April 10, 1934. J. W. DOHERTY 1,954,239

DRYING KILN

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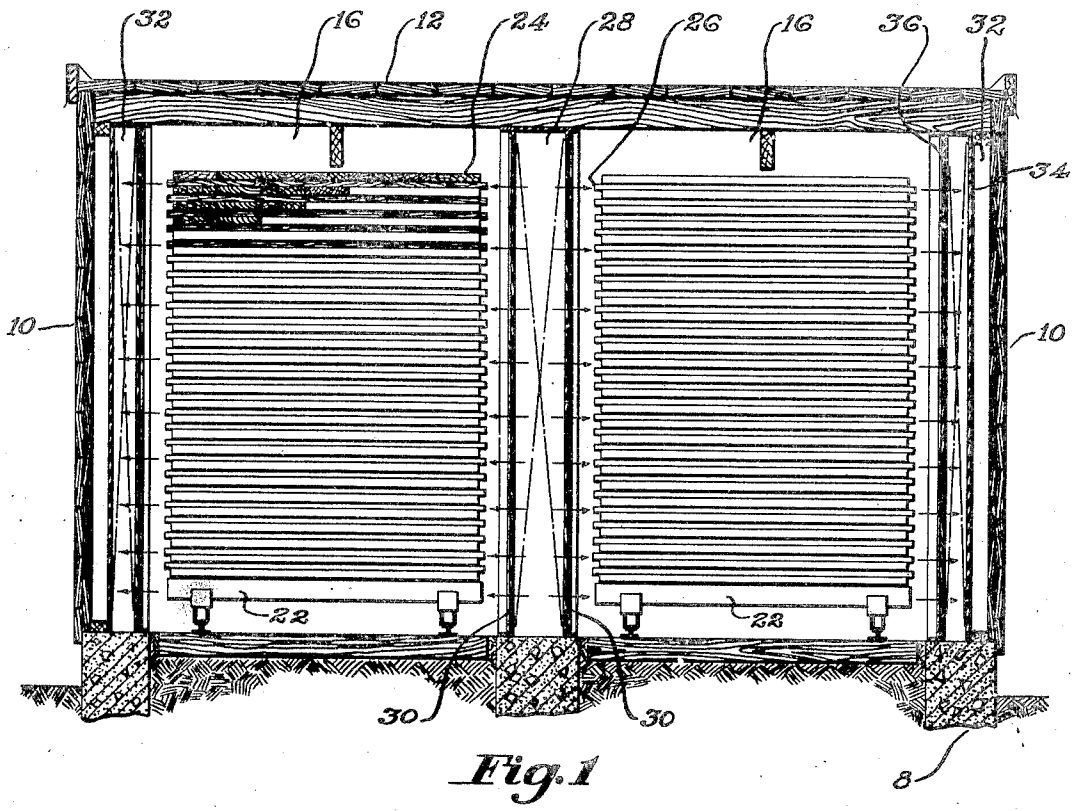


