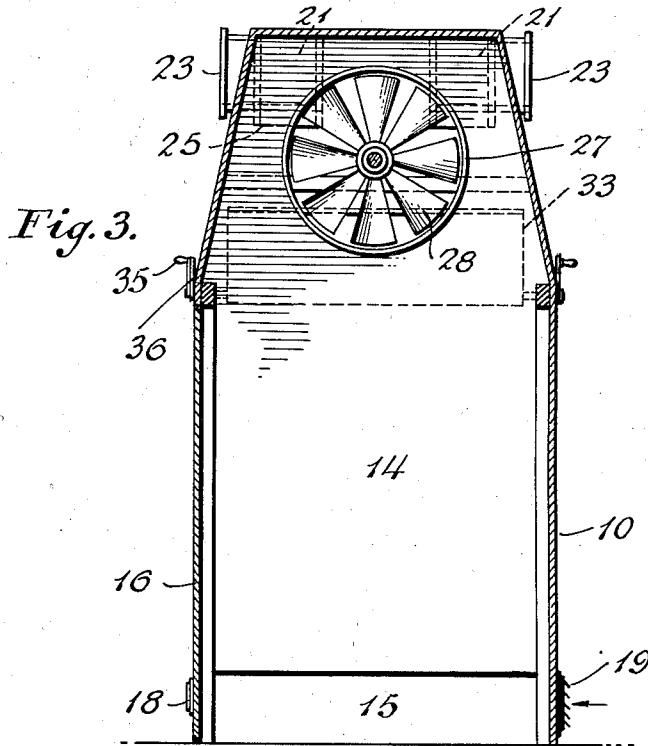
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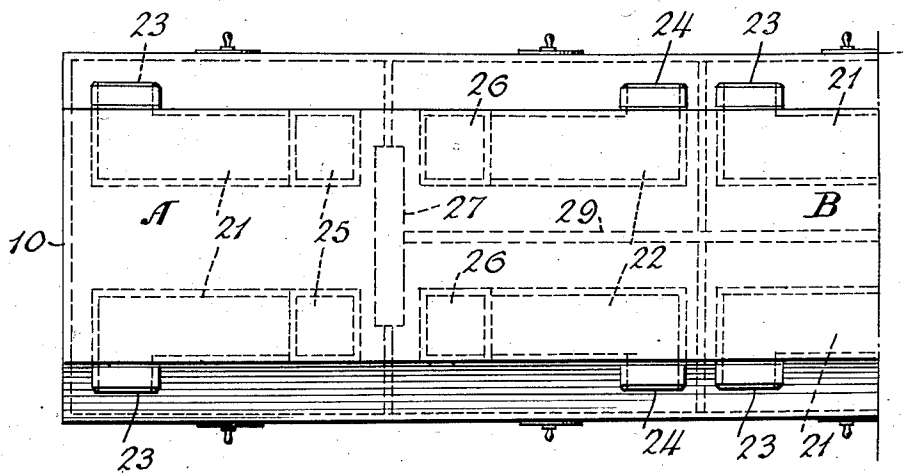
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*Fig. 4.*



INVENTOR  
GUIDO E. BAROZZI

BY  
*Stika & Stelenski*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE

2,002,170

## DRYING APPARATUS

Guido E. Barozzi, Woodcliff, N. J.

Application October 27, 1933, Serial No. 695,475

3 Claims. (Cl. 34-19)

The invention relates to drying apparatus and has for its object to provide an apparatus of this type adapted particularly for the drying of moist or wet material or for the gaseous treatment of matter in bulk, and further contemplates the production of such an apparatus which is simple in construction and of maximum efficiency in operation. Other more specific objects will appear from the description hereinafter and the features of novelty will be pointed out in the claims.

In the accompanying drawings which illustrate an example of the invention without defining its limits, Fig. 1 is a front elevation of the drying apparatus with parts broken away; Fig. 2 is a fragmentary sectional elevation; Fig. 3 is a cross-section on the line 3-3 of Fig. 1 and Fig. 4 is a plan view.

