2 Sheets—Sheet 1.

G. F. WILSON & C. A. CATLIN.

Method of and Apparatus for Drying.

No. 215,191. Patented May 6, 1879.

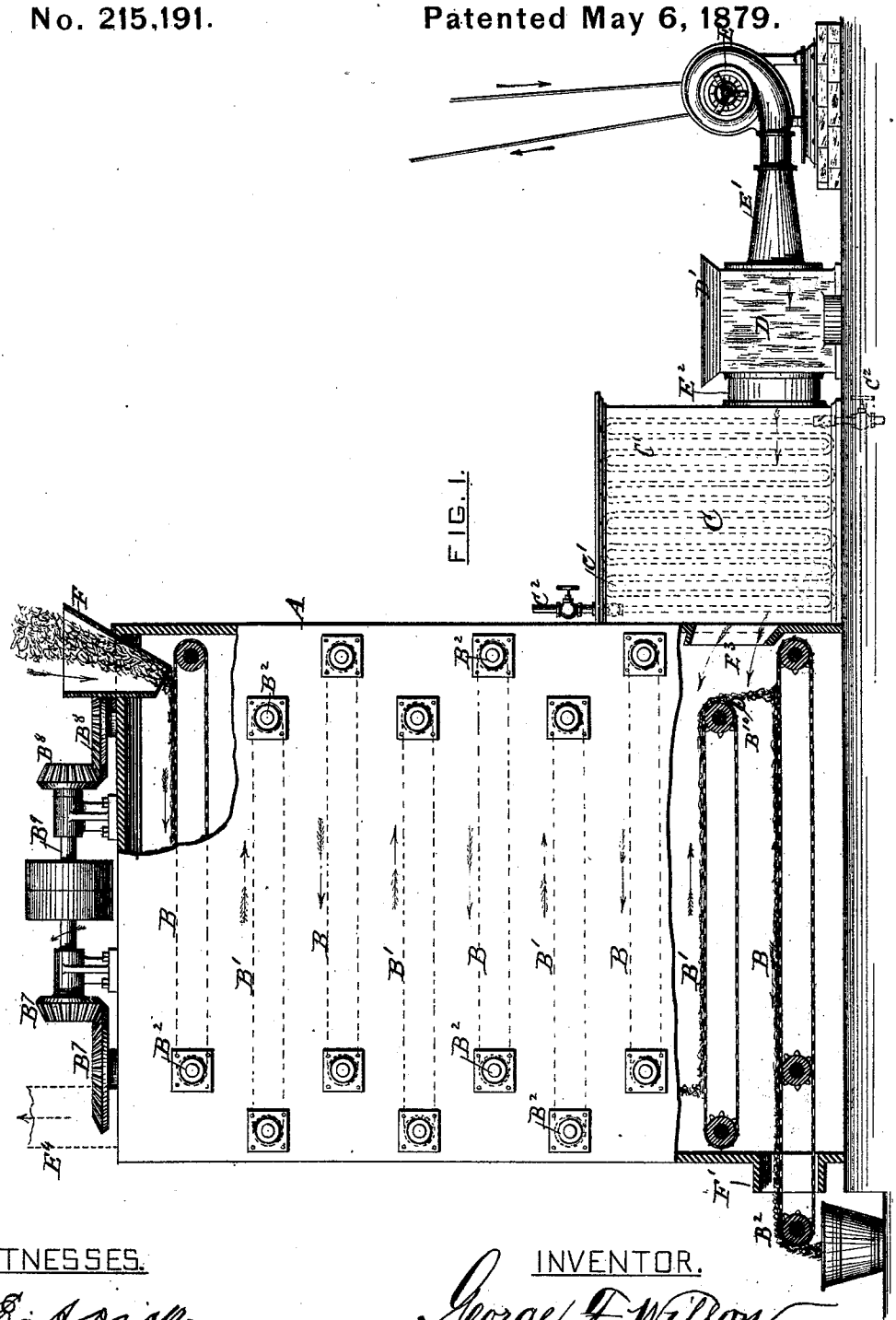

FIG. 1.

WITNESSES.

E. A. Brick

C. J. Hedrick

INVENTOR.

