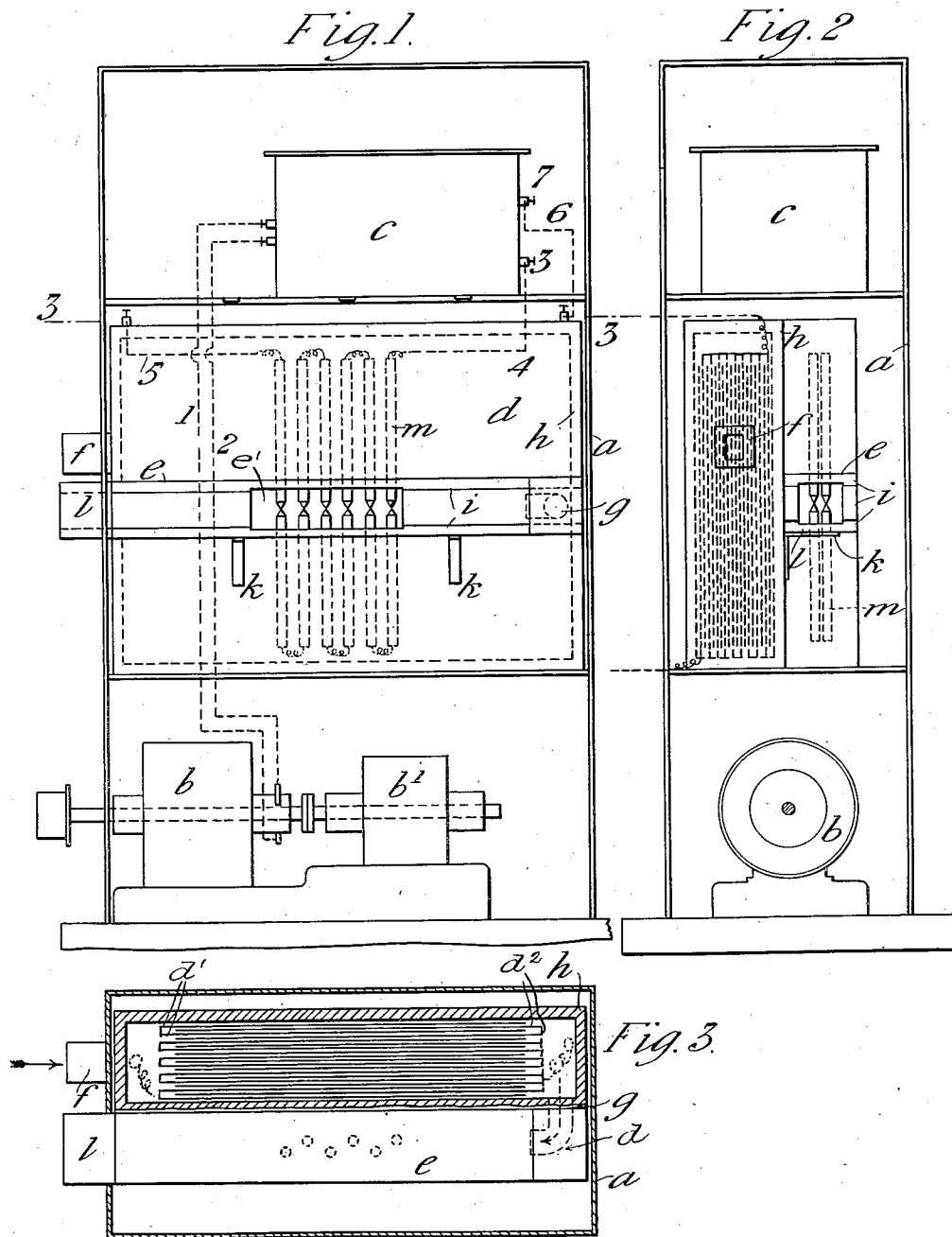


S. LEETHAM.
 APPARATUS FOR BLEACHING AND STERILIZING.
 APPLICATION FILED JULY 16, 1904.



WITNESSES
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR BLEACHING AND STERILIZING.

