

J. BLACK & A. H., H. & A. B. LENNOX.  
DRYING MACHINE.

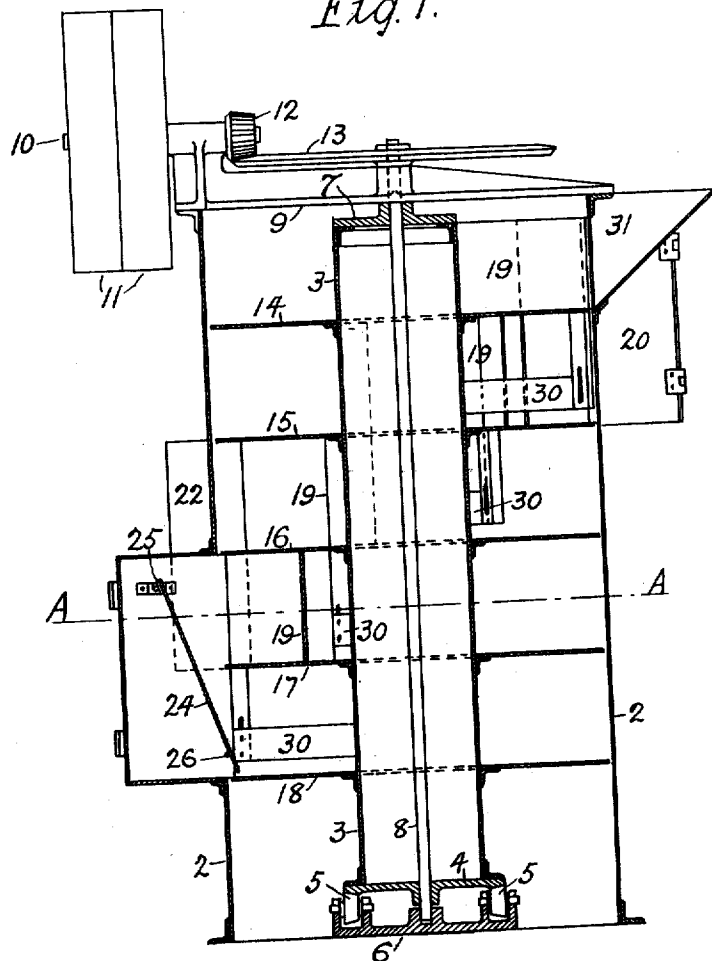
APPLICATION FILED MAR. 30, 1908.

Patented Nov. 3, 1908.

3 SHEETS—SHEET 1.

902,931.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

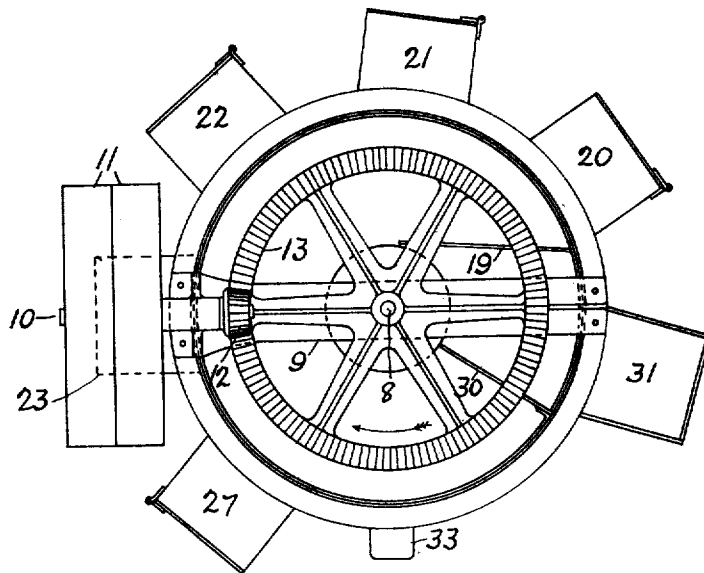
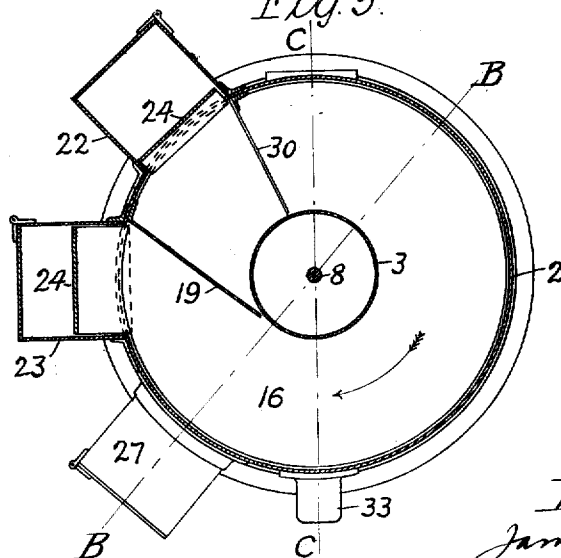


Fig. 3.