George F. Wilson
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by A. Pollok
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2 Sheets—Sheet 2.

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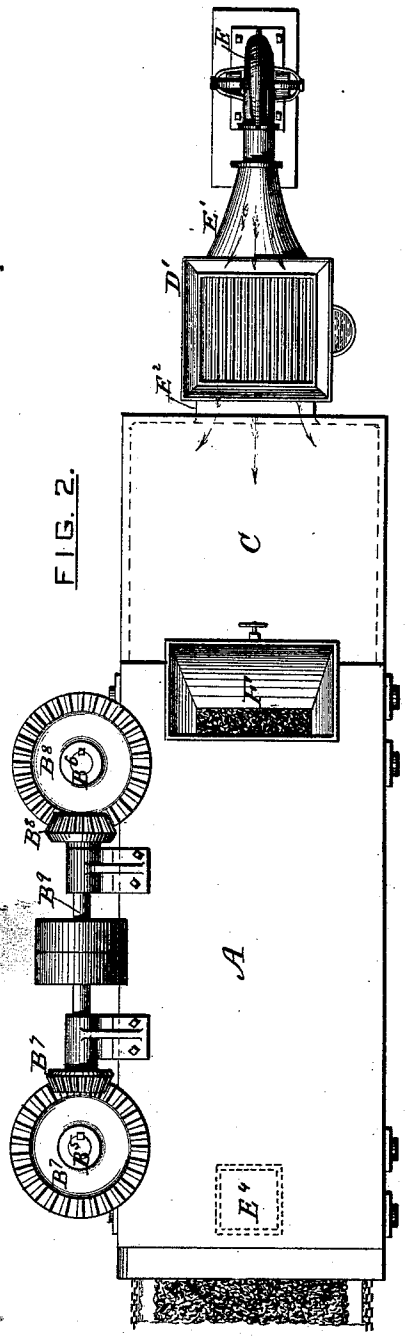

FIG. 2.

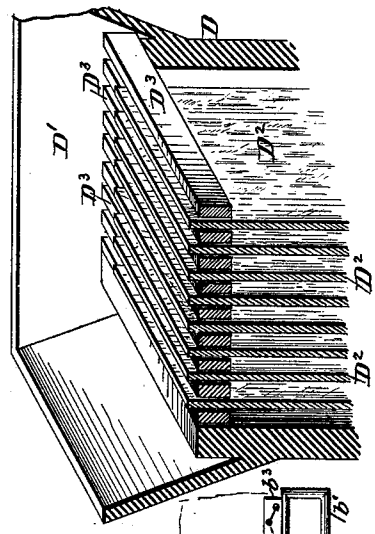

FIG. 4.

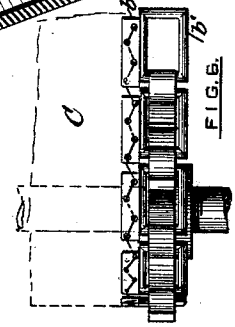

FIG. 6.

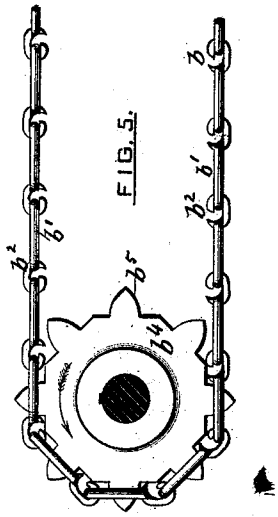

FIG. 5.

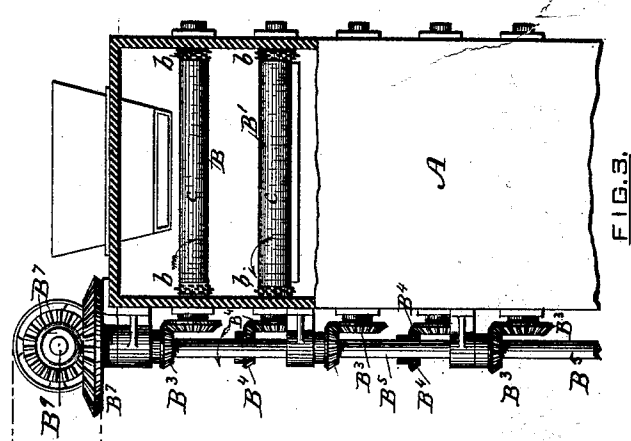

FIG. 3.

