

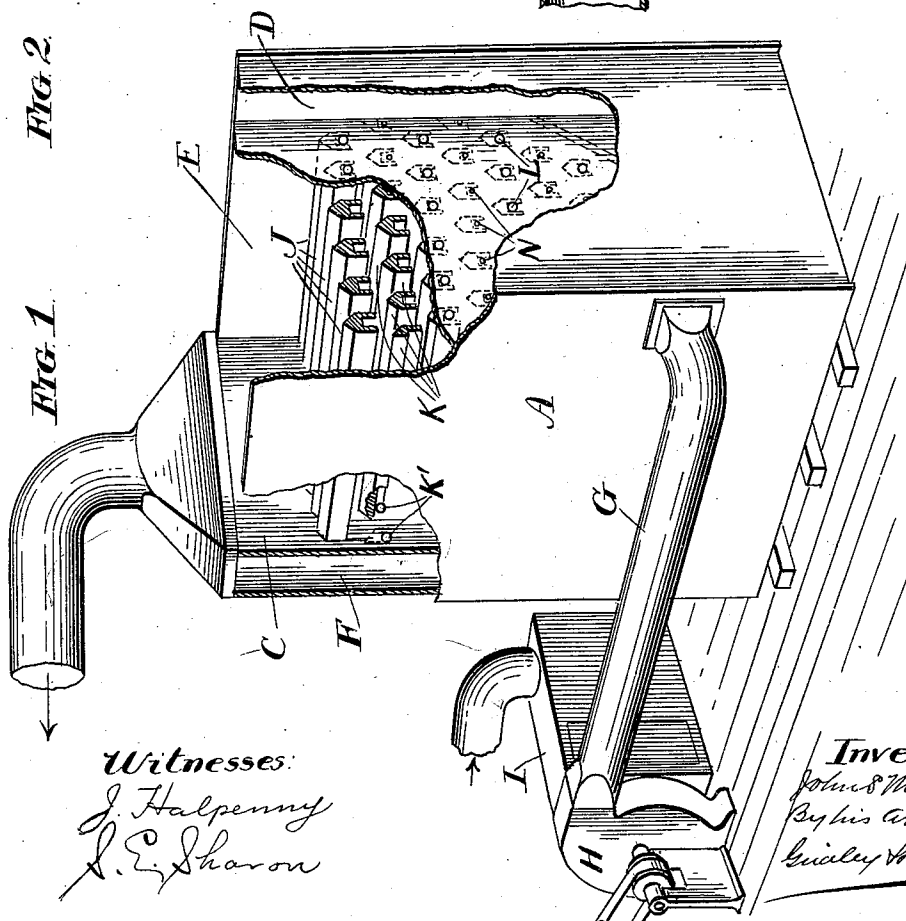
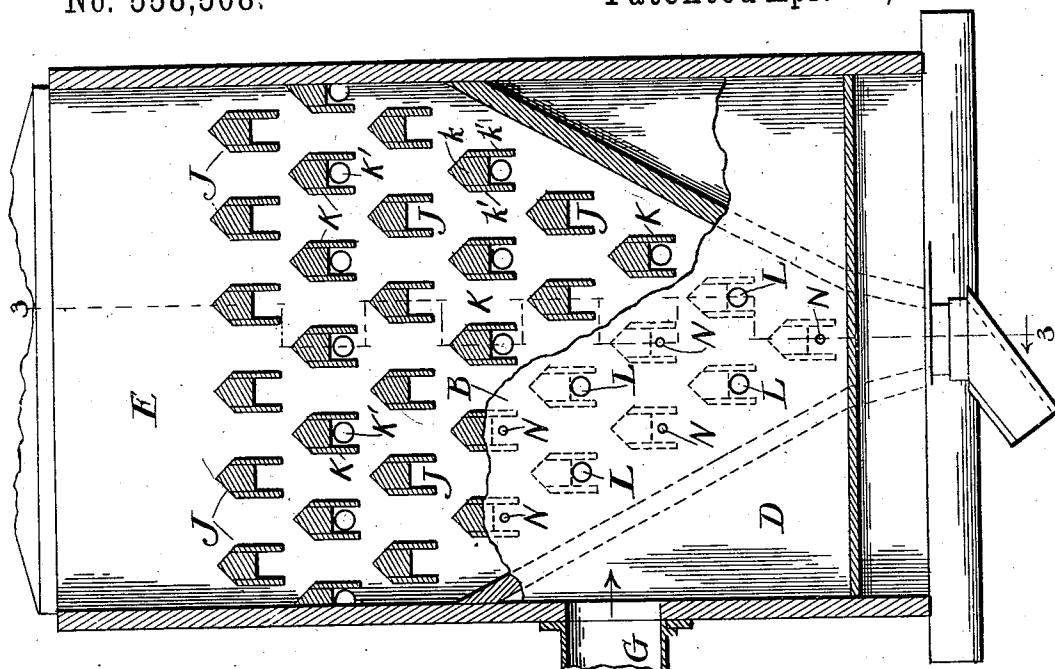
(No Model.)