Fig. 1

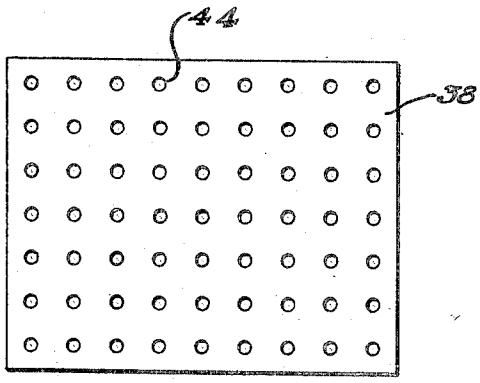


Fig. 2

Witness

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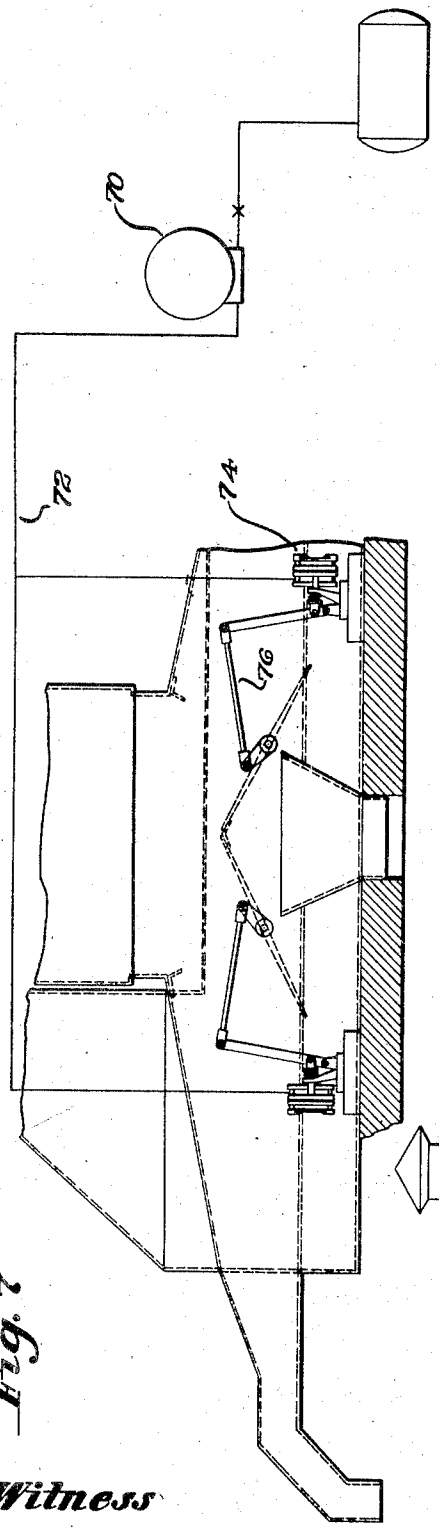


Fig. 7

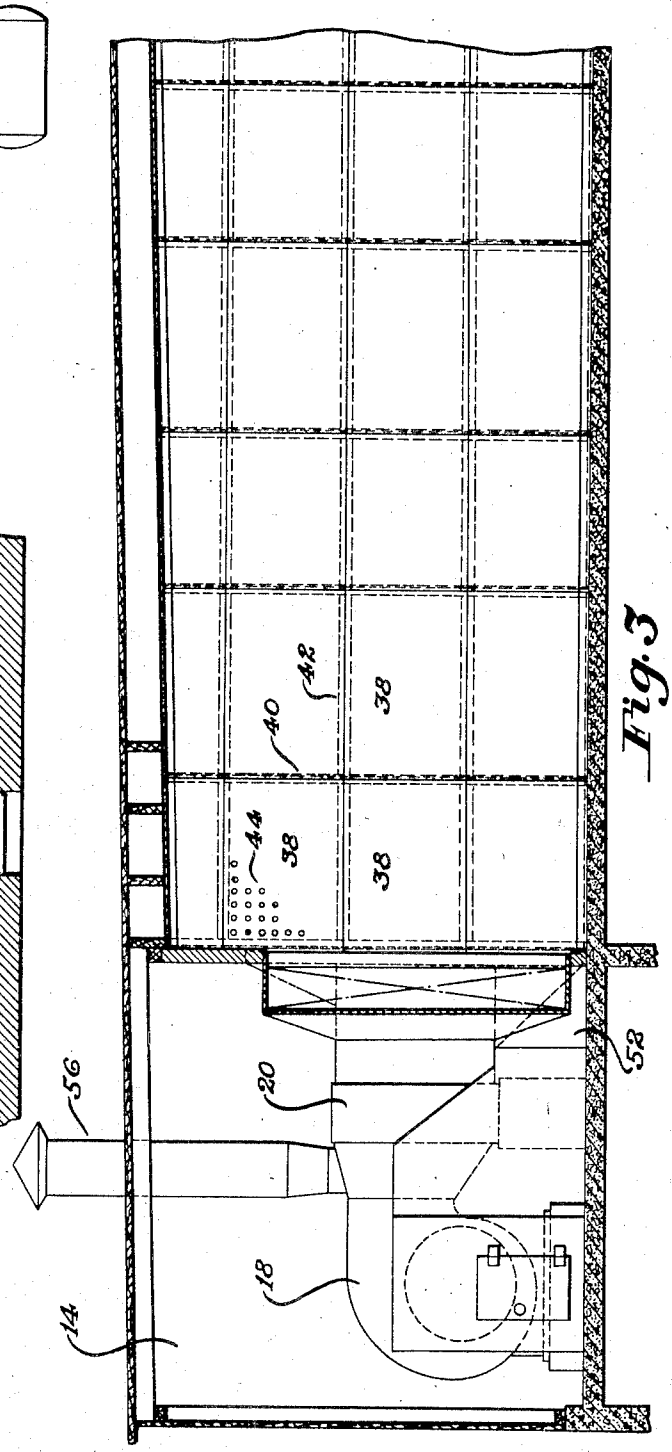


Fig. 3

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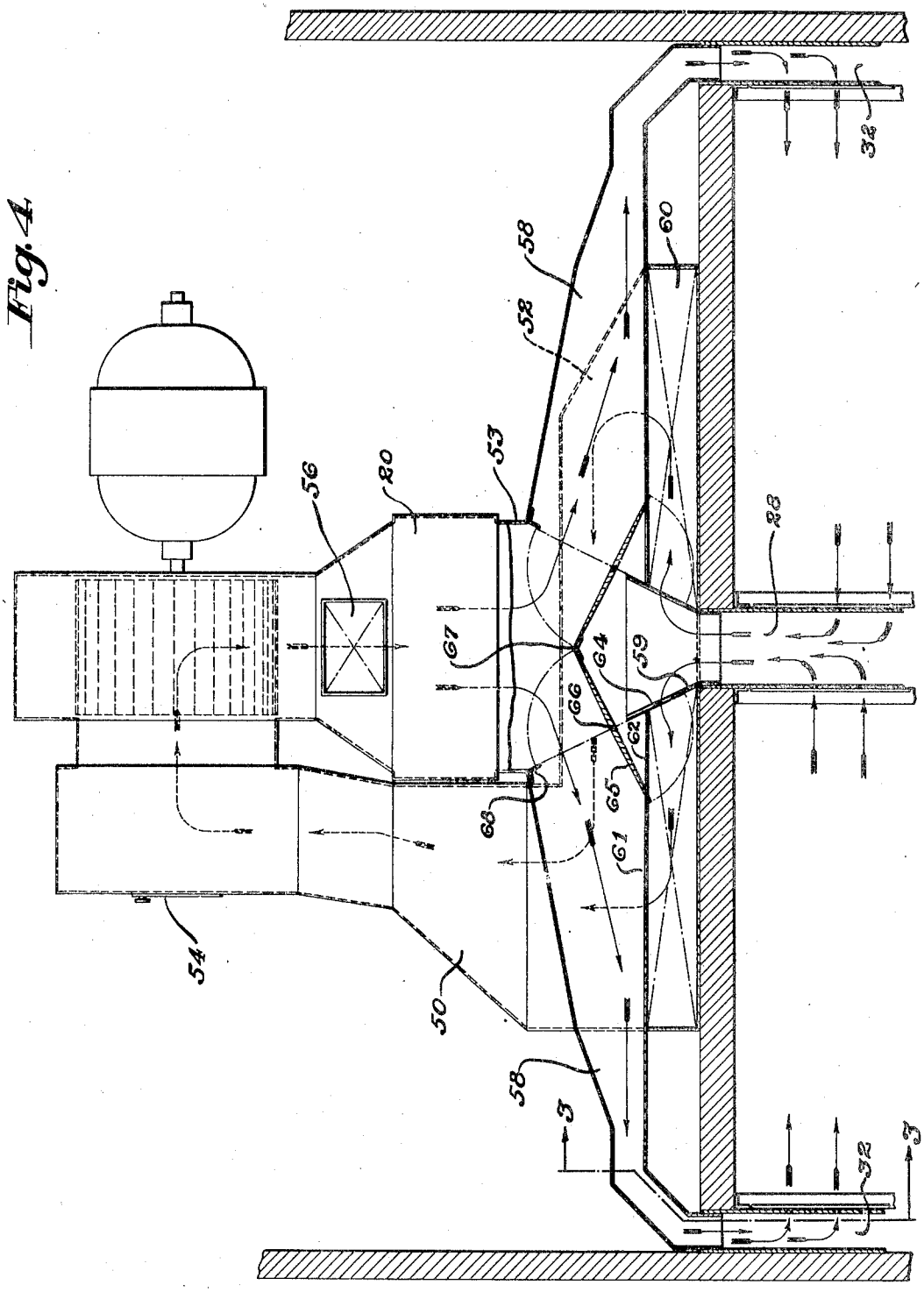
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Fig. 4



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Fig. 5

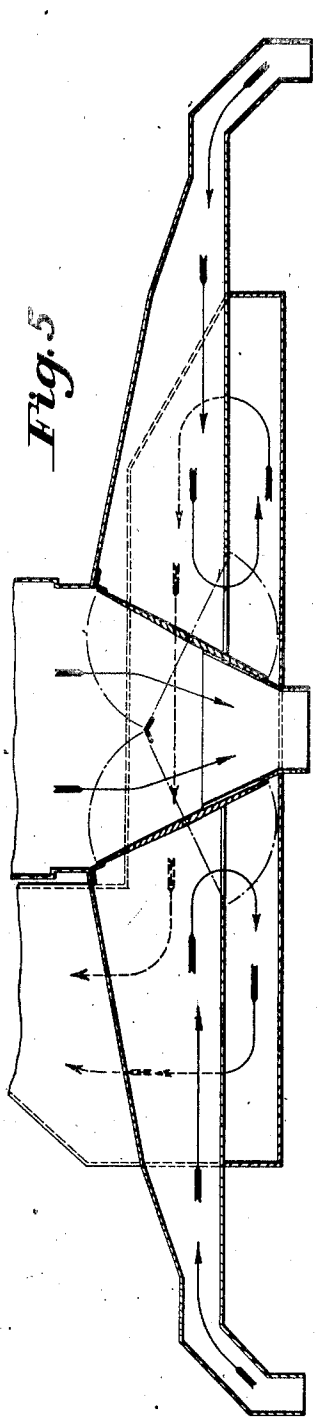
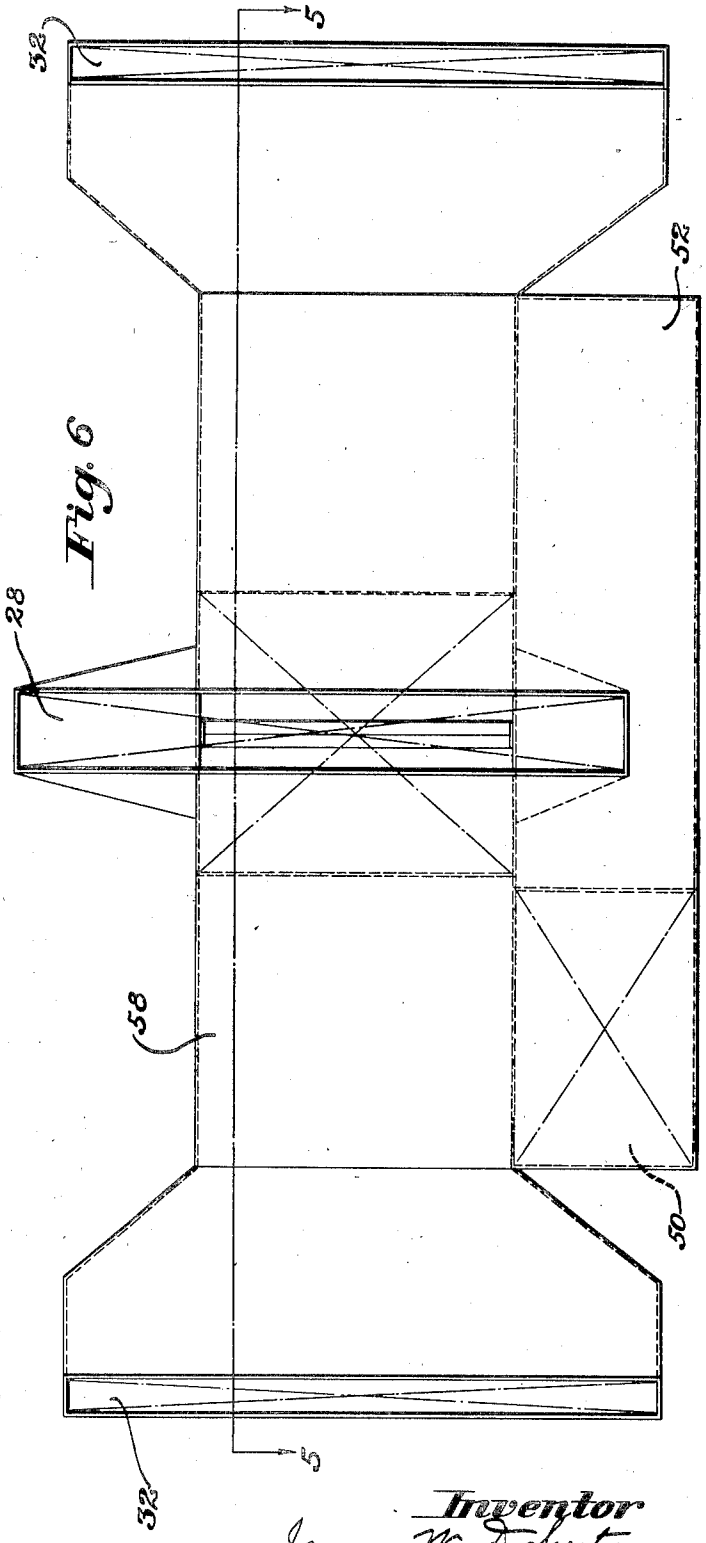


Fig. 6



Witness

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UNITED STATES PATENT OFFICE

1,954,239

DRYING KILN

James W. Doherty, Hyde Park, Mass., assignor to B. F. Sturtevant Company, Hyde Park, Mass., a corporation of Massachusetts

Application December 30, 1930, Serial No. 505,564
In Great Britain August 28, 1930

1 Claim. (Cl. 34—46)

The present invention relates to drying kilns.

The object of the present invention is to provide simple and effective means for subjecting the material in the kiln to currents of air in opposite directions to the end that all material in the kiln may be uniformly treated.

With this object in view, the present invention consists of the kiln and associated apparatus hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating the preferred form of invention as applied to a kiln for drying lumber, Fig. 1 is an end sectional elevation of a kiln embodying two drying rooms; Fig. 2 is an elevation of a plate forming a portion of the duct wall; Fig. 3 is a sectional elevation of a kiln, being taken on line 3—3 of Fig. 4; Fig. 4 is a horizontal sectional view of a portion of the kiln showing the blower and associated apparatus; Fig. 5 is a horizontal sectional view of a part of the apparatus shown in Fig. 4 to illustrate the arrangement of dampers for reversal of flow, being taken in section on line 5—5 of Fig. 6; Fig. 6 is an end view of the duct connections; and Fig. 7 is a diagram illustrating the automatic connections for reversing the air flows.

The illustrated kiln comprises a cement foundation 8 and insulated outer walls 10, and a roof 12. The kiln is provided at one end with a fan chamber 14 and is divided longitudinally into two drying rooms 16. Within the fan chamber are received a centrifugal fan 18 and the air heating and humidifying apparatus 20 of any usual or preferred form.

The material to be dried is stacked on trucks 22 and rolled into the drying room on suitable rolls in the usual manner. As shown in Fig. 1, the material to be dried comprises planks 24 of wood arranged in horizontal rows and separated by the usual transverse stickers 26. Arranged longitudinally between the drying rooms and extending the full length of the kiln is a central duct 28 enclosed between walls 30. At the outer sides of the kiln are disposed ducts 32 each of which comprises an imperforate wall 34 spaced inwardly from the sides 10 of the kiln to provide heat insulation and a perforate wall 36 communicating with the drying room. Inasmuch as the central duct 28 furnishes air for both drying rooms, its width is approximately twice that of each outside duct 32. When constructed for flow of air, as indicated by the arrows in Fig. 1, the central duct 28 is a supply duct and the outside ducts 32 are exhaust or return ducts. The supply duct 28 is connected to the outlet of the fan and the exhaust ducts 32 return the air to the inlet side of the fan. According to the present invention, the air flow may be reversed, as will hereinafter be described, so that the ducts 32 become supply ducts and the central duct 28 becomes an exhaust duct.

Referring now to the duct walls through which the air passes between the ducts and the drying rooms, the walls 30 of the central duct 28 comprise a plurality of perforated plates 38 assembled as shown in Fig. 3 on vertical angles 40 and horizontal stringers 42. Each plate 38 has a large number of regularly arranged, closely spaced openings 44. The aggregate area of the openings 44 in one wall 30 is less than one-half the total cross-sectional area of the supply duct, preferably about one-third of the supply duct area, although a ratio of between 30 and 40% is usually satisfactory. The cross-sectional area of the duct on which the ratio of areas is based is the area of the duct opening, as viewed in Fig. 1, but it will be understood that in the particular form of the invention shown in Fig. 1, wherein the central duct 28 acts as a supply duct for both drying rooms, the effective supply duct area for each drying room is only one-half of the total cross-sectional area of the entire central duct 28. This preferred ratio of areas assures a smooth, uniform flow of air through the material.

The wall 36 of each outer duct 32 is similar in construction to the walls 30 of the inner duct.

In the preferred construction, the plates 38 forming the duct walls are made of standard size, suitable for kilns of any length; and in the manufacture of particular kilns, the duct areas are varied to carry the requisite amount of air to the drying rooms. Thus, for a kiln 100 feet long, the ducts are of a certain area, and the duct walls are composed of the requisite number of plates; for a kiln 200 feet long, plates of the same construction are used, but the ducts are made twice as wide to maintain the same ratio of orifice area to duct cross-sectional area.

In operation, the air is first circulated for a time in the direction indicated by the arrows in Fig. 1, that is, from the duct 28 outwardly to the ducts 32, and the flow is then reversed, that is, from the ducts 32 inwardly to the ducts 28. The value of the reversing feature is most apparent in the treatment of material of high moisture content wherein relatively dry air is circulated at fairly high velocity through the drying chamber. In such a case, if the air is always circulated in the same direction, that portion of the material in the drying chamber near the

supply duct is much more rapidly dried than the portion near the exhaust duct. By periodical reversals of flow, however, all portions of the material are subjected to substantially equal drying action.

The construction of ducts and passages by which reversal of air flow is secured is shown in Figs. 4 to 7 inclusive. The intake of the fan connects through a passage 50 with a fan inlet chamber 52, which extends transversely across the bottom of the fan chamber, and the outlet of the fan connects through the heating and humidifying apparatus 20 with an outlet chamber 53. The intake of the fan is provided with an adjustable door 54 to continuously make up a small proportion of fresh air and the outlet communicates with a stack 56 to discharge a portion of the used air to the atmosphere. Each outside duct is connected with a chamber 58. These chambers are mounted directly above the fan inlet chamber 52 and are connected with the neck 53. The central duct 28 is fitted with a tapered throat 59. The fan inlet chamber is provided with an upstanding portion 60 which is adapted to communicate with either the chambers 58 or the throat 59, and to this end, one wall 61 of each chamber 58 is provided with a vertical opening 62, and each side of the throat is cut away at 64. The direction of circulation of air through the chambers 58 and the throat 59 is selectively controlled by two flat plate dampers 65 which are mounted on rock shafts 66. The dampers swing in the openings 62 of the walls 61; in one position thereof as shown in Fig. 4, they shut off communication between the chambers 58 and the chamber 52 and establish communication between the throat 59 and the chamber 52 by respectively closing the openings 62 and opening the cut-away portions 64. In the opposite position of the dampers, as shown in Fig. 5, the reverse connections are established, that is, the openings 62 are opened and the cut-away portions 64 are closed.

In the position of Fig. 4, the edges of the dampers bear against a central vertical angular bracket 67, and in the position of Fig. 5, they bear against vertical angles 68 at the joints between the chambers 58 and the neck 53.

In the position of Fig. 4, the outside ducts act as supply ducts and the central duct as an exhaust duct. Tracing the flow of air from the fan, as indicated by the arrows, the air passes first through the heating and humidifying apparatus 20 and the neck 53 and then directly into the chambers 58, the dampers 65 acting as baffles to direct the air without abrupt changes of direction. The air flows from the chambers 58 directly into the ducts 32, through the drying rooms, into the central duct 28, and thence through the throat 59 and the cut-away sides thereof into the chamber 52. From there, the air finds its way back to the fan intake through the passage 50.

With the dampers in the position shown in Fig. 5, the air flows are reversed. The air, after passing through the heating and humidifying apparatus, enters directly into the throat 60 and the supply duct 28, from which it flows across the drying rooms in the reverse direction to the exhaust ducts 32. From the ducts 32, the air enters the chambers 58 and passes through the openings 62 into the fan intake chamber 52.

The dampers may be automatically operated at intervals by a clock 70 controlling the air pressure in the line 72 which leads to diaphragm motors 74 connected by linkage 76 with the rock shafts 64 on which the dampers are mounted.

It will be noted that the construction and arrangement of the chambers and ducts is such that the direction of air flow through each drying chamber of the double or two chamber kiln is controlled and reversed by means of a single, flat plate damper which is of the most simple and inexpensive construction.

Having thus described the invention, what is claimed is:

A drying kiln comprising drying rooms, a central duct between the drying rooms and external ducts, a fan, an inlet chamber and an outlet chamber for the fan, passages leading from the external ducts to one of said chambers, a throat leading from the central duct to the same chamber, a pair of dampers in said chamber adapted in one position to close the central duct from the chamber and to permit communication of the chamber with the external ducts, and in another position to reverse the connections, the passages and the throat having openings leading into the other of said chambers, and the dampers being adapted to selectively open or close said openings, whereby fluid may be circulated by the fan either from the central duct outwardly or from the external ducts inwardly.

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