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PATENTED FEB. 26, 1907.

H. J. CALDWELL & J. R. BARR.

GRAIN BLEACHER.

APPLICATION FILED JULY 11, 1904.

2 SHEETS—SHEET 1.

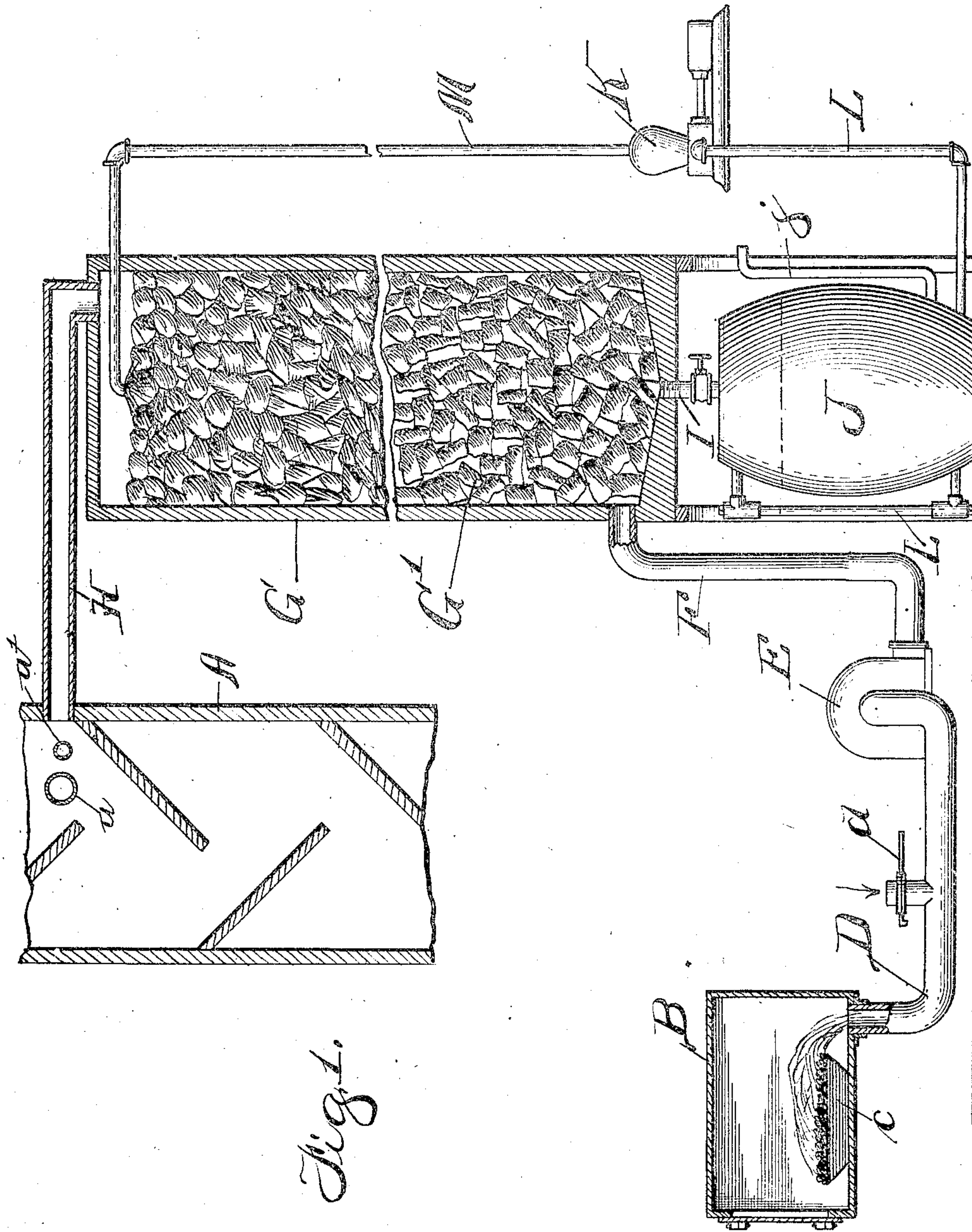


Fig. 1.