2 Sheets—Sheet 1.

J. S. METCALF.
GRAIN DRIER.

No. 558,508.

Patented Apr. 21, 1896.



Witnesses:

J. Halpenny
S. E. Sharon

Inventor:

John S. Mearns
By his Attorney
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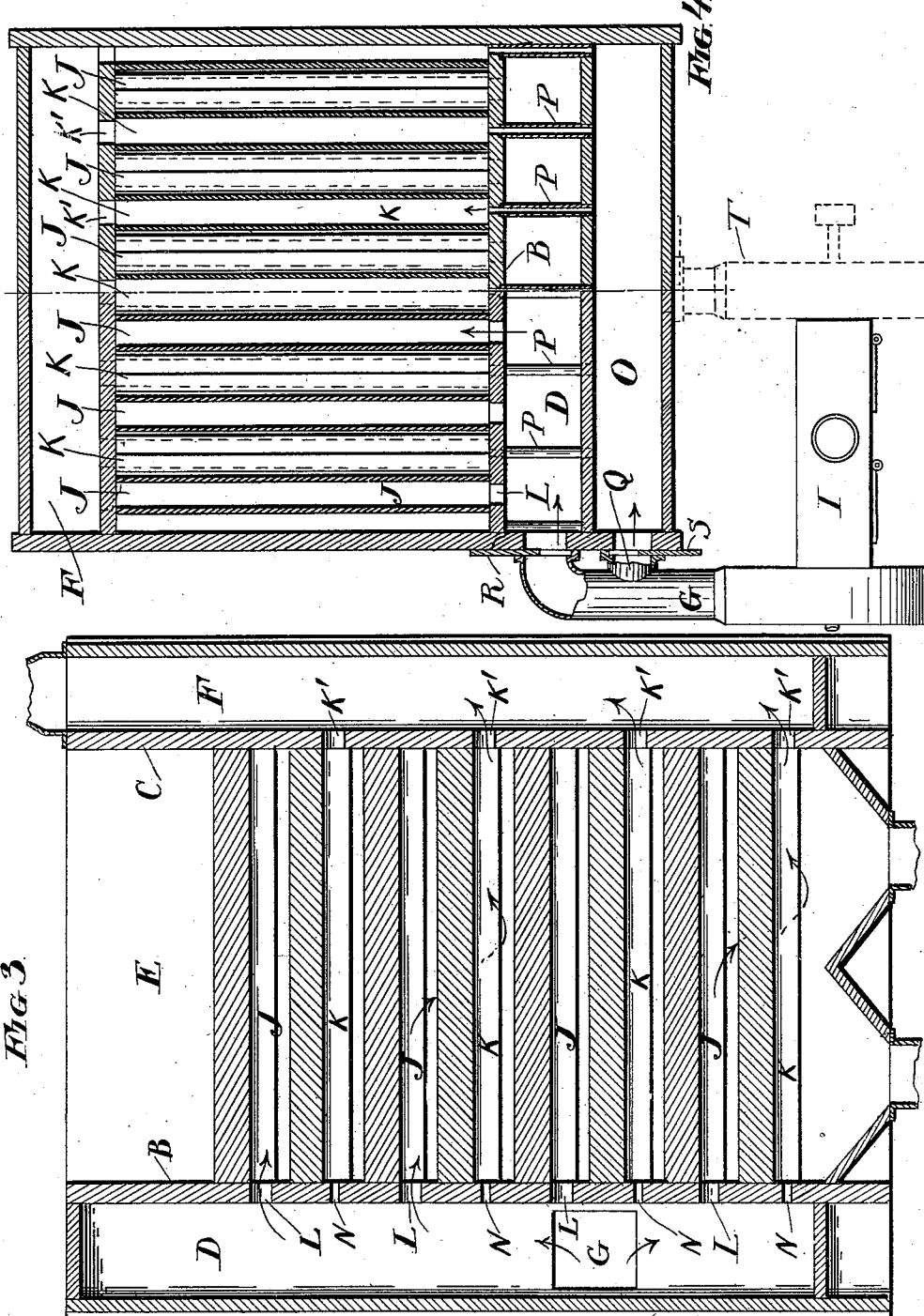
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J. E. Sharon

