J. M. WILLIAMS.

PROCESS OF BLEACHING AND AGING CEREALS.

APPLICATION FILED MAY 18, 1906.

963,970. Patented July 12, 1910.

Fig. 1.

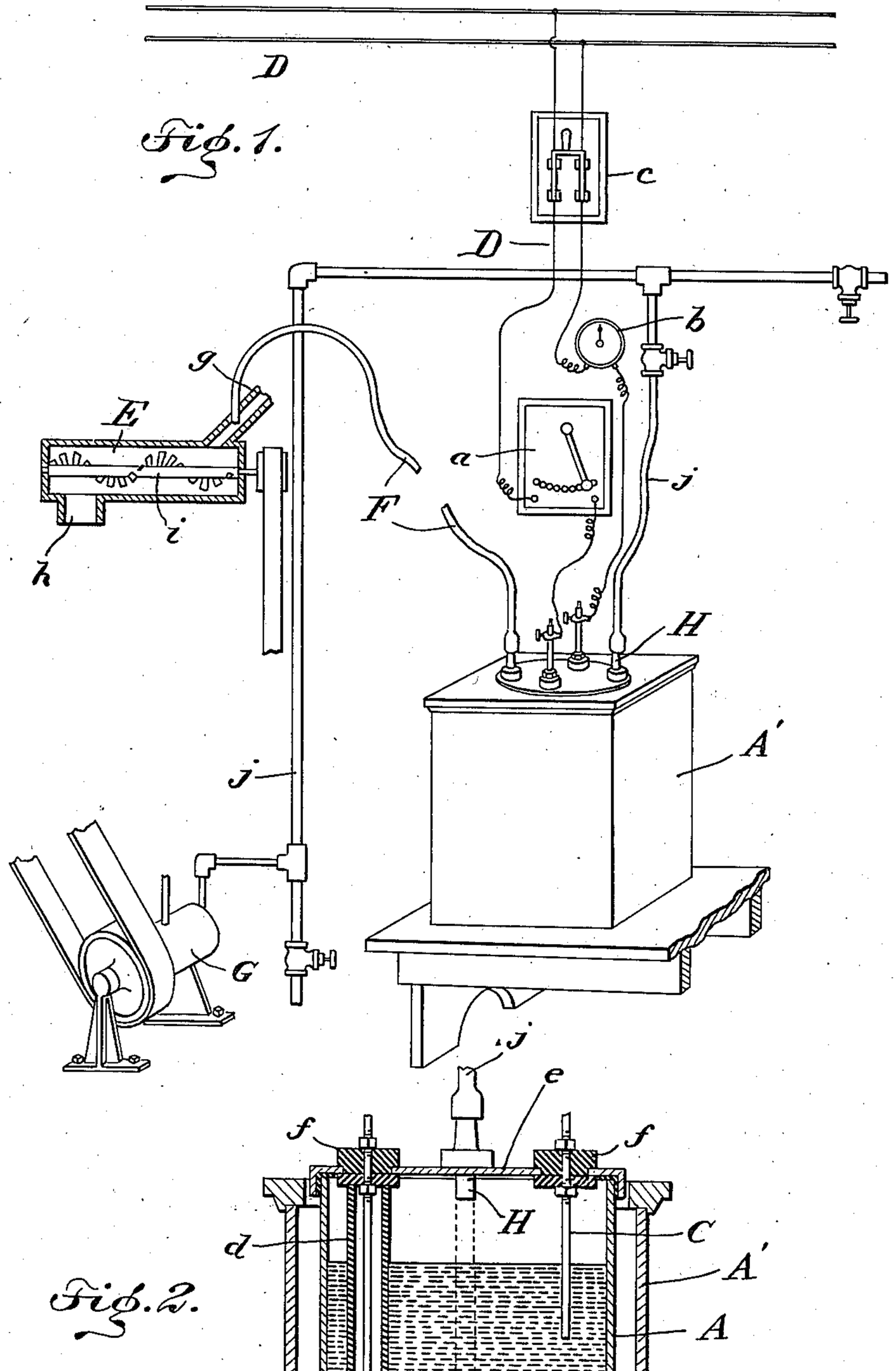


Fig. 2.

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JOHN MORRIS WILLIAMS, OF GUTHRIE, OKLAHOMA.

## PROCESS OF BLEACHING AND AGING CEREALS.

963,970. Specification of Letters Patent. Patented July 12, 1910.

Application filed May 18, 1906. Serial No. 317,636.

*To all whom it may concern:*

Be it known that I, JOHN MORRIS WILLIAMS, a citizen of the United States, residing at Guthrie, in the county of Logan and State of Oklahoma, have invented a certain new and useful Process of Bleaching and Aging Cereals, of which the following is a specification.

My invention is a process of bleaching and aging cereals, more particularly flour, and contemplates the production of certain bleaching and aging agents by means of electrolysis.

In accordance with my invention I electrolyze various chemical bodies, such as acids and salts, and subject the flour, or other material under treatment, to the action of the gases or other agents resulting from the electrolytic decomposition.

Various types of apparatus may be employed in practicing my process, but in the drawings hereto annexed I have illustrated one form of apparatus which in practice has proven to be suitable for my purpose.