Witnesses

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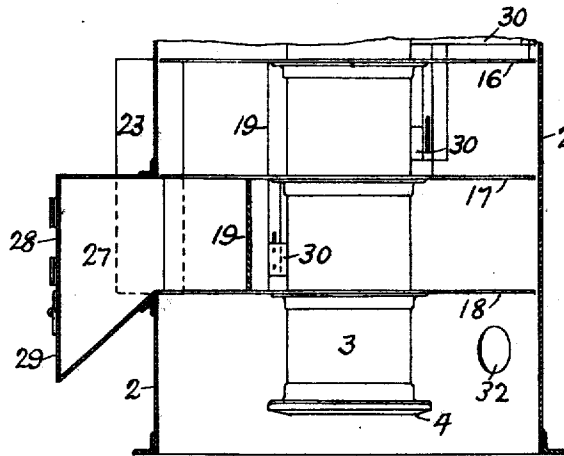
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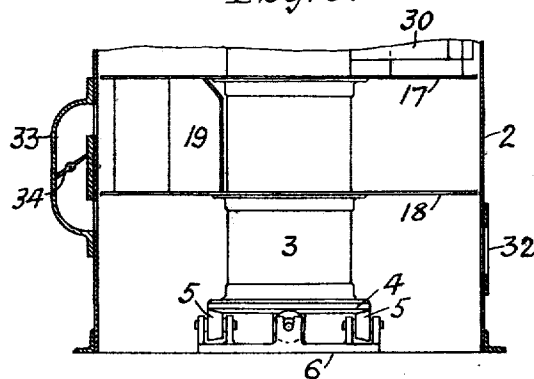
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3 SHEETS—SHEET 3.

*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

JAMES BLACK, ALLISON HALL LENNOX, HAROLD LENNOX, AND ALLISON BELL LENNOX, OF  
NEWCASTLE-UPON-TYNE, ENGLAND.

## DRYING-MACHINE.

No. 902,931.

Specification of Letters Patent.

Patented Nov. 3, 1908.

Application filed March 30, 1908. Serial No. 424,277.

*To all whom it may concern:*

Be it known that we, JAMES BLACK, ALLISON HALL LENNOX, HAROLD LENNOX, and ALLISON BELL LENNOX, subjects of the King of England, residing at Newcastle-upon-Tyne, Northumberland, England, have invented certain new and useful Improvements in Drying-Machines, of which the following is a specification.

This invention relates to an improved continuous drying machine for drying coal, coke, broken slag, ores of various kinds, manures, grain, hops, peat, or other wet or moist material, and consists in the novel features hereinafter described and specifically pointed out in the claims.

An embodiment of the invention is represented in the accompanying drawings in which

Figure 1 is a sectional elevation of the improved machine; Fig. 2 a plan view thereof; Fig. 3 a cross-section on the line A—A of Fig. 1; Fig. 4 a partial section on the line B—B of Fig. 3 and Fig. 5 a partial section on the line C—C of Fig. 3.

The machine consists of a fixed vertical circular metallic casing or framing 2 of suitable diameter and capacity for the quantity of material to be dried in a given time, and of a revolving inner vertical cylinder 3 which is driven by power in any suitable manner, for example as described below.

4 designates the bottom cover of said cylinder 3 which forms a path running on rollers 5 mounted in open topped bearings of the roller bed plate 6.

7 indicates the top cover of said cylinder 3 and 8 a vertical shaft keyed or otherwise fixed to the covers 4 and 7 and working in bearings in the bed plate 6 and in a top bracket 9 which also carries bearings for the driving shaft 10. On the latter are mounted the usual fast and loose pulleys 11 and a bevel pinion 12 in mesh with a bevel wheel 13 fixed to the upper end of the shaft 8 for driving the latter and consequently the cylinder 3.

A series of horizontal metallic shelves 14, 15, 16, 17 and 18 spaced a suitable distance apart above each other is fixed to the revolving cylinder 3 and all the shelves extend from said cylinder to the outer casing 2 thus forming chambers. The top shelf 14 is a certain distance below the top of the casing.

A vertical plate 19 forming a scraper is at-

tached to the casing. The said plate 19 extends across the space between the casing 2 and cylinder 3 and is approximately tangential to the cylinder, though not attached thereto (see Fig. 2). One of these plates is provided for each chamber except the bottom one.

A box 20 of a depth extending from the top of the casing to the second shelf 15 and provided with a door on the outside is fixed to the outer side of the casing 2, said box having one side open through or into the casing, and the scraper aforesaid being fixed at the far side of the box to which the shelf is traveling. Other boxes 21, 22 and 23 containing such chutes are arranged for each adjacent pair of chambers as shown in the drawings. In each box is a chute 24, which inclines downwards and delivers on to the shelf below. This chute is hinged as at 25 in open topped bearings and rests on a pin 26 see Fig. 1.