Inventor:

John S. Metcalf
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UNITED STATES PATENT OFFICE.

JOHN S. METCALF, OF CHICAGO, ILLINOIS.

GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 558,508, dated April 21, 1896.

Application filed March 28, 1895. Serial No. 543,466. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. METCALF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Drying Grain, of which the following is a specification, reference being had to the accompanying drawings, which are made a part hereof, and in which—

Figure 1 is a perspective view of an apparatus embodying the invention, some of the parts being broken away. Fig. 2 is a section thereof taken in irregular vertical planes. Fig. 3 is a vertical section thereof on the line 3 3, Fig. 2. Fig. 4 is a horizontal section thereof under a slight modification, the section being taken in two planes.

The ratio or quantity of aqueous vapor that can be absorbed by air, or, in other words, its degree of saturation, depends upon the temperature, being greater as the temperature increases, and vice versa. Consequently if a body of atmospheric air be heated to a given temperature and be then passed through a body of wet grain or any other material of a very much lower temperature, during its entire passage through the grain the temperature of the air will decrease. It follows, therefore, that after it has become saturated to its fullest capacity from that time on, so long as its temperature continues to fall, the vapor will be condensed and will settle upon the grain or whatever else it comes in contact with. Hence if a current of dry heated air be passed through a body of grain which is uniformly damp there will come a time when the grain will be perfectly dry in the vicinity of the point where the air enters it and damp from that vicinity to the point where the air leaves it, and the degree of this dampness will increase in the direction traveled by the air, being greatest where the air leaves the grain.

The object of the present invention is to provide an apparatus for drying grain of such construction that the objection above pointed out will be obviated as much as possible; and to this end the invention consists in the features that are particularly pointed out in the claims hereinafter.

In the drawings, A represents a casing which may be of any suitable construction,

and B and C represent two partitions arranged within the casing and dividing its interior into three compartments or chambers D, E, and F. With the chamber D communicates a pipe G, which leads from the discharge-nozzle of a fan H, the eye of which is in communication with an air-heater I, which is not shown in detail, because the present invention is not limited to a heater of any particular construction. Any heater that will raise the temperature of the air to the desired degree will answer the purpose and be included within the term "heater" as used in this specification.

The grain is dried in the chamber E, which in the example shown in the drawings is traversed by a number of ducts or passages J and K. In the example shown each of these passages is constructed of a heavy central beam or timber *k*, to the opposite sides of which are secured boards *k'*, that project downward some distance below it, these three parts together forming a sort of inverted trough; but I desire to have it understood that in its broadest aspect the present invention is not limited to an air-passage of any particular construction. In the example shown these passages are arranged quincunally or staggered, and while this arrangement is preferred, still it is not essential.

The passages J constitute what may properly be termed the "inlet-passages," and each of them is in open communication with the hot-air chamber D through an opening L of ample capacity formed through the partition B.

The passages K may properly be termed the "outlet-passages," and each of them is in open communication with the chamber F through an opening K' of ample capacity formed through the partition C. The inlet-passages being closed, excepting as above described, it follows that hot air forced into them from the hot-air chamber D will escape from their open lower sides, and as each of them occupies a position that is central with relation to each group of four outlet-passages the hot air will seek these four outlet-passages, and thus permeate the mass of grain in all directions. It will be understood, of course, that while all of these passages are buried under the grain, none of them are filled, as

the grain is not sufficiently mobile to flow upward between their depending sides.

