

Jan. 23, 1951

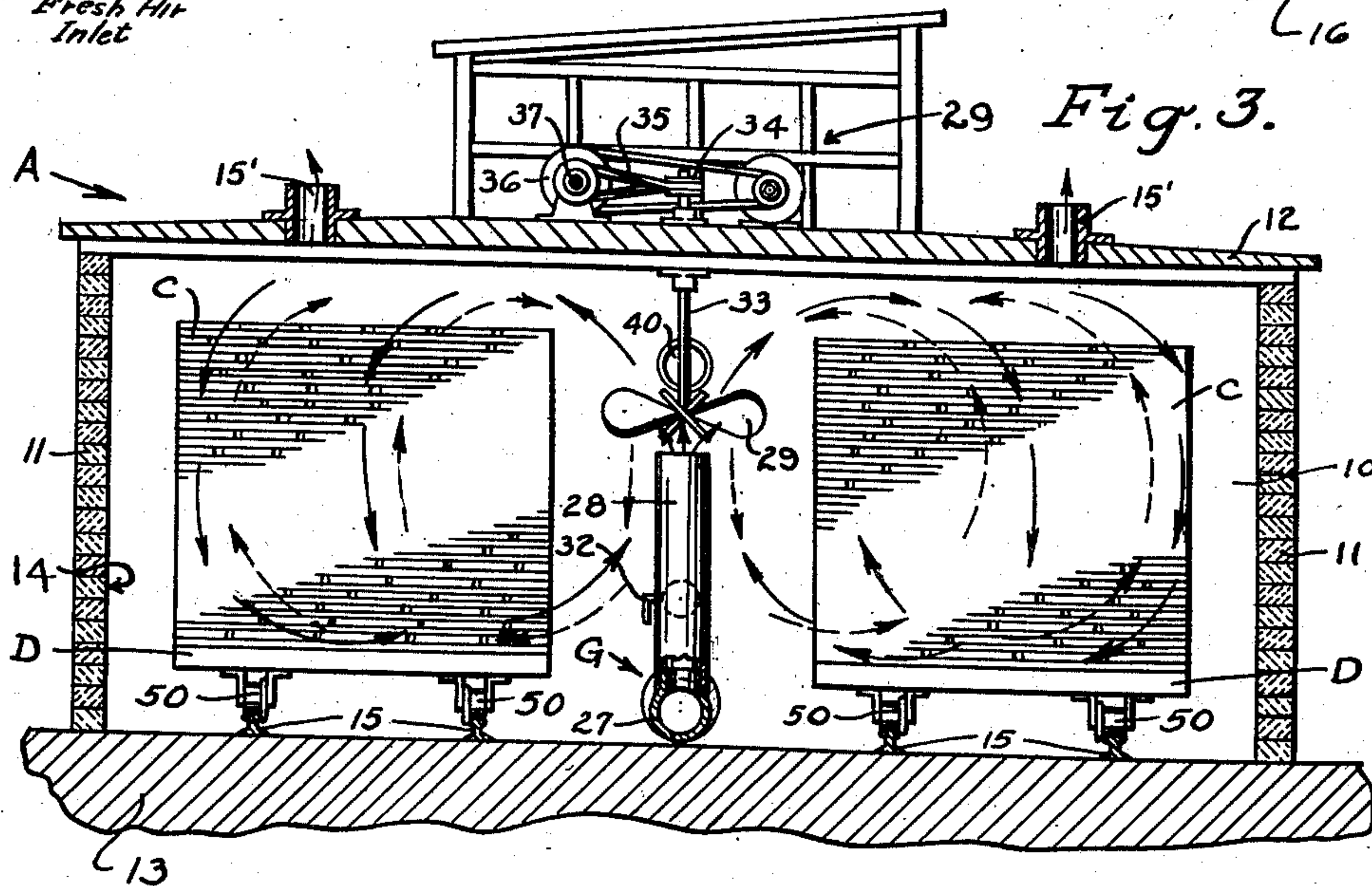
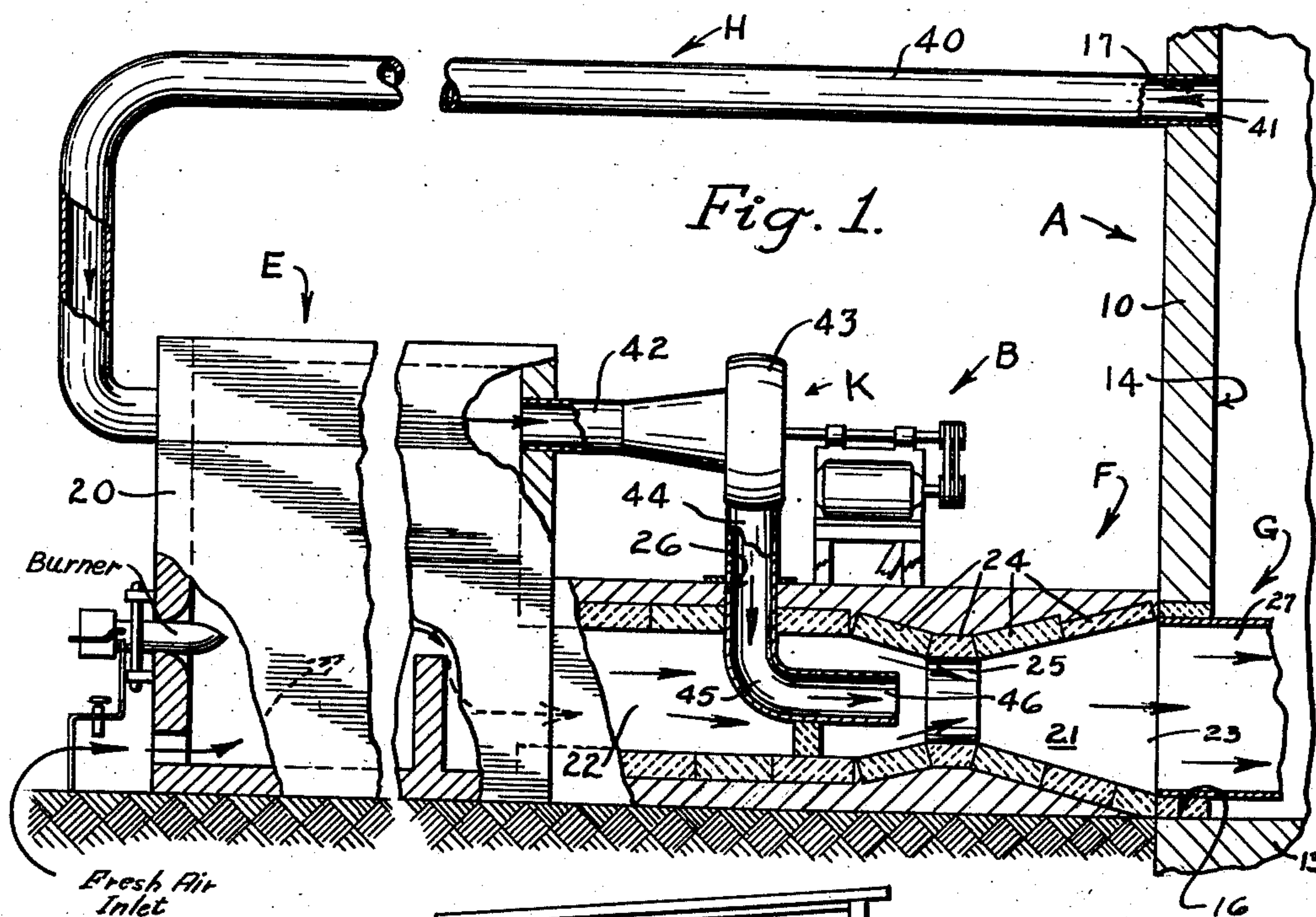
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2,538,888