Figure 1 is a general view of the apparatus, and Fig. 2 is a cross-section through the electrolytic cell.

A is the electrolytic cell composed of a material which is acid-proof and a non-conductor of electricity, preferably, glazed pottery. It is housed in the casing A′, and contains a positive electrode or anode B, and a negative electrode or cathode C. The electrodes, which are preferably of carbon, are included within an electric circuit D, supplied with a current from any suitable source of electrical energy. For this purpose a current, such as is ordinarily used for incandescent lighting, has proven satisfactory.

It will be understood that the circuit is provided with such devices as the rheostat *a*, the ammeter *b*, and the switch *c*.

The positive electrode B extends well toward the bottom of the cell, and is preferably incased, for substantially its entire length, in an insulating jacket *d*, the said electrode and jacket being suspended from the closure *e* of the cell A. The negative electrode, C, does not extend into the cell to the same extent as the positive electrode B, and by this means I am enabled to secure a better diffusion of the current through the electrolyte. The electrodes pass through stuffing boxes *f*, which are preferably made out of aluminum.

E represents a cereal treating chamber having a feed spout or hopper *g*, and a discharge spout *h*, the said chamber being provided with a feed screw or agitator *i*.

The electrolytic chamber of the cell A, communicates with the cereal treating chamber E, by means of a pipe or passage F, whereby the gaseous products of electrolysis are brought into contact with the material under treatment.

In order to expedite the flow of the bleaching agents from the cell to the cereal chamber, I provide means for introducing a current of air or gas into the cell, the pressure produced by which facilitates the passage of the bleaching agents to the flour. The current of air, when introduced below the surface of the electrolyte, has the advantage of keeping the electrolyte uniformly mixed, and of freeing the electrodes from the gases which accumulate thereon. In the case of many electrolytes, however, which apparently have depolarizing properties, as is the case, for example, with nitric acid, I do not introduce the air below the surface of the electrolyte, but on the contrary, above the surface of the acid. It will be observed that, in any event, whether the air is introduced below or above the surface of the electrolyte, it serves the purpose, in addition to those specified, of diluting the bleaching gases to such degree as is desired.

The current of air is supplied to the cell by the pump G, the outlet from which, *j*, leads to a pipe H, see Fig. 2. Said pipe H is shown in full lines as terminating above the surface of the electrolyte, and, in a modified form, in dotted lines extending below the surface of the electrolyte. The pipes E, H, may be attached to the electrolytic cell A, by means of nipples, which are made, preferably, of aluminum.

The electrolyte may consist of any suitable acid such as hydrochloric, HCl, sulfuric, $H_2SO_4$, or nitric, $HNO_3$, or a solution of any suitable salt, such as sodium chlorid, NaCl, or sodium nitrate $NaNO_3$. I have found nitric acid particularly well adapted for this purpose, and the commercial acid, of a strength of about 36 degrees Baumé, gives excellent results.

In practically carrying out my process, in its preferred form, I place the electrolyte, say nitric acid, in the cell A, turn on the electric current and start the air pump. The bleaching gases are immediately given off

and pass to the flour treating chamber, where they come into intimate contact with the flour, which flour is preferably spread out or distributed in such manner as to enable the bleaching gases to be readily commingled with all parts of it. The whitening or bleaching action on the flour is almost instantaneous.

The flour treated by my process is considerably whiter than the untreated flour, and a corresponding change appears in the resulting bread. Furthermore, the "sponge" is more easily worked during the process of bread-making, it being less tough and sticky than when made from untreated flour. Another important advantage possessed by the flour thus treated is that its keeping qualities are greatly enhanced, due probably to the fact that the process destroys, in whole or in part, any bacteria which may have been contained in the flour, thereby sterilizing it to a certain extent.

The bleaching agents produced will depend on the character of the electrolyte employed, but they will contain the products of electrolysis of water, oxygen and hydrogen, and oxids of carbon, if carbon electrodes be used, probably some hydrogen peroxid and ozone, and, in addition, other gases such as compounds of chlorin, or compounds of nitrogen.

The process is simple and economical, in that the installation of the plant may be effected at small cost, and the electrolytes employed are inexpensive. In the event of employing nitric acid as the electrolyte, no by-products are produced in the cell, and the process can be carried on continuously, the acid remaining practically uniform in strength until all decomposed.

It will be understood that the process as described may be modified in details without departing from the spirit of the invention.

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

1. The process of treating cereals, such as flour, which consists in subjecting them to the action of bleaching agents resulting from the electrolytic decomposition of a solution of nitric acid.

2. The herein described process which consists in electrolytically decomposing a solution of nitric acid, mixing the gases or vapors evolved with air, and subjecting a cereal to the action of the resulting mixture.

3. The herein-described process of treating cereals which consists in subjecting them to the action of gases resulting from electrolyzing a solution of a chemical agent while blowing air through the same.

4. The herein-described process of treating cereals which consists in subjecting them to the action of gases resulting from electrolyzing an acid while blowing air therethrough.

5. The herein-described process of treating cereals which consists in subjecting them to the action of gases resulting from electrolyzing nitric acid while blowing air therethrough.

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

JOHN MORRIS WILLIAMS.

Witnesses:
A. M. Williams,
Geo. H. Willis.