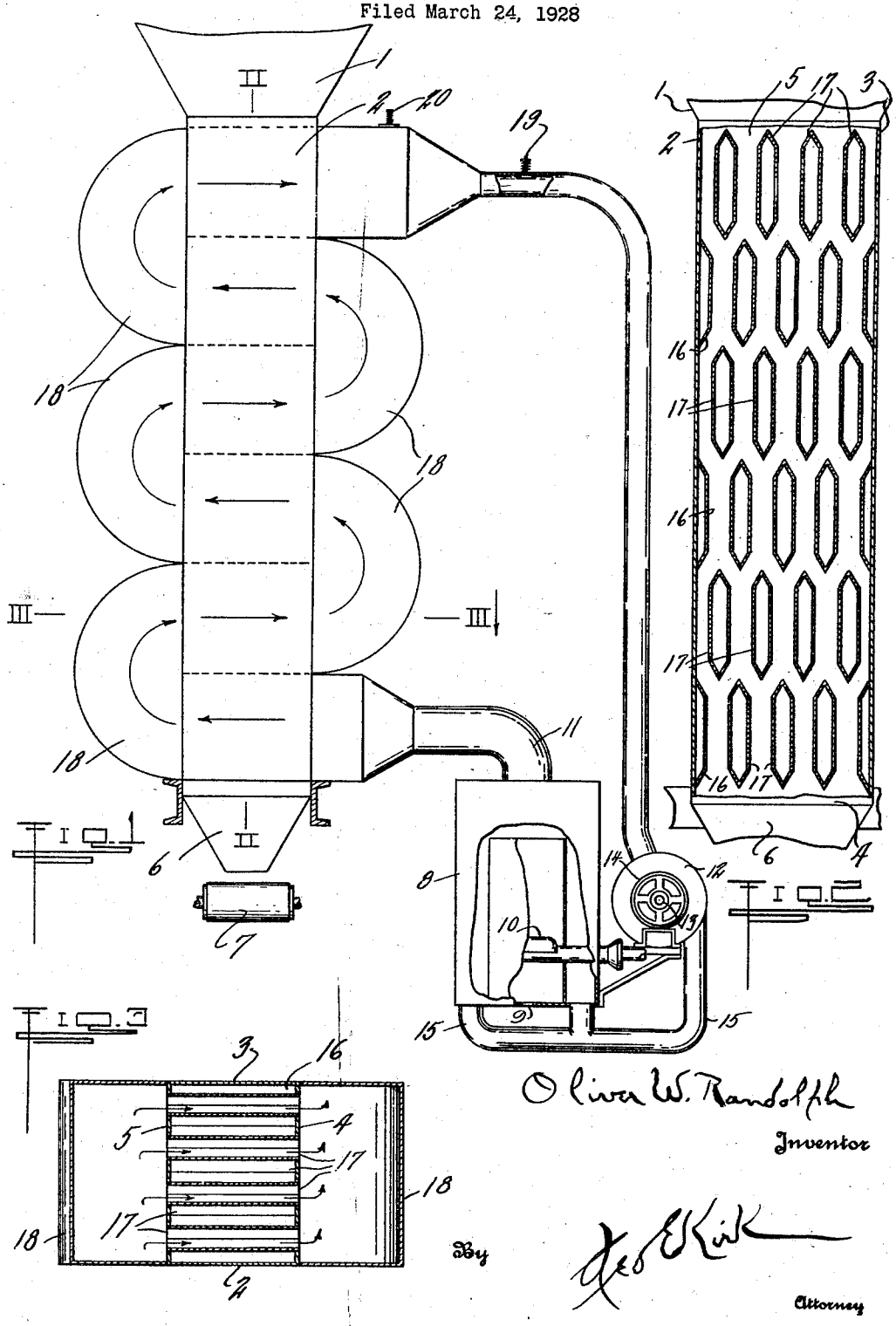
June 10, 1930. O. W. RANDOLPH 1,763,538

STERILIZER

Filed March 24, 1928



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Patented June 10, 1930 1,763,538

UNITED STATES PATENT OFFICE

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STERILIZER

Application filed March 24, 1928. Serial No. 264,515.

This invention relates to temperature controlled treatment of flowing material.

This invention has utility when incorporated in sterilizers for cereals.

Referring to the drawings:

Fig. 1 is a side elevation, with parts broken away, of an embodiment of the invention in a sterilizer for cereals;

Fig. 2 is a section on the line II—II, Fig. 1; and

Fig. 3 is a section on the line III—III, Fig. 1.

Hopper 1 is kept charged with flowing material, as wheat, to enter gravity way herein shown as comprising parallel side walls 2, 3, between opposing walls 4, 5. This gravity way 2, 3, 4, 5, terminates in discharge hopper 6 from which extends conveyor 7 in removing the material from this sterilizer to be sacked, placed in bins or for other disposition.

Furnace 8, as a heater, has air intake 9 to support combustion at burner 10. This expanded warm air passes from this furnace by duct 11. A draft inducing means herein is shown as fan or blower 12 having shaft 13 driven by motor 14. This fan has discharge therefrom by way 15 into the furnace, and thence by duct 11 to ducts 16, 17, between the walls 5, 4, which, as closed passages, extend transversely of the gravity way 2, 3, 4, 5. There is thus provided a pass for the heated medium transversely of this gravity flow way with an abstracting of some of the heat therefrom through the walls of the ducts 16, 17. Return bend 18 connects, from the lower first pass, the draft of this hot air for second pass through this gravity flow way transversely by ducts 17, to second return bend 18 for repassage by ducts 16, 17, with a repetition of this reverse pass to an extent desired in the provision of two vertical series of return bends staggered to produce a sinuous way intercepting the gravity way transversely and in an opposing direction to the material flow in such gravity way.

As herein shown, the cross-sectional area of the ducts 16, 17, in one pass approximates the cross-section area of the ducts 17 in the adjacent pass. Accordingly, in the operation herein, the reduction in the temperature of the treating medium, as hot air, brings about a contraction of such so that the initial velocity is greatly reduced. This means with a longer interval of contact in the upper passes or transverse ducts, there is heat exchange increase. However, the proportioning is desirably one wherein there may be efficiency in these steps of heat transference.

Assuming the grain in the hopper 1 has a temperature of 65° F. and it is desired to have such grain discharge to the conveyor 7 at a temperature approximately 150° F., the heated air may be supplied at say 280° F. with discharge of said air by the duct 9 to the furnace 8 at a temperature of approximately 160° F. This approximates about 20° F. temperature drop per pass with six passes as herein shown as to the treating medium. This will approximate a taking up of temperature per pass by the cereal of about 15° F. Accordingly, the solid mass of flowing grain in the gravity way 2, 3, 4, 5, as tumbling about over the vertically staggered ducts 16, 17, thoroughly exposes all of such grain throughout this flowing solid stream to more or less abutting contact with the walls of the heat imparting closed ducts in this recirculation closed sterilizing circuit.

It is to be noted this approximates a difference of about 115° F. between the heating medium and the medium to be treated as entering the successive passes. This approximately constant temperature difference means there is approximately a uniform heat transference which in the slowing up of the velocity in the ascent, due to the contraction of the gases, may work out for possible advantage in the upper stages. Such balancing of pressure as may be desired in the operations herein, is cared for by automatic air intake valve 19 and automatic relief or exhaust valve 20 in the duct 9 opening as there may be pressure reduction falling short of the demand for hot air through the furnace as introduced by the fan 12. The stem to intake valve 19 is fixed with the disk and as the disk moves inward compresses the spring about such stem as tending normally to hold the valve 19 closed. The valve 20 has its stem fixed and

the spring about such stem tends to hold the disk of this valve 20 in closed position. As the disk raises, it compresses the spring on the stem.

In the operations herein in this closed circuit, there is, as a sterilizer, a retention of the mass and weight of the material being treated. In fact, in runs of grain, there has been, notwithstanding the increase of temperature, from 65° F. to 150° F. on discharge, a loss of less than 1% in weight.

What is claimed and it is desired to secure by Letters Patent is:

1. A temperature controlled apparatus comprising a rectangular vertical way for granular material to be exposed to temperature treatment therein, said way having transverse upwardly and downwardly pointed vertically parallel flat sided hexagonal cross section ducts vertically staggered, and return bend connections laterally of said way in two opposing vertically opposite series cooperating with said ducts as the connecting passage in a sinuous vertical course independently of communication with said way, equal pressure being maintained throughout said ducts so as to approximate equal heat transference from the separate ducts throughout the apparatus.

2. A closed circuit sterilzer comprising a gravity way for the material to be treated, transverse ducts through said way, a relatively staggered opposing vertical series of return bends on opposite sides of said way connecting said ducts as a sinuous vertical series in providing a course isolated from the gravity way, a connection for the course exteriorly of the gravity way between the top and bottom of said ducts and therewith providing a closed circuit, said connection as delivering to the course expanding thereinto and heating means in said connection, equal pressure being maintained throughout said ducts so as to approximate equal heat transference from the separate ducts throughout the sterilizer.

3. A closed circuit sterilizer comprising in series heating means, a sinuous heat-giving-off way including ducts, a lesser cross-sectional dimension duct from the way than said way, a fan drawing hot air through said duct away from the way and delivering to the heating means, and a granular material gravity way transversely of which said ducts extend, said gravity way being independent of communication with said closed circuit, equal pressure being maintained throughout said ducts so as to approximate equal heat transference from the separate ducts throughout the sterilizer.

In witness whereof I affix my signature.

OLIVER W. RANDOLPH.