The apparatus consists of a housing 10 of suitable dimensions and constructed of materials consistent with the matter to be dried or treated, said housing in the illustrated example being of generally rectangular form with its upper portion converging upwardly as illustrated in Fig. 3. In its preferred form the housing is divided into a plurality of independent sections by airtight partitions 11, the example illustrated in the drawings showing two sections A and B, with the distinct understanding that the number of sections may be increased and that in some arrangements a single section may constitute the complete apparatus; in addition a complete installation may consist of a plurality of sections, such as A and B, arranged independently of each other instead of being combined in the form of unit as shown in the drawings. In any case each section is divided into two chambers or compartments 12 and 13 by means of a partition 14 which extends from the top of the apparatus to a point at a distance from the bottom thereof, so as to provide an opening 15 at the lower end of said partition 14 through which communication is established between the chambers 12 and 13. The chambers or compartments 12 and 13 are normally closed by one or more air-tight doors 16 or the like, which may be readily opened to render the interior of said chambers easily accessible and which may be locked in their closed positions by means of suitable locking devices 17. The compartments or chambers 12 and 13 are provided with preferably screened openings 18 located for instance in the doors 16 at the lower ends thereof, and with openings 19 located in one of the walls of said compartments preferably in registry with the

openings 18; the openings 19 in the preferred arrangement are controlled by means of conventional louvres 20 which are pivotally mounted to open inwardly and to swing outwardly to closed positions. At their upper portions the chambers or compartments 12 and 13 are provided with air channels 21 and 22 having outer open ends located exteriorly of the housing 10 as shown in Figs. 1, 2 and 3 and controlled by louvres 23 and 24 respectively which are pivotally mounted so as to close outwardly and to open inwardly into said channels 21 and 22 respectively. The channels 21 and 22 which, as shown in Figs. 1 and 2, project toward each other, terminate at their inner ends in downwardly directed extensions 25 and 26 which open respectively into the chambers 12 and 13. As shown in Figs. 1 and 2, the partition 14 of each section A and B extends upwardly between the inner ends of said channels 21 and 22 and is provided with an opening 27 in which a fan 28 is rotatably mounted, the arrangement being such that the fan 28 is located contiguous to the extensions 25 and 26 of the air channels 21 and 22; obviously other devices for developing air currents may be substituted for the fans 28 and it is accordingly to be understood that the latter are intended to exemplify all suitable types of such devices. Each fan 28 or its equivalent may be independently connected with a suitable actuating mechanism or all of the fans or equivalent devices of an apparatus consisting of a plurality of sections such as A and B may be connected with a single source of power. The illustrated example shows two fans 28 mounted upon a common shaft 29 suitably journaled in the housing and connected by means of a chain drive or the like 30 with an electric motor 31; as shown in Fig. 1 the chain drive 30 and the motor 31 are located exteriorly of the housing 10, the motor being supported upon a suitable shelf or bracket 32 fixed upon said housing at a convenient point. While the illustrated example shows the fans 28 and the air channels 21 and 22 located at the upper parts of the chambers 12 and 13, it will be understood that in some cases it may be found desirable to locate said fans and air channels at the lower parts of said chambers. In any case, the fans 28 or their equivalents are of such a type that the air currents produced thereby may be reversed in their direction of movement either by reversing the direction of rotation of the fans or by otherwise manipulating the same or their equivalents. In addition to the

parts so far described, the apparatus includes adjustable deflecting members 33 located in the chambers 12 and 13 and pivotally mounted at 34 upon the housing 10 in any convenient manner; the adjustment of the deflecting members 33 is facilitated by externally located devices 35 which in addition may be constructed in a manner to co-operate with externally located segments 36 to lock said deflecting members 33 in their adjusted positions. The material to be treated in the apparatus may be introduced into the chambers or compartments 12 and 13 in any suitable manner as for instance by being placed upon trays 37 arranged to be stacked upon suitable trucks 38 dimensioned and arranged to pass through the spaces normally closed by the doors 15, when the latter are open as illustrated in Fig. 1.

With the arrangement set forth the fans 28 which constitute means for producing currents of air are located so as to be common to the chambers 12 and 13 of each section of the apparatus as is clearly shown in Fig. 2. In practice therefore, the fans when operated will produce counter-currents of air in adjacent chambers 12 and 13; that is, if the fans 28 are actuated in the direction indicated by the arrow in Fig. 2, an upward current of air will be developed in the chamber 13 as indicated by the arrows *a* and a downward current of air will be produced in the chamber 12 as indicated by the arrows *b* therein. Under such conditions a predetermined amount of additional fresh air or its equivalent will be drawn through the air channels 22 and added to the current of air which passes downwardly in the chamber 12, the louvres 24 under such conditions being automatically swung to their open position to permit the entrance of such additional air into the channel 22. At the same time the pressure of the air developed in the opposed air channel 21 will act upon the louvres 23 thereof to automatically force the same to a closed position so that no air may pass outwardly through said channel 21; in other words, the control of the air channels 21 and 22 by the louvres 23 and 24 is effected in inverse relation. The deflecting members 33 which previously have been adjusted to the desired positions serve to divide the air currents and particularly the downwardly directed air currents so as to evenly distribute the same over the chamber 12 or 13 as the case may be. It will be understood that the air which passes upwardly in the chamber 13 is drawn into the same through the openings 18 and 19 at the lower portions thereof, while the air which passes downwardly in the chamber 12 flows outwardly through the openings 18 alone; this is due to the fact that the pressure exerted by the currents of air acts upon the louvres 20 which control the openings 19 in a manner to close the same.