DRIER FOR LUMBER AND THE LIKE

Filed April 15, 1948

2 Sheets-Sheet 1



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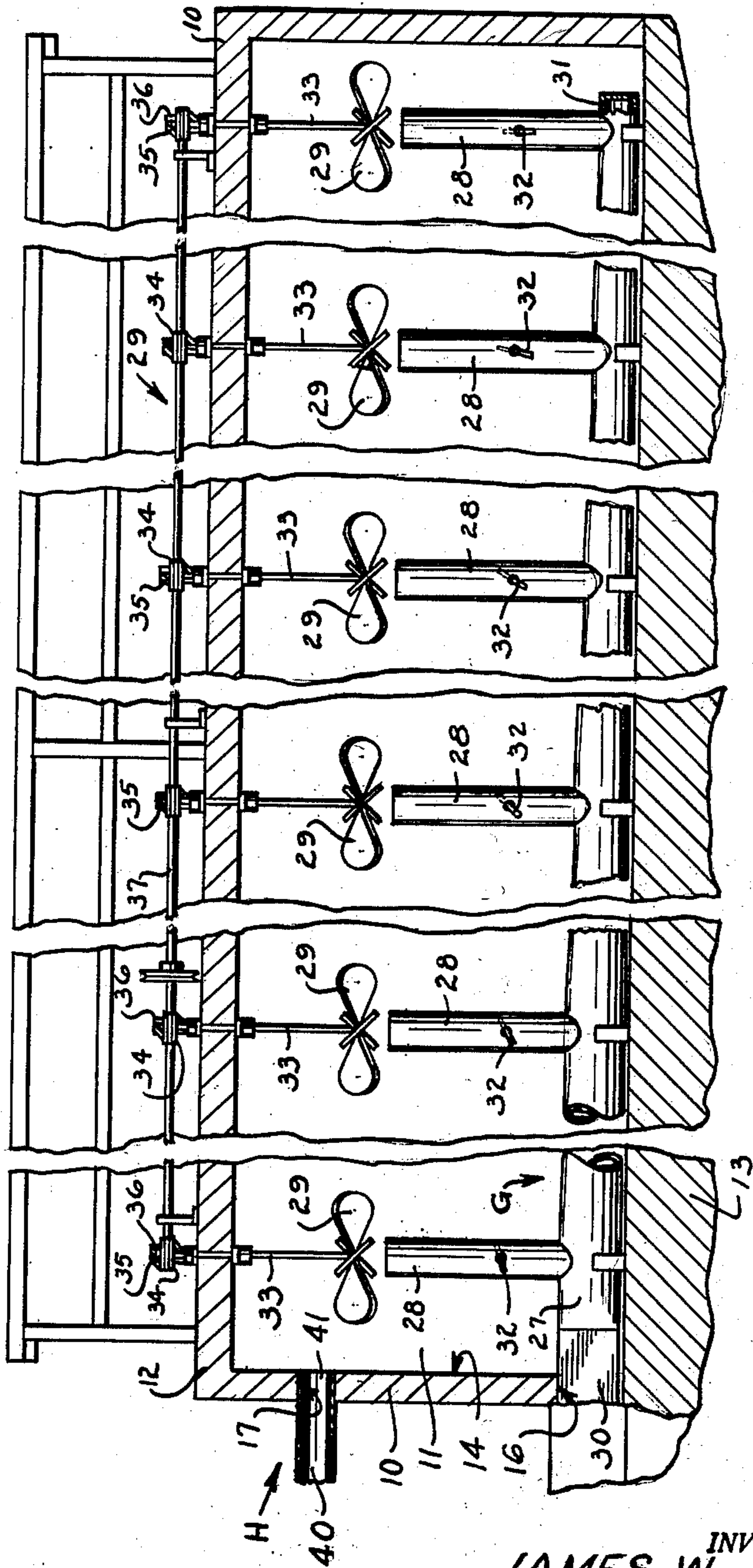


Fig. 2.

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2,538,888

DRIER FOR LUMBER AND THE LIKE

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Application April 15, 1948, Serial No. 21,221

4 Claims. (Cl. 34—223)

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This invention relates to driers embodying a controlled heat circulating system. Such driers may be employed, for example, in drying lumber within a dry kiln.

An important object of the invention is to provide a dryer for association with a dry kiln in which drier the heat is generated wholly outside the kiln.

Another important object is to provide such a drier which employs a carrier medium to aid in insuring the uniform distribution of heat throughout the length and breadth of the kiln, but controlled as required, which carrier medium is, preferably, the air drawn from the kiln and again introduced thereinto.

Still another important object is to provide a dryer whereby control of temperature and humidity within the kiln is effected for cell and/or progressive drying.

Yet another important object is to provide a dryer as described, which does not entail a large heating plant associated therewith.

Other objects and advantages of the invention will be apparent during the course of the following detailed description of the invention, taken in connection with the accompanying drawings, forming a part of this disclosure, and in which drawings:

Figure 1 is a view partly in side elevation and partly in vertical section of the novel dryer.

Figure 2 is a vertical longitudinal section of a kiln in which portions of the dryer are installed.

Figure 3 is a transverse section of the kiln, with dryer installed, and with the kiln containing material to be dried.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention and wherein similar reference characters designate corresponding parts throughout the several views, the letter A designates a dry kiln, with which the novel dryer B may be associated for drying the material C disposed upon suitable supports D.

The dry kiln A may be of any approved construction and include end walls 10, side walls 11, a roof 12 and floor 13, all defining a chamber 14. The floor may support spaced-apart rails 15. Suitable conventional means may be provided to draw off excess moisture from the chamber 15, as conduits 15'.