WITNESSES.

E. A. Hedrick

C. J. Hedrick

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UNITED STATES PATENT OFFICE.

GEORGE F. WILSON, OF EAST PROVIDENCE, AND CHARLES A. CATLIN, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN METHODS OF AND APPARATUS FOR DRYING.

Specification forming part of Letters Patent No. **215,191**, dated May 6, 1879; application filed February 21, 1879.

To all whom it may concern:

Be it known that we, GEORGE F. WILSON, of East Providence, in the State of Rhode Island, and CHARLES A. CATLIN, of Providence, in said State, have invented a new and useful improvement in methods of and apparatus for drying various substances to be used in chemical works and other industrial establishments, which improvement is fully set forth in the following specification.

The invention consists in the method of drying substances of various kinds, and also in the construction and combination of parts of the apparatus employed, as hereinafter set forth.

The material to be dried is subjected, by means of a series of endless aprons on which it is exposed, to the action of a blast of air moving in opposite direction to the movement of the material to be dried on the aprons, the air-blast being dried by chemical means (sulphuric acid) in a dehydrator of special construction, and heated or cooled by passing over a coil of pipes, through which a suitable heating or cooling medium (steam or hot or cold water) is circulated.

The following description will enable those skilled in the art to which it appertains to make and use my said invention, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 represents a side view, partly in section, of the apparatus employed by me; Fig. 2, a top or plan view; Fig. 3, an end view, showing the upper part of the drying-chamber, a portion of the casing being removed; Fig. 4, an enlarged view, partly in section, illustrating the construction of the dehydrator; Figs. 5 and 6, side and top views, respectively, showing, on a large scale, the manner of forming and operating the endless apron.

A is the drying-chamber; B B^1, the endless aprons, supported by rollers B^2, turning in bearings, and revolved in opposite directions by the bevel-gears B^3 B^4, attached thereto and on the upright shafts B^5 and B^6. These shafts are operated, through bevel-gears B^7 B^8, by means of a pulley on the shaft B^9, rotated by suitable power. Scrapers B^{10} may be provided on the under side of each apron to prevent adherence of the material thereto. C is the air heating or cooling chamber, provided with a coil or coils of pipe, C^1, through which a suitable heating or cooling medium is introduced by the connecting-pipes C^2, provided with stop-cocks, as shown in Fig. 1.

Any desired medium may be used—steam or hot or cold water, or other fluid of the proper temperature.

The dehydrator, or apparatus for depriving the air of moisture before it is passed through the chamber C, is denoted by D. The outer or inclosing vessel is made of lead, the sides being extended upward and outward above the top to form a receptacle, D^1. The interior of the dehydrator is divided by glass plates or partitions D^2, kept in place by leaden cross-bars D^3, which latter do not make a close joint with the glass plates and sides of the vessel, but sufficient space is allowed between them for a liquid placed in the receptacle D^1 to trickle down over the interior of the dehydrator and sides of the said plates in a thin film.

The dehydrator, instead of being made of lead, might be lead-lined; or it may be made, together with the partitions and cross-bars, of any desired material capable of resisting the corrosive action of the drying material used, which is preferably sulphuric acid. A suitable fan, E, or other kind of blowing apparatus, is used to create the proper current of air. The outlet of the blower is connected by the passage or channel E^1 with the dehydrator. The latter is in communication with the heating or cooling chamber through the short passage E^2, and the heating or cooling chamber communicates with the drying-chamber by the opening E^3 at the bottom. E^4 is the passage for the escape of the air from the drying-chamber.

F is the hopper for introducing the material to be dried, and F′ the opening at which the dried material is removed from the drying-chamber.

The endless aprons B B^1 are constructed in the following way: The sides are formed by chains *b* of links b^1, each link being rectangular, and connected with the next one by a hook, b^2, formed in one piece with or welded or oth-

erwise fastened to the body of the link. Each link is provided on one side with a projection, b^3, welded to or formed in one piece with the link, and having a number of holes formed therein.