No. 816,482.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SIDNEY LEETHAM, miller, a subject of the King of Great Britain and Ireland, residing at Elm Bank, York, in the county of York, England, have invented certain new and useful Apparatus for Bleaching or Sterilizing, (for which I have applied for a patent in Great Britain, dated the 9th day of March, 1904, No. 5,790,) of which the following is a specification.

My invention relates to apparatus for use in bleaching or conditioning or sterilizing flour or other materials requiring to be thus treated or for sterilizing milk or food products or other substances liable to fermentation or decay or for bleaching cotton yarns, calico, oils, sugar, and the like.

In Frichot's British specification No. 21,971 of 1898 there are described two forms of apparatus for use in bleaching flour, which are illustrated in Figures 5 and 5^a, respectively. One of them works with a sparking electrical discharge and the other with a silent electrical discharge or inductive effect. Frichot proposed the one apparatus as an alternative to the other for charging air with ozone; but I have found that the gaseous agent produced varies considerably in composition in the two forms of apparatus and under different conditions. It may vary from the extreme at one end of air charged almost solely with ozone, produced by the silent discharge or induction type of apparatus, to the extreme at the other end of air containing very little ozone, but some other compound or compounds of the exact nature of which I am at present ignorant, having bleaching or sterilizing properties produced by the sparking discharge type of apparatus.

I have found that a greatly-improved bleaching or sterilizing or conditioning effect is obtained by exposing the material to be treated to air which has passed through both types of apparatus either in succession or not, and my invention relates to a combination of apparatus whereby materials may be treated by air which has been subjected successively to the action of a silent electrical discharge and to the action of a sparking electrical discharge in any order or by air which has been subjected to the action of a silent electrical discharge and has then been mixed with air which has been subjected to a sparking electrical discharge.

By way of example I will describe an apparatus constructed according to my invention with reference to the accompanying drawings, in which—

Fig. 1 is a front view of the apparatus necessary for generating the mixture of gaseous products with which the material requiring to be bleached or sterilized or conditioned is to be treated, all contained in a fireproof casing *a*, which is shown in the drawings as having had its doors removed. Fig. 2 is a side view with the side of the casing *a* removed. Fig. 3 is a horizontal section on line 3 3 of Fig. 1.

Referring to Figs. 1 to 3, the apparatus for generating the gaseous products comprises a dynamo *b*, a transformer *c*, an ozonizer *d*, and a sparking discharge apparatus *e*, all conveniently arranged in a fireproof-casing *a* in superimposed compartments therein, as shown in Figs. 1 and 2.

The ozonizer *d* may be of the well-known type consisting of alternating plates *d'* and grids *d''* of metal, with interposed sheets of insulating material arranged in vertical planes in a casing *h*. All the grids are electrically connected with one terminal of the ozonizer and all the plates with the other. An air-inlet *f* and outlet *g* are provided at opposite ends of the casing *h*, so that air introduced into the one must pass between the plates and grids on its way to the other.

The sparking discharge apparatus may consist of a trunk or conduit built up of fireproof plates *i*, preferably slate slabs. This conduit is supported on suitable brackets *k*, fixed to the casing *h*, and through the top and bottom plates *i* are passed electrodes *m*, of metal, wire, carbon, or other suitable material, each of the upper ones being in the same axial line with a lower one and preferably distant from it by about one-eighth of an inch. At the part of the conduit where these electrodes are the side may conveniently have a glass window *e'* in it to allow of the character of the sparks between the electrodes being examined. As shown in Fig. 3, the outlet from the ozonizer-casing communicates with one end of this conduit, so that the air having traversed the ozonizer passes between the electrodes to the outlet *l* at the other end of the conduit.

