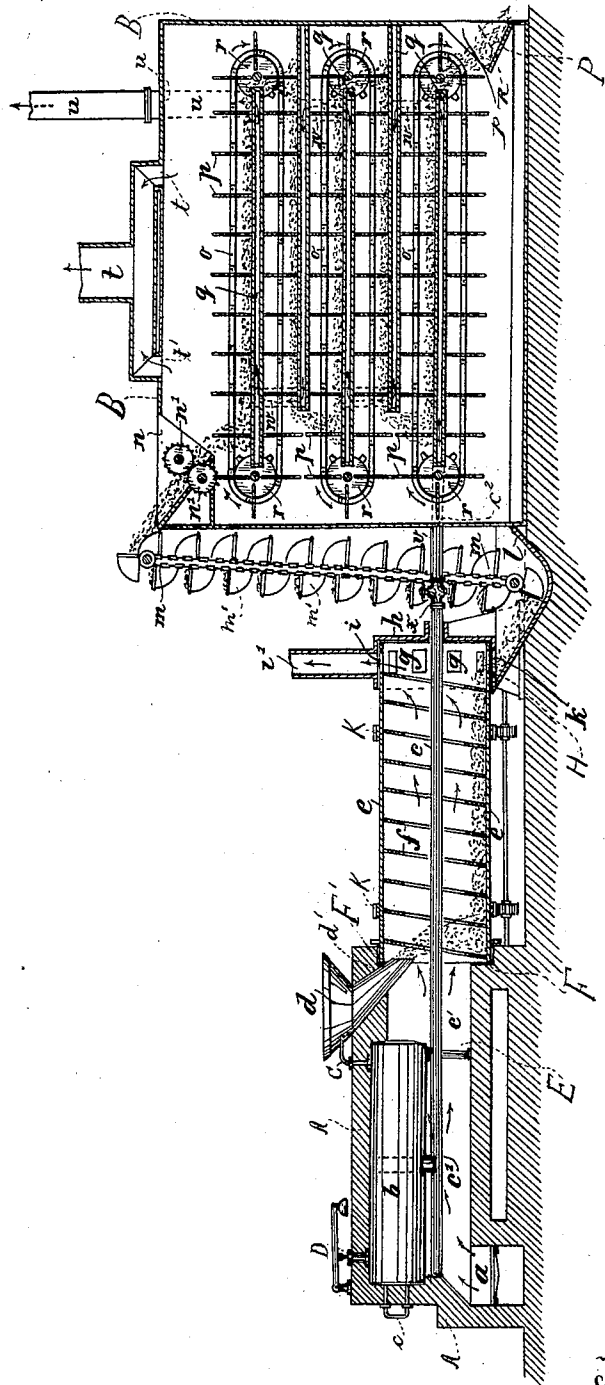


(No Model.)

E. STAUBER.
DRYING APPARATUS.

No. 606,097.

Patented June 21, 1898.



Witnesses:

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UNITED STATES PATENT OFFICE.

EMANUEL STAUBER, OF BERLIN, GERMANY.

DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 606,097, dated June 21, 1898.

Application filed August 15, 1896. Renewed March 28, 1898. Serial No. 675,513. (No model.)

To all whom it may concern:

Be it known that I, EMANUEL STAUBER, engineer, a subject of the Emperor of Austria-Hungary, and a resident of the city of Berlin, German Empire, have invented certain new and useful Improvements in Methods of and Apparatus for Drying Moist Materials, (for which I have obtained patents in England, No. 9,665, dated May 6, 1896; in Austria, No. 46/1,976, dated May 16, 1896; in Denmark, No. 560, dated May 3, 1896, and in Belgium, No. 120,118, dated March 3, 1896, and No. 121,109, dated April 29, 1896,) of which the following is a specification.

My invention relates to means and apparatus for drying material and is so constructed, as hereinafter described and fully shown, as to expose the wet material at first to an intense fire heat and then to a steam heat, thus drying the same in a most thorough and rapid manner. In an apparatus for drying by direct fire heat before used danger was experienced from burning, and, on the other hand, if steam was alone used it took some time to satisfactorily dry the material.