Only two essential changes need to be made to adapt the conventional dry kiln A to the novel dryer, these being an intake opening 16 in one wall, such as an end wall 10, adjacent the floor 13 and an outlet opening 17 spaced above the

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opening 16, and the opening 17 may be in the same end wall 10, as in Figure 1.

The novel dryer B comprises fluid heating means E; heated fluid conducting means F from the means E to the chamber 14 of the kiln A; means G to circulate heated fluid throughout the kiln A; means H to conduct a carrier medium from the kiln A to the fluid heating means E; and means K to draw the carrier medium from the kiln A through the means H and E and force it and the heated fluid through the means F into the chamber 14.

The fluid heating means E may be a suitable furnace 20, such as an oil or gas-fired one, disposed wholly outside and spaced from the kiln A and provided with any conventional means to permit entrance of regulated volumes of fluid, as air, for heating.

Heated fluid conducting means F from the fluid heating means E to the chamber 14 of the kiln A preferably comprises a conduit 21 opening at its intake end 22 into the lower portion of the furnace 20 and opening, at its exit end 23, into the intake opening 16 of the kiln wall. The conduit 21 is preferably interiorly lined with refractory material 24 and, intermediate its ends 22 and 23, is provided with a venturi 25. The conduit wall may be provided with an opening 26 spaced between the end 22 and venturi 25 for accommodation of a portion of the means K to be described.

Means G to circulate heated fluid throughout the kiln A preferably comprises a substantially horizontally-disposed conduit 27, substantially vertically-disposed, spaced-apart, open-ended conduits or laterals 28 leading therefrom, fans 29 disposed adjacent the upper open ends of the conduits 28, and means 29 to rotate the fans 28.

The conduit 27 preferably extends to the length of the chamber 14, opens at its intake end 30 into the exit end 23 of the conduit 21 and the opposite end 31 of the conduit 27 may be closed. From the end 30 to the end 31, the conduit 27 gradually decreases in internal diameter.

Mounted upon and opening into the conduit 27 are the spaced-apart, substantially vertically-disposed open-ended conduits or laterals 28. They may be of less internal diameter than the internal diameter of any portion of the conduit 27 and each is of substantially the same internal diameter. They extend upwardly toward the roof 12 to, for example, substantially half the height of the chamber 14 and may carry conventional dampers 32, whereby the volume of the

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current of heated fluid drawn through them may be regulated, as is well known in the art.

The fans 29 are constructed and arranged to draw heated fluid through the conduits or laterals 28, out their open ends and whirl it throughout the chamber 14, substantially as shown by the full line arrows in Figure 3 or, with the direction of rotation of the fans conventionally reversed, whirl it substantially as shown by the dotted line arrows of this Figure 3. Preferably one is disposed relatively close to the upper end of a conduit 28 with its axis of rotations substantially coincident with the longitudinal axis of the conduit 28.

These fans 29 may be rotated by any suitable means 29. For example, the upwardly-extending shafts 33 may be journaled in the roof 12 and terminate, exteriorly thereof in pulleys 34 carrying crossed belts 35 extending to pulleys 36 mounted upon a shaft 37 operatively connected with any suitable means, as an engine or motor.

Means H to conduct a carrier medium from the kiln A to the fluid heating means E is shown mainly in Fig. 1 and comprises a conduit 40 which extends from its intake end 41 at the kiln wall outlet opening 17 to the furnace 20 thence through the upper part of the furnace and out of the furnace and through the outlet conduit 42 outside the furnace opening into the means K next to be described.

Means K is, more specifically, provided to draw the carrier medium from the kiln A through the conduit 40 and force it (now heated) and the heated fluid from the furnace 20 into the means F from whence it is forced through the conduit 21 into the conduit 27. The means K comprises a suitable device 43 to cause a vacuum in the conduit 40 and force the heated carrier medium, caused to flow therethrough, into the conduit 21 to mingle with the heated fluid from the furnace 20 in the conduit 21 and then flow into the conduit 27. This device 43 may be a conventional impeller-equipped blower, into the wall of which the outlet end 42 of the conduit 40 opens and, from the peripheral wall of the blower, a conduit 44 extends through the opening 26 in the conduit 21 and into this conduit, where the conduit 44 forms an elbow 45 and has its exit end 46 opening into the conduit 21 adjacent the venturi 25. That is, the axis of the exit end 46 is substantially coincident with the longitudinal axis of the conduit 21 and the end 46 is disposed between the venturi and intake end 22 of the conduit 21. The conduit 44 is, in exterior diameter, considerably less than the interior diameter of the conduit 21, including the diameter of the venturi thereof.