Grain-driers having passages constructed and arranged substantially in the manner described have long been in use, and in using them it is found that, owing to the facts stated in the early part of this specification, the grain in the immediate vicinity of the open bottom of the inlet-passages soon becomes thoroughly dried, and that from this point to the point where the air leaves the grain and enters the outlet-passages the dampness increases, the grain immediately beneath said outlet-passages being thoroughly soaked.

It is found also that the soaking of the grain at this point is due principally to the fact that much of the moisture absorbed by the air as it passes through the grain is condensed and precipitated after entering the outlet-passage. This being so, it follows that if the temperature of the air can be maintained at a sufficient degree after it enters these outlet-passages there will be no condensation and precipitation within them, and the evil resulting therefrom will therefore be avoided. To this end I introduce into each of these outlet-passages a volume of dry air at a sufficiently high temperature to raise and maintain the temperature of the air, leaving the grain above the dew-point. This, then, is my improved method of drying grain. Broadly stated, it consists in passing heated air through the body of grain and introducing to this air, as it leaves the grain saturated with vapor, a sufficient quantity of dry heated air to prevent condensation and consequent precipitation, and I desire to have it understood that in its broadest aspect my invention is not limited to an apparatus of any particular construction for carrying out this improved method, albeit I prefer the apparatus shown in Figs. 1, 2, and 3 of the drawings, as it is simple, cheap, and effective.

In this apparatus the dry heated air is introduced into the outlet-passages from the hot-air chamber D, through perforations N, formed through the partition B, opposite the ends of said ducts or passages, the relative capacities of the openings L and N being such that the air passing through L will have sufficient pressure to permeate the grain in the manner described.

As shown in Fig. 4, the dry air that is introduced into the outlet-passages is not taken from the air-chamber D, but from a separate chamber O, from which it is conducted through the chamber D and to the outlet-passages by tubes P. This chamber O may be supplied with air from the fan H through a branch pipe Q, and the force of the air entering the chambers D and O may be regulated by valves R and S, located in the pipes G and Q, respectively, or the fan H may be used exclusively for supplying the chamber D, and a separate fan T (indicated by dotted lines) provided for supplying the chamber O; but these are mere details in construction which will depend

upon the circumstances in individual cases, and the invention is not to be understood as being limited to them.

The term "passage," as used in this specification in referring to the outlet-passages K, is not to be interpreted as being limited to a passage of any particular size, shape, or construction; but it is to be construed broadly and includes any duct, passage, space, or chamber of whatever shape, size, or construction into which the air enters after it leaves the material being dried.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a drying apparatus, the combination with a chamber in which the material to be dried is placed, of means for introducing heated air into said chamber, an outlet-passage into which the air enters after leaving the material being dried, means for introducing heated air into said outlet-passage, and an outlet-opening through which the mixed volumes of air escape from said passage without again entering the drying-chamber, substantially as set forth.

2. In a drying apparatus the combination with a chamber in which the material to be dried is placed, of means for introducing heated air into said chamber, a number of outlet-passages into which the air enters after leaving the material being dried, and means for introducing heated air into each of said outlet-passages, substantially as set forth.

3. In a drying apparatus, the combination with a chamber in which the material to be dried is placed, of means for introducing heated air into said chamber, an outlet-passage traversing said chamber, said outlet-passage being open at bottom for receiving the air after it leaves the material being dried, and means for introducing heated air into said outlet-passage, substantially as set forth.

4. In a drying apparatus the combination with a chamber in which the material to be dried is placed, of means for introducing heated air into said chamber, a number of outlet-passages open at bottom for receiving the air after it leaves the material being dried, a chamber with which all of said outlet-passages communicate at their discharge ends, and means for introducing heated air into the opposite end of each of said passages, substantially as set forth.

5. In a drying apparatus the combination with a chamber in which the material to be dried is placed, of a number of air inlet and outlet passages traversing said chamber, a chamber with which all of said passages communicate at one end, means for forcing heated air into said chamber, and a chamber with which all of the outlet-passages communicate at the other end, the passages being open at the under side, substantially as set forth.

JOHN S. METCALF.

Witnesses:

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S. E. SHARON.