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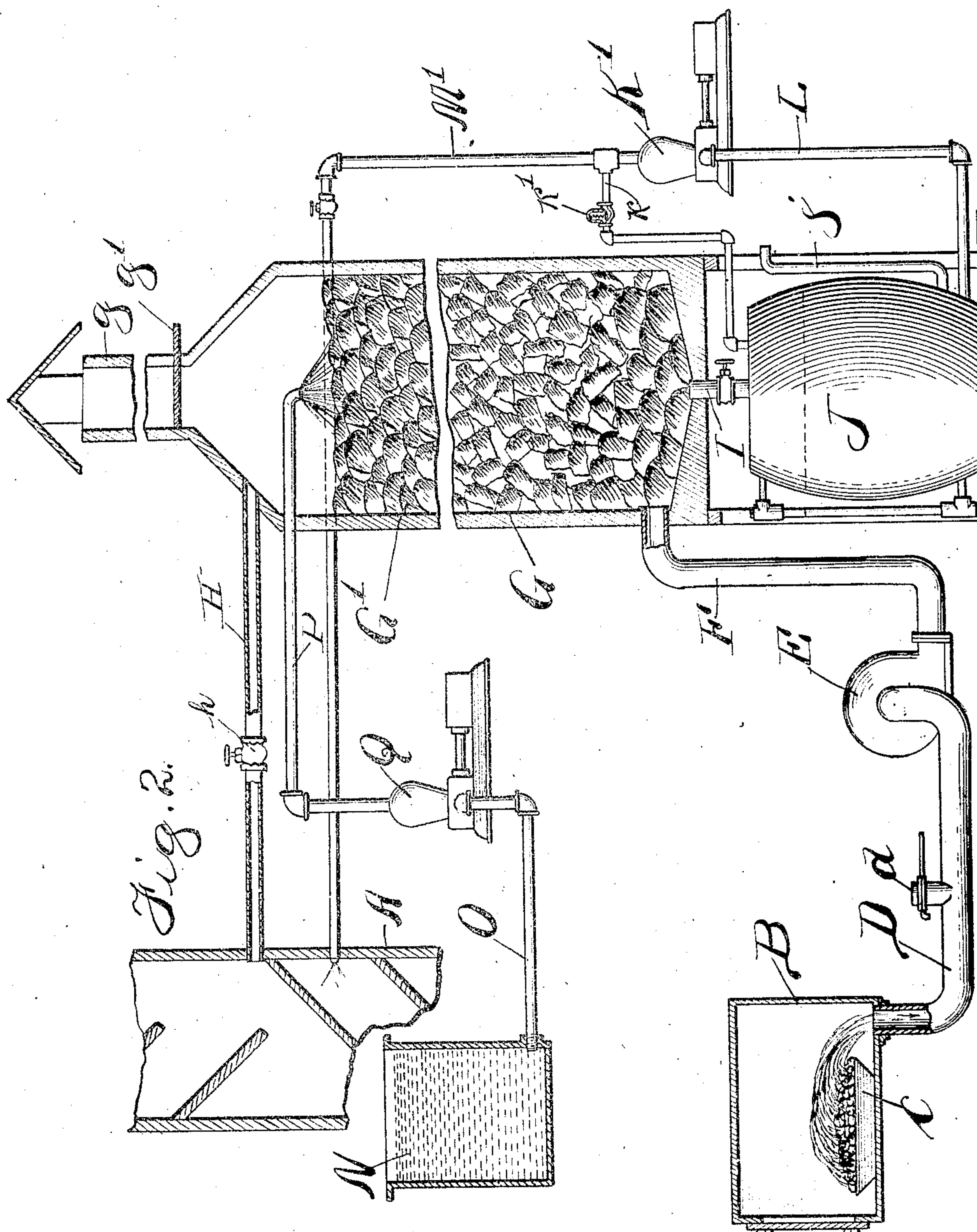
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

HARRY J. CALDWELL AND JAMES R. BARR, OF EARL PARK, INDIANA.

GRAIN-BLEACHER.

No. 845,446.

Specification of Letters Patent.

Patented Feb. 26, 1907

Application filed July 11, 1904. Serial No. 216,088.

To all whom it may concern:

Be it known that we, HARRY J. CALDWELL and JAMES R. BARR, citizens of the United States, residing at Earl Park, in the county of Benton and State of Indiana, have invented certain new and useful Improvements in Grain-Bleachers, of which the following is a specification.

Our invention relates to improvements in the art of and apparatus for treating, purifying, and cleansing grain, commonly referred to as "bleaching," and for the purpose of conditioning grain and removing must, rust, discolorations, &c.

The object of our present invention is to provide a simple and effective means for so treating the grain, while eliminating all possibility of fire and of overheating the grain.

Another object of our invention is to provide such an apparatus as shall be exceedingly efficient for the purpose named.

These and such other objects as may hereafter appear are attained by our invention, as shown in the convenient embodiment thereof found in the accompanying drawings, in which—

Figure 1 is a side elevation, partially in section, of one form of our present apparatus; and Fig. 2 is a like view of a modification thereof.

Like letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates a portion of a familiar form of stack for the treatment of grain. The exact form of stack, however, constitutes no part of our invention. Therefore the part marked A may be taken as typically indicating any suitable compartment for treating grain, whether in a moving column or in a stationary body.

B indicates a familiar form of furnace for generating sulfur fumes by burning sulfur in the pan C.

D is a fumes-conduit leading to the eye of the fan E, and *d* is a valve for admitting air to mix with fumes when desired, the pipe F leading from the eduction-port of the fan E to the interior of the casing G. This casing contains a quantity of coke, pumice-stone, broken brick, or like material, through which fluid, gases, and the like may readily pass. H is a fumes-pipe leading from the casing G to the grain-treating compartment. I is an outlet-pipe leading from the casing G to any suitable reservoir, such as J, said

reservoir being, if desired, provided with an overflow-pipe *j*. K is a pump arranged to pump water or other fluid from the reservoir J through the pipe L and thence back through the pipe M into the casing G. With the apparatus so constructed the fan E exhausts from the furnace B the fumes generated by burning the sulfur in the pan C and forces these fumes into the base of the casing G. At the same time, by means of the pump K or in any other convenient manner, water or other suitable fluid is discharged into the top of the casing G and percolates through and permeates the broken mass of coke, pumice-stone, broken brick, and the like, the sulfurous water trickling through the pipe I into the tank J, whence, in the construction shown in Fig. 1, it is again pumped back into the casing G. The fumes entering the casing G through the pipe F are scattered and retarded in their passage through said casing by the presence of the broken mass G' and are brought in intimate contact with the moisture which permeates the broken mass G' thus cooling the fumes, if desired, by making the casing G of proper length, eliminating all possibility of fire from the burning sulfur coming in contact with the grain to be treated and facilitating the combination of the sulfurous oxid in the fumes with the hydrogen in the water to form the bleaching agent, sulfurous acid, while the fumes not absorbed by the water will escape through the fumes-pipe H with more or less moisture, in the form of vapor, into the treating-compartment. The shorter the casing G the hotter will become the water passing through the casing and the greater in volume will be the moisture passing with the fumes through the pipe H to the treating-compartment. For many purposes the sulfurous fumes escaping through the pipe H will carry with them sufficient moisture for the bleaching or treatment of the grain. If, however, more moisture be required under any given conditions, the grain may be moistened in any familiar manner, although we prefer, when additional moisture is needed, in form as shown in Fig. 1, using a steam-jet in an open port or connection, as shown in our Letters Patent No. 728,859, whereby the steam-jet entering the treating-compartment will draw a current of air with it, thus neutralizing the heat of the steam. Still it may be deemed desirable at times to inject the steam through the port *a'* and to carry a

condensing medium, such as air or water, into the stack A through the separate port *a*.

It will be seen that with our present apparatus we provide means which may be utilized to sufficiently cool the fumes, if desired, to prevent overheating of the grain and to avoid all danger of fire to the building in which the apparatus is located and at the same time facilitate the production of the desired bleaching agent and provide means whereby the bleaching agent may carry with it into the treating-compartment more or less of the moisture required for the efficient treatment of the grain. It will also be recognized that where the apparatus shown in Fig. 1 is used the water, which is passed rapidly through the broken mass *G'*, will ultimately become saturated with the sulfurous fumes and become increasingly heated until there will be a free evaporation of the sulfur-impregnated water through the pipe *H* into the grain-treating compartment.

In Fig. 2 we have shown our apparatus so modified that the grain may be directly treated with the diluted sulfurous acid, which escapes from the casing *G* through the pipe *I* into the tank *J*, and may be treated with the sulfurous-acid fumes which escape from the casing *G* through the pipe *H*, which is controlled by the valve *h*, fresh water or other suitable fluid being supplied to the casing *G* from a reservoir *N* through pipes *O P* by a pump *Q*, the fluid as it escapes from the bottom of the casing *G* being pumped to the desired point by a pump *K'* and sprayed by force or by steam onto the grain. The pumps *Q* and *K'* may be so related to each other that a substantially constant level may be maintained in the tank *J*.

k is a by-pass pipe leading from the pipe *M'* to the reservoir *J* and controlled by a pressure-valve *k'*, so that while the pump *K'* may operate at a uniform speed the amount of fluid discharged into the casing *A* may be controlled at will, and any pressure generated within the pipe *M'* will open the valve *k'*.

In using the vaporous fumes and the moisture they carry we prefer the embodiment of our present invention found in Fig. 1, while we prefer the modification thereof found in Fig. 2 when the diluted sulfurous acid escaping through the bottom of the casing *G* is to be sprayed against the grain, using or not using at the same time, as may be preferred, the sulfurous fumes passing from the casing *G*. In the one case the treating-fumes may carry with them the necessary moisture for the effective treatment of the grain. In the other case the water or other fluid which is projected against the grain carries all necessary moisture and with it in solution a quantity of the bleaching element, and the quantity of the bleaching element thus held in solution can be regulated to any extent desired and any strength of solution made by

varying the proportions of the casing *G* and the amount of water passed through it; but obviously a wide range of treatment can be attained by using either the fumes from the top of the casing or the solution from the bottom of the casing, or the two in combination.

When only the solution from the bottom of the casing is used and not the fumes, such solution provides both the moisture and the bleaching element and may be projected against the grain at any place desired, preferably when such grain is being moved from one bin to another, and when this solution only is used in the treatment of grain no treating-casing *G* is necessary.

In view of the fact that means are provided for forcing the fumes through the casing *G* the fumes may be introduced at any convenient point in the casing *G*, and therefore may be forced upwardly or downwardly, as may be desired.

It should be understood that in the drawings we have merely illustrated suggestive and convenient embodiments of our present invention; but obviously many variations may be made therefrom without departing from the spirit of our invention.

We claim—

1. In a grain-bleacher, the combination with a treating-compartment, of means for generating treating-fumes, a casing containing a mass of loose material, means for conducting said fumes into said casing, means for projecting free moisture into the upper part of said casing, and means for conducting the fumes from said casing to the grain-treating compartment.

2. In a grain-bleacher, the combination of a treating-compartment, a mixing-compartment having its upper portion in communication with the treating-compartment, said mixing-compartment containing a mass of broken material, a fumes-furnace in communication with the lower portion of the mixing-compartment, means adapted to maintain a flow of water through the mass of broken material, and suitable means adapted to conduct water from the lower part of the mixing-compartment to the treating-compartment.

3. In a grain-bleacher, the combination of a fumes-generator, a casing containing a mass of loose material, the lower portion of the casing being in communication with the fumes-generator so that fumes may rise through the mass of material in the casing, means for supplying water to the upper part of the casing so that the same may flow downwardly through the mass of material, a pipe leading from the lower part of the casing, and means adapted to maintain a flow there-through whereby water from the casing may be projected against grain to be treated.

4. In a grain-bleacher, the combination with a treating-stack, of a casing containing

2. mass of irregular material, the upper part
of the casing being in communication with
the stack, a source of treating-fumes in com-
munication with the lower part of the stack,
5 conducting means in communication with
the casing above and below the mass of mate-
rial, means for circulating water through said
conducting means and the mass of material,
and means whereby a portion of the water
10 may be withdrawn and projected into the
stack.

5. In a grain-bleacher, the combination of
a treating-stack, a casing containing a mass
of broken material, a fumes-furnace adapted
15 to supply treating-fumes to the casing,
means for conducting fumes from said fur-
nace to said stack, a reservoir in communica-
tion with the lower part of the casing, a pipe
leading from the reservoir and opening into

the upper part of the casing, a body of water 20
adapted to circulate through the casing, the
reservoir and pipe, and a pump adapted to
maintain the circulation of the water.

6. The combination with a vertical stack
arranged to receive a continuously-flowing 25
body of grain, of a sulfur-furnace, a casing
containing a mass of loose material such as
coke, means for conducting the fumes from
said furnace into said casing, means for pro-
jecting free moisture into the upper part of 30
said casing, and means for conducting the
fumes from said casing to said vertical stack.

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