It is advantageous to supply both ozonizer and sparking apparatus from the same source

of current and to connect the ozonizer in series with the sparking-electrodes—that is to say, one end of the secondary circuit of the transformer is connected to the plates of the ozonizer and the other end of the circuit to the grids, the sparking electrodes being interposed in series in the circuit either on the plate side or on the grid side of the ozonizer. The ozonizer thus acts as a condenser in the sparking discharge-circuit. In Fig. 1 the dynamo *b* is shown as an alternating-current generator the field of which is excited by an auxiliary direct-current generator *b'*.

The brushes of the dynamo *b* are shown connected by wires 1 and 2 with the terminals of the primary coil of the transformer *c*, respectively. The secondary circuit of the transformer is shown from terminal 3 through wire 4 to the first of the electrodes *m* and through all the electrodes in series, then through wire 5 to one terminal of the ozonizer. The other terminal of the ozonizer is connected, through wire 6, to the other secondary terminal 7 of the transformer.

Although I have shown the units of my new combined apparatus in particular forms, I wish it to be understood that other forms may be used with great advantage; but whatever the form the best results are obtained if the air is first passed through the ozonizer and then through the sparking apparatus, as here shown.

It must be added that there is a suitable velocity at which the air should pass through the apparatus here shown in order to obtain the best result. This necessarily varies with the dimensions of the apparatus and the electrical conditions; but I may illustrate the requisite proportions by reference to an apparatus actually now in use. In this apparatus the ozonizer is of the form and capacity known to the market as an "Andreoli" ozonizer of eighty square feet capacity. The sparking apparatus has six carbon electrodes with spark-gaps three thirty-seconds of an inch. The transformer is of the type known as "step-up resin-oil" transformer, the voltage available on the primary circuit being about one hundred volts and that obtained on the secondary circuit being from six thousand to eight thousand volts. This gives a potential difference between the terminals of the ozonizer of about three thousand to four thousand volts, the remainder of the potential being distributed over the spark-gaps. The electric current passing through the apparatus is of very small amperage, being in the case above mentioned about 0.07 to 0.08 ampere. Under these conditions the best velocity in the air in the electrode-chamber is about fifty miles per hour, and the quantity to suit the above conditions and to

treat about ten sacks of two hundred and eighty pounds each of flour per hour is two hundred to three hundred cubic feet per minute, the area of the cross-section of the electrode-chamber being about nine square inches.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim—

1. In apparatus for bleaching and similar operations the combination of an ozonizer, a sparking discharge apparatus and a high-tension electric circuit including in series both the ozonizer and the sparking discharge apparatus.

2. In apparatus for bleaching and similar operations the combination of an ozonizer, pairs of electrodes, a spark-gap between the electrodes of each pair, and electrical conductors connecting the said pairs of carbons in series with each other and with the said ozonizer.

3. In apparatus for bleaching and similar operations, the combination of an ozonizer, a conduit, pairs of electrodes in the said conduit, a spark-gap between the electrodes of each pair, a source of high-tension discontinuous electric current and electrical conductors connecting the said pairs of electrodes with the said ozonizer and with the said source of current in such a manner that the ozonizer acts as a condenser for the circuit of the electrodes.

4. In apparatus for bleaching and similar operations a sparking discharge apparatus comprising a conduit, built of fireproof plates, consecutive pairs of electrodes passing through the said plates, a spark-gap between the electrodes of each pair, a source of high-tension electric current and electrical conductors connecting the said pairs of electrodes with the said source of high-tension electric current.

5. In apparatus for bleaching and similar operations a sparking discharge apparatus comprising a conduit built of fireproof plates, a window in the side of the said conduit, consecutive pairs of electrodes passing through the said plates, a spark-gap between the electrodes of each pair, a source of high-tension electric current and electrical conductors connecting the said pairs of electrodes with the said source of high-tension electric current.

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

SIDNEY LEETHAM.

Witnesses:

GEO. P. BOUSFIELD,
H. BECKETT.