From the above it will be obvious that the fan or fans or equivalent devices cause a current of air or its equivalent to rise in one or more chambers or compartments and to be augmented at an intermediate point by an additional supply of air entering through one of the air channels 21 or 22 and then in this augmented condition passing downwardly to the adjoining chamber or chambers and through the openings 18 to a point exterior to the housing 10. By reversing the direction of rotation of the fans 28 or by otherwise manipulating the same or the equivalent devices, the direction of flow of the air currents in

the chambers 12 and 13 may be reversed from that indicated in Fig. 2; that is, the air or its equivalent may be caused to flow upwardly in the chamber 12 and downwardly in the chamber 13 in which case the predetermined amount of additional air will be supplied through the air channel 21, and the air channel 22 under such conditions will be closed to the atmosphere by the louvres 24. The deflecting members 33 may be adjusted to horizontal positions to function as closures for predetermined portions of the chambers 12 and 13 if this should for any reason become desirable.

In any case the material being treated, for instance the material contained in the trays 37 on the trucks 38, may be subjected to the action of a current of air travelling in a given direction or if desired, it may receive additional treatment by currents of air travelling in the opposite direction without the necessity for removing said material from its compartment before the treatment has been completed. In other words, the apparatus provides for the ready reversal of the currents of air or equivalent gas, so that the material in each chamber or compartment may be treated with alternately upwardly and downwardly travelling currents of air or the like until the treatment has been finished. When this condition is reached, the treated material may be easily removed from the apparatus by simply opening the doors 16 and then wheeling out the trucks 38 or otherwise removing said material from said compartments. The apparatus is of compact form in that it consists of two or more chambers or compartments combined in the form of a unit in such a manner that counter-currents of air or the like may be produced in each chamber by a single fan or equivalent device. The apparatus further includes a system of automatically controlled air or gas intake ports, so that additional air or gas may be admitted without loss excepting through predetermined channels or outlets. This arrangement provides for the simultaneous treatment of material in two or more compartments or chambers, so that air or equivalent gas which already has done its work in one chamber is augmented by the addition of a supply of fresh air or gas and then directed in a manner to perform its functions in an adjacent chamber before discharge or recirculation. The action of the apparatus is thus very efficient and permits the material to be subjected to a thorough and uniform drying action or other treatment, the apparatus being particularly adapted for drying macaroni, noodles and the like. It will be obvious that the medium circulated by the fans 28 or their equivalent through the compartments 12 and 13 may be some gaseous medium other than air and may, if desired, comprise any gas having predetermined properties particularly adapted for the treatment to which the material is to be subjected in the apparatus. The terms "drying" and "air" as utilized in the description are thus intended to have a broad significance and the claims are to be construed accordingly.

Various changes in the specific form shown and described may be made within the scope of the claims without departing from the spirit of the invention.

I claim:

1. A drying apparatus comprising a pair of chambers divided by a central wall having openings at opposite ends so that said chambers communicate with each other at each end, reversible

means for producing a current of air mounted in one of said openings, means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber at the end adjacent said current producing means, other means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber adjacent the other end, said chambers each having an opening allowing passage of air in either direction at the end of the chamber remote from said current producing means.

2. A drying apparatus comprising a pair of vertical chambers divided by a vertical central wall having upper and lower openings so that said chambers communicate with each other at each end, reversible means for producing a current of air mounted in one of said openings, means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber at one end and adjacent said current producing means, other means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber adjacent the opening at the other end, said chambers each

having a screened opening allowing passage of air in either direction at the end of the chamber remote from said current producing means.

3. A drying apparatus comprising a pair of chambers divided by a central wall having openings at opposite ends so that said chambers communicate with each other at each end, reversible means for producing a current of air mounted in one of said openings, means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber at the end adjacent said current producing means, other means allowing admission of air but preventing expulsion of air from the chambers mounted in each chamber adjacent the other end, said chambers each having an opening allowing passage of air in either direction at the end of the chamber remote from said current producing means, a deflector plate in each chamber pivotally mounted at one end centrally in the chamber adjacent said current producing means, and means for tilting said plate to change the angle of deflection of the air currents.

GUIDO E. BAROZZI.