The chutes are shown on the drawings as delivering near the outer edge of the shelves. As the top shelf revolves, any material thereon is diverted by the scraper 19 into the box 20 and falls on to the chute 24 and thence on the shelf below. On the opposite side of the box to the scraper above, a second scraper 19 is fixed to the casing its height being equal to the distance between the two shelves, and extending to and tangential to the cylinder as described for the scraper on the top shelf. The second box 21 is fixed to the casing near the second scraper and the depth of this box extends from the first shelf 14 to the third shelf 16. The chute of this box delivers on to the third shelf 16, and so on from shelf to shelf to the bottom shelf 18 which has a box 27 serving for delivering the dried material into any suitable receptacle. The said box 27 has a door 28 provided with a hinged flap 29 for this purpose.

31 designates the charging hopper leading to the uppermost shelf 14.

Each shelf is provided with a spreader 30 for evenly distributing the material thereon, the said spreader having means for adjusting its distance above the shelf. The bottom chamber, that is, the chamber between the bottom shelf 18 and the casing bottom is in communication for example through aperture 32 with some suitable heat supply source, such as a furnace or the like. The hot air, or gas passes from said bottom cham-

ber to the next chamber above between the two lowest shelves by means of a pipe or passage 33 provided with a damper 34 if necessary, formed or fixed on the outside of the casing 2, and opening into the second chamber near the scraper but on the front side thereof as shown in Fig. 5. Said air or gas passes round the second chamber in an opposite direction to the motion of the shelves until it reaches the other side of the scraper 19 where it thus passes upwards to the next chamber through the chute box 23 which forms a passage or connection between the two chambers, and circulates in this chamber in the same direction as in the lower chamber, that is in the opposite direction to the motion of the shelves. From this chamber the hot air or gas passes to the next above in the same manner and so on through all the chambers, and finally is discharged from the top chamber into the atmosphere.

The action of the machine is as follows: After the chambers have been heated by hot air, gas or the like introduced through opening 32, the revolving cylinder 3 and therefore the shelves 14-18 being put in motion, the material to be dried is delivered by an elevator or other means through the hopper 31 on to the top shelf 14, and, as it passes round thereon is evenly distributed by the spreader 30 over said shelf which is heated from the heat below. As the material comes to the scraper 19 it is discharged through the box 20 on to the chute 24 to the shelf 15 below, the action of the scraper mixing the moist and partly dried material. In the second chamber it is laid evenly on the shelf by the spreader 30, and as it moves round is acted on by the hot air or gas above it and the heat of the shelf below it, until it comes to the scraper in this chamber, when it is discharged in the same manner as before on to the shelf below, the material being again mixed by the action of the scraper. Thus the material passes down through all the chambers, and is discharged from the last in a more or less dried state as may be required, as by regulating the speed of the shelves and therefore the amount or quantity of material passing through the machine in a given time, any required degree of dryness can be obtained.

In some cases where the material is in large pieces the deflecting plates and spreaders may be omitted.

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. A machine of the character described comprising in combination a casing circular in cross-section, a central concentric revolvable cylinder within said casing, a series of

shelves connected to said cylinder dividing the casing into a series of superposed compartments, means for supply of material to the uppermost shelf of said series, means, exterior of the casing, for transferring material from each shelf to the shelf next below, means for discharge of dried material from the lowermost shelf and means for the introduction and circulation of a drying medium through the chambers in succession in a direction contrary to that of the movement of the material.

2. A machine of the character described comprising in combination a casing circular in cross-section, a central concentric revolvable cylinder within said casing, a series of shelves connected to said cylinder dividing the casing into a series of superposed compartments, means for supply of material to the uppermost shelf of said series, means, exterior of the casing, for transferring material from each shelf to the shelf next below, means for deflecting material from the shelves into said transferring means, means for spreading the material over said shelves, means for discharge of dried material from the lowermost shelf, and means for the introduction and circulation of a drying medium through the chambers in succession in a direction contrary to that of the movement of the material.

3. A machine of the character described comprising in combination a casing circular in cross-section, a central concentric cylinder within said casing, means for rotating said cylinder, a series of shelves connected to said cylinder and dividing the casing into a plurality of superposed compartments, means for supply of material to the uppermost shelf of said series, a series of boxes exterior of the casing and each affording communication from one chamber to the next below; a vertical scraper in each chamber for deflecting material from the respective shelf to the adjacent box, means for spreading the material over said shelves, means for discharge of dried material from the lowermost shelf and means for the introduction and circulation of a drying medium through the chambers in succession by way of the boxes, in a direction contrary to that of the movement of the material.

In witness whereof we have signed this specification in the presence of two witnesses.

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Witnesses:

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