In the accompanying drawing the figure shows a vertical sectional view of my device, in which—

A is a casing having therein a fire-rack *a* and boiler *b*. Connected with the said boiler in any ordinary manner is a feed-pipe C and safety-valve D. One end of the boiler rests in the casing A, while the other end is supported by standards E, one of which is shown. Connected to said boiler is a horizontal steam-pipe *c*, running through and beyond the casing A. At the end of the said casing farthest from the said fire-rack and on the upper portion of the same is an oblique opening *d'*, through which passes a funnel *d*. At the same end of the said casing is a shoulder F, in which suitably and rotatably mounted is one end of the cylinder *e*, having an annular shoulder F' adjacent to said shoulder F. The other end of said cylinder has a cap or end piece *h*, having an annular inwardly-directed shoulder or flange H, in which the free end of the said cylinder is rotatably mounted. An opening K is provided at the lower portion of the said flange H, while an exhaust-pipe *v'* is integrally formed on the upper part. In the end of the said cylinder and so ar-

anged as to register as the same revolves with said opening K are openings *g*. A spiral flange *f* is located in said cylinder and around said steam-pipe *c* and is so arranged that as the cylinder is rotated material put in the funnel *d*, which is in connection with said cylinder, will be carried toward the openings *g*. Secured on the exterior of said cylinder and near the ends of the same are encircling bands K with teeth on the outer edges thereof, while below the cylinder suitably mounted are gear-wheels K', engaging said teeth and thus rotating said cylinder.

Adjacent to the closed end of the cylinder is an oven B, which has secured therein hollow or heating plates *q*, made of any ordinary material and so arranged and secured that every other one projects farther toward the cylinder side of the oven, while the intervening shelves overlap in the opposite direction.

The steam-pipe *c* enters the oven through an opening *c'* in the wall of the same and is connected with the longest hollow shelf or heating-plate which is in communication with the next shelf by a pipe *w*. Thus in turn each shelf is joined to the shelf above by pipes *w*. Secured to the upper shelf at the end opposite to said cylinder is an exhaust-pipe *u*, which passes through an opening *u'* in the top of the oven B. Suitably mounted at either end of the said shelves or heating-plates which project farthest toward the cylinder end of the oven are rotating rollers *v*, each pair of which carries an endless transport-band *o*, on which is secured driving plates or arms *p*. These plates are so arranged that they project both above and below said bands and are adapted to drive any material on the upper shelf to the end thereof and return the same on the next succeeding lower shelf, as will be readily understood from the drawing.

A reservoir *l* extends from under the opening K in the cylinder *e* in a downward then upward direction, where it is secured to the oven B. A funnel *n* is placed in the upper portion of the oven B and has therein secured disintegrators *n' n'*, the operation of which may be readily understood.

An endless chain *m*, carrying buckets *m'*, is mounted at the cylinder end of the oven and is adapted to gather the material from

the reservoir *l* and carry the same up to the funnel *n*, thus exposing the material to an atmospheric drying. An exhaust-pipe *t* is in connection with said oven at its upper part by means of openings *t'* *t''*, while an opening *R*, with a guiding-plate *P*, is provided in the lower part of said oven farthest from said cylinder.

The operation of the device may be readily understood when taken in connection with the accompanying drawing. The material inserted in the funnel *d* is guided into the cylinder *e*, and by means of the spiral flange the same is carried through the openings *g*, *i*, and *k* into the reservoir *l*, where the buckets on the endless chain carry said material up to the funnel *n*. Here the disintegrators *n'* act on the material and force it into the upper shelf *q*. The bands, with driving-plates *p*, now shove, push, or drive it along the said shelf and drop it over the end thereof, where it is carried back by the same arms. Next it drops over on the next shelf, where a different band, with its plates, puts it through a similar operation. The fire heat entering the open end of the cylinder comes in direct contact with the wet material, thus subjecting it to an intense heat, and owing to its wetness no danger of burning ensues. An exhaust-pipe *i* carries off this heat, together with the steam of the wet material, which is then, as before explained, passed on to the next stage. The steam passing through the pipe *c* enters the hollow shelves or plates in

succession and is drawn through by the exhaust-pipe *u*, while the exhaust-pipe *t* serves to draw out of the oven all dampness ensuing from the drying operation.

Having now described my invention, what I wish to claim and protect by Letters Patent is—

In a device for drying wet material a casing, a fire-rack therein, a boiler above said rack and within said casing, a shoulder in said casing end opposite said fire-rack a rotatable cylinder engaging said shoulder, a cap, an annular inwardly-directed flange secured thereto having an opening in the lower part thereof and being adapted to receive the other end of said cylinder, a steam-pipe in connection with said boiler and passing lengthwise through said cylinder, a spiral flange within said cylinder and surrounding said pipe, an exhaust-pipe in connection with said cylinder, encircling bands having teeth on the outer end thereof, gear-wheels adapted to engage the same and a funnel in said casing and entering said cylinder, all of the said parts being combined substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMANUEL STAUBER.

Witnesses:

HENRY HASPER,

W. HAUPT.