

June 9, 1925.

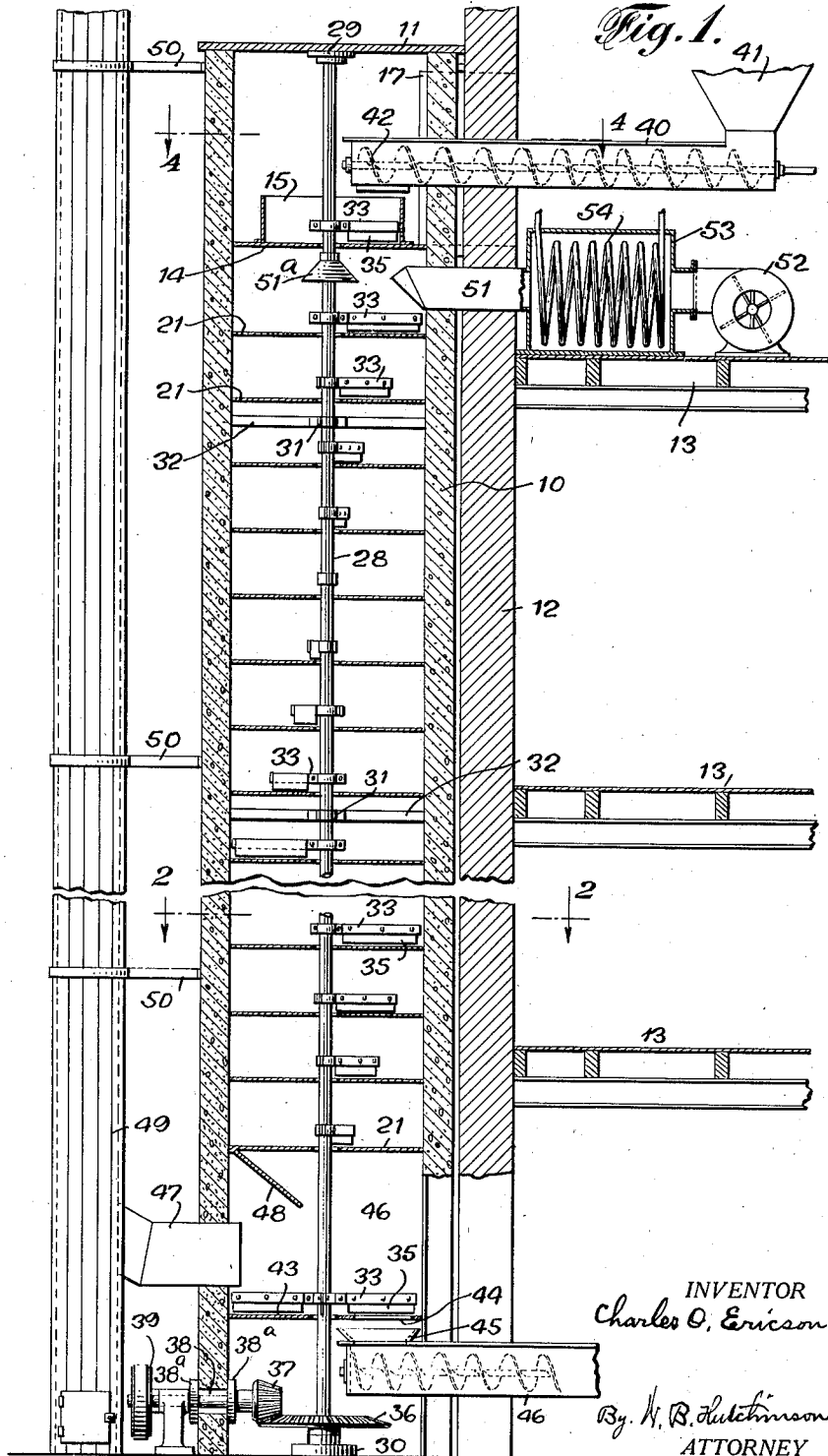
1,540,769

C. O. ERICSON

DRIER

Filed March 23, 1923

3 Sheets-Sheet 1



INVENTOR
Charles O. Ericson

By N. B. Hutchinson,
ATTORNEY

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3 Sheets-Sheet 2

Fig. 2.