The rollers B^2 are provided at the ends with wheels b^4, fixed on the shaft by a feather, or in other suitable way. Projections b^5 on these wheels fit within the rectangular portions of the links b^1, and cause the revolution. The fabric, *c*, of which the endless apron is composed is fastened to the projections b^3 of the links b^1 by a cord or lacing, as clearly shown in Fig. 6.

The operation of the machine is as follows: Sulphuric acid is placed in the receptacle D^1 on the top of the dehydrator D. Steam or hot or cold water is passed through the coil of pipes C^1 in the chamber C. The fan E is rapidly revolved. The endless aprons B B^1 are revolved by their gearing. The material to be dried is introduced by the hopper F and delivered on the upper apron, B, which carries it to the opposite side of the drying-chamber and deposits it on the next apron, B^1, which carries it back to the first side of the drying-chamber and deposits it on the next apron. The air forced by the fan E passes through the dehydrator D, where it is dried by contact with the sulphuric acid, which trickles from the receptacle D^1 down the sides of the glass plates D^2; thence it passes through the chamber C, where its temperature is raised or lowered, according to the temperature of the medium circulating in the pipe-coil C^1, and, entering the drying-chamber, acts upon the material exposed on the apron.

On the drawings, the direction of the air-blast, the direction of the movement of the endless aprons and material dried, and also of part of the gearing are shown by arrows.

The invention may be employed for drying glue, acid-powders, or cream-tartar substitutes, grain, or other articles, and it is, among other uses, adapted for the production of desiccated milk or milk-powder.

The fabric of which the endless aprons are composed may be of any desired material; but when the apparatus is used in making desiccated milk the fabric employed should be such as to have no injurious action thereupon, and to impart no disagreeable flavor thereto.

Instead of sulphuric acid, an equivalent hygroscopic liquid-drying material might be used. The sulphuric acid is believed also to have an additional purifying effect on the air by the destruction of germs carried thereby.

Having thus described our said invention, and the manner in which the same is or may be carried into effect, what we claim, and desire to secure by Letters Patent, is—

1. The method of drying or depriving substances of moisture by exposing the same to a blast of air which has been deprived of its moisture by passing in contact with a hygroscopic liquid in thin films, and then regulated as to its temperature by passing over a coil in which a heating or cooling medium is circulated, substantially as described.

2. The method of drying substances by exposing the same successively upon a series of endless aprons to a blast of air moving in opposite directions to the movement of the substance to be dried on the aprons, the said air-blast being deprived of its moisture by passing in contact with a hygroscopic liquid in thin films, and regulated as to its temperature by passing over a coil of pipes in which a heating or cooling medium is circulated, substantially as described.

3. The method of preparing air for use in drying apparatus, the same consisting in passing it in contact with sulphuric acid in thin films, substantially as described.

4. The combination of the following elements: first, a drying-chamber provided with a series of endless aprons and means for operating alternate ones in opposite directions; second, a cooling or heating chamber provided with a coil for the circulation of a suitable medium; third, a dehydrator; and, fourth, a fan-blower, substantially as described.

5. An endless apron formed of a fabric stretched between and secured at the sides to endless chains composed of links, each provided with a hook at one end, attached to or formed in one piece therewith, substantially as set forth.

6. A dehydrator having its interior divided by partition-plates kept in place by cross-bars, and having its sides extended upward above the top to form a receptacle, a slight space being left between aforesaid cross-bars and plates to allow the flowing between them of the liquid placed in said receptacle in thin films, substantially as described.

7. A dehydrator for use with sulphuric acid, the same consisting of the leaden inclosing-casing and acid-receptacle on top thereof, the glass partition-plates, and leaden cross-bars, substantially as described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

GEO. F. WILSON.
CHAS. A. CATLIN.

Witnesses to signature of Geo. F. Wilson:
A. POLLOK,
E. A. DICK.

Witnesses to signature of C. A. Catlin:
E. J. CARPENTER,
G. M. CARPENTER, Jr.