In the use of the novel dryer B associated with the kiln A, for example, in drying material C, as lumber, the material may be introduced into the kiln A in any approved way. For instance, it may be piled upon supports D, which may be trucks, mounting wheels 50 rolling upon the rails 15 and the trucks may be moved into the kiln. The furnace 20 having been fired, and the fans 29 and device 43 set in motion, heated air and carrier medium will be circulated throughout the chamber of the kiln. There will not be any great employment of outside air, which would entail the use of extra heat. The system is not, however, a conventional closed system, but large volumes of outside air are not required.

In some manufacturing operations it is desired to operate a dry kiln as a batch process. That is, the entire building is filled with lumber and the

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temperature is raised to a uniform degree throughout the kiln chamber and then maintained at uniform degree for approximately three days. On the other hand, approximately $\frac{1}{3}$ of the lumber to be processed is put into the building each day. Under these conditions, after the third day, the operator removes one batch of lumber each day, and heats one batch each day. This latter is a progressive kiln operation and in this type of operation the temperature must be higher at one end of the building than it is at the other.

By the use of the dryer herein disclosed the temperature may be set so that it is either uniform throughout the kiln chamber for use under one processing operation, or it may be varied to a very even gradient from one end of the kiln chamber to the other end for use with the other.

The danger of fire within the kiln is reduced, since there is no combustion within the kiln as is now obvious.

Various changes may be made to the form of the invention herein shown and described without departing from the spirit of the invention or scope of the claims.

What is claimed is:

1. In a drier of moisture-containing material, for association with a kiln having a chamber constructed and arranged to contain said material for drying, said drier including means to conduct a fluid to said chamber, including a conduit extending to said chamber, means opening into said chamber to conduct a carrier medium from said chamber, means to heat said fluid and medium exteriorly of said kiln, means to cause mingling of the heated fluid and heated medium within said conduit, and means to circulate said mingled heated fluid and medium through said chamber, including a conduit extending through said chamber from said first-named conduit and graduating in interior diameter from its juncture with said first-named conduit, being of greatest interior diameter adjacent said juncture, open-ended laterals extending upwardly from said last-named conduit, and fans directly above and adjacent the outer ends of said laterals with the axis of rotation of each fan substantially aligning with the longitudinal axis of its associated lateral.

2. In a drier of moisture-containing material, for association with a kiln having a chamber constructed and arranged to contain said material for drying, said drier including means to conduct a fluid to said chamber, including a conduit extending to said chamber, means opening into said chamber to conduct a carrier medium from said chamber, means to heat said fluid and medium exteriorly of said kiln, means to cause mingling of the heated fluid and heated medium within said conduit, and means to circulate said mingled heated fluid and medium through said chamber, including a conduit extending through said chamber and opening into said first-named conduit, said second-named conduit decreasing in interior diameter from its juncture with said first-named conduit, a plurality of spaced-apart laterals extending upwardly from said second-named conduit and having open upper ends, a damper in each lateral, and a fan adjacent each open upper end.

3. In a drier of moisture-containing material, for association with a kiln having a chamber constructed and arranged to contain said material for drying, said drier including means to conduct a fluid to said chamber, including a conduit extending to said chamber, means open-

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ing into said chamber to conduct a carrier medium from said chamber, means to heat said fluid and medium exteriorly of said kiln, means to cause mingling of the heated fluid and heated medium within said conduit, and means to circulate said mingled heated fluid and medium through said chamber, including a conduit extending through said chamber and opening into said first-named conduit, said second-named conduit decreasing in interior diameter from its juncture with said first-named conduit, a plurality of spaced-apart laterals extending upwardly from said second-named conduit and having open upper ends, with the interior diameters of each lateral substantially alike, a damper in each lateral, and a fan adjacent each open upper end.

4. In a drier of moisture-containing material, for association with a kiln having a chamber constructed and arranged to contain said material for drying, said drier including means to conduct a fluid to said chamber, including a conduit extending to said chamber, means opening into said chamber to conduct a carrier medium from said chamber, means to heat said fluid and medium exteriorly of said kiln, means to cause mingling of the heated fluid and heated medium within said conduit, and means to circulate said mingled heated fluid and medium through said

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chamber, including a conduit extending through said chamber and opening into said first-named conduit, and means to selectively permit varied volumes of heated fluid and medium to flow from said second-named conduit into said chamber at spaced-apart distances longitudinally of said second-named conduit.

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