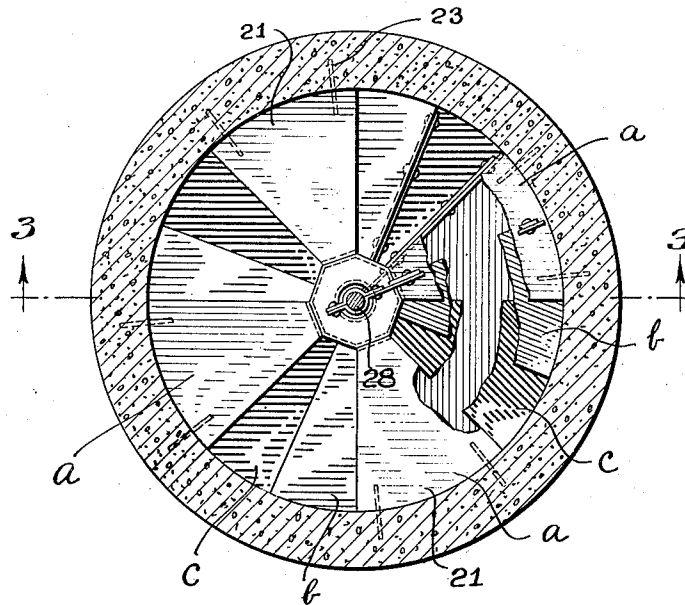
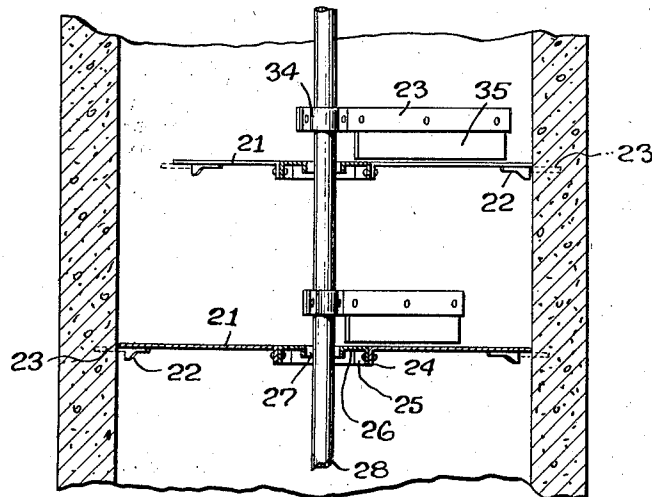


Fig. 3.



INVENTOR
Charles O. Ericson,
BY
W. B. Hutchinson,
ATTORNEY

June 9, 1925.

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Fig. 4.

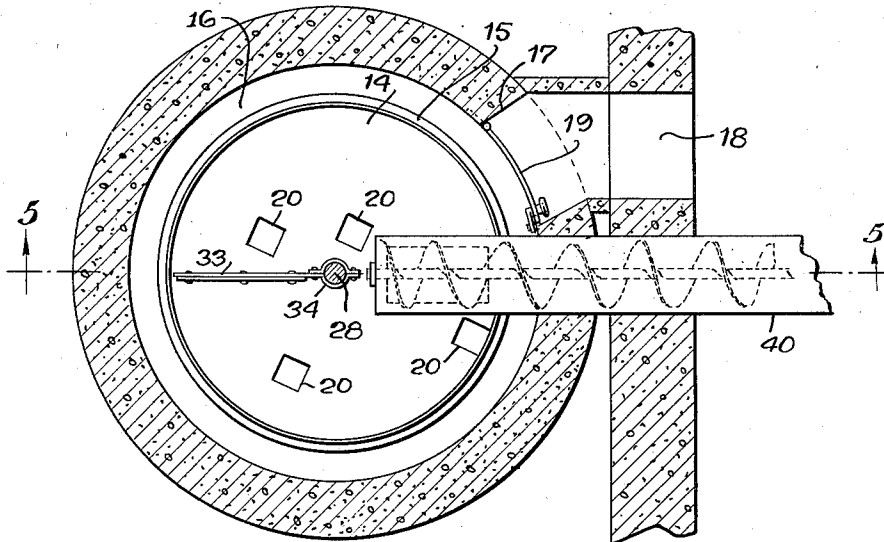
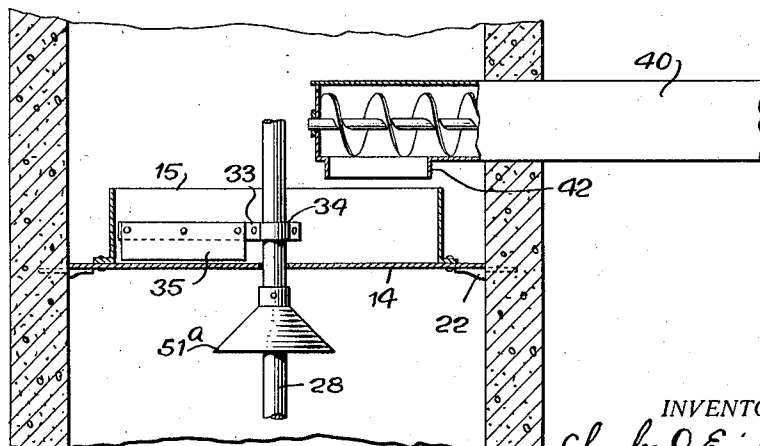


Fig. 5.



INVENTOR
Charles O. Ericson.

BY

W. B. Hutchinson,
ATTORNEY

Patented June 9, 1925.

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UNITED STATES PATENT OFFICE.

CHARLES OSCAR ERICSON, OF HELMETTA, NEW JERSEY.

DRIER.

Application filed March 23, 1923. Serial No. 627,129.

To all whom it may concern:

Be it known that I, CHARLES O. ERICSON, a citizen of the United States, and a resident of Helmetta, Middlesex County, New Jersey, have invented a new and useful Improvement in Driers, of which the following is a full, clear, and exact description.

My invention relates to improvement in driers, and particularly driers adapted for use in drying tobacco, malt, cereals, and in fact most more or less finely divided materials, but it can be used, as stated, for many purposes. Many driers used for such materials are arranged in a generally horizontal way, in which case they occupy a great deal of floor space, and are usually revolved. Such driers, and in fact most driers for the purpose for which this is intended, are made chiefly of metal and wear out rapidly, because the metal corrodes on account of the condensation of moisture, and sometimes the effect of internal fumes. In some types of driers the heating pipes are arranged within the drier, and those have proved objectionable because the heat is so unevenly distributed.

The object of my invention is to produce a simple and unusually substantial drier which will last for a very long time, and which is very efficient. In carrying out my invention, I prefer to make the body of the drier a vertical tube, preferably cylindrical, and to construct it of reinforced concrete, or of material which is not liable to corrosion. By arranging it in a vertical manner it occupies very little floor space, and can be located adjacent to a building, and provided with a convenient stack if preferred, so that the vapors can readily pass off. My invention is intended in connection with the foregoing to provide a series of shelves one above the other, stepped along in such a way that the material passing through the drier will be moved slowly from shelf to shelf, and pass downward through the drier in a generally spiral direction. The material to be dried is supplied at the top, and the hot air or drying medium is also admitted at the top, while the exhaust is from a point near the bottom of the drier. A series of slowly rotating wiping arms are arranged within the drier, and brush the material slowly from shelf to shelf, and thus it follows that the material is uninjured, but is turned and moved about so that all parts of it come in contact with

the drying medium, passing downward through the tube or drier body, and so the material is rapidly and very thoroughly dried.

I also get an advantage by blowing in the hot air or other drying medium from the top and exhausting from the bottom rather than creating the necessary draft by suction, as by the arrangement which I use and show, the drying medium fills the body of the drier under a moderate pressure, and the vapors pass out under a gentle movement without taking any of the dried stock with them. I also use a vertical shaft which extends through the drier and carries wiping arms to move the material from shelf to shelf, and these arms carry brushes which will not injure the material or the shelves, stand heat well, and serve the purpose perfectly. In general I produce a drier which is simple and durable in construction, in which the movable parts are substantial and move slowly, and in which drying can be continuously carried on in an expeditious and inexpensive way. Furthermore, it will be seen from the description which follows, that a drier of the type described will use very little power, even when adapted to dry a great quantity of material.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar reference characters indicate corresponding parts in all the views.

Figure 1 is a broken vertical section of the drier embodying my invention.

Figure 2 is a cross section on the line 2—2 of Figure 1.

Figure 3 is a vertical section on the line 3—3 of Figure 2.

Figure 4 is a cross section on the line 4—4 of Figure 1, and

Figure 5 is a broken enlarged detail vertical section of the upper part of the drier.

The drier body 10 is in the form of a hollow tube, preferably cylindrical, and it should be made of non-corrosive material, preferably reinforced concrete. It is closed at the top as shown at 11, and can conveniently be arranged and supported beside the wall 12 of a building, in which the floors are indicated at 13. Near the top of the body 10 is a floor 14, and on this is erected preferably a hopper 15, leaving a way 16 around it so that a person can

walk around the hopper conveniently for any reason, and access can be had from the building or from the outside through a doorway 17, which in the present instance communicates with a door 18 in the building wall, and a suitable door 19 is used to close the opening.

Disposed at various parts of the floor 14 and opening therethrough, are holes 20 which lie within the hopper 15, and through which the material to be dried is fed. The material which is dropped through the holes 20 falls upon shelves 21 which are arranged horizontally and at different elevations throughout the greater part of the body 10, as shown in Figure 1. These shelves can be arranged in a series of any desired number, and in the present instance I show four shelves for each level, these being preferably segmental in shape as shown in Figure 2, and this view also brings out the arrangement of the shelves which causes the material to pass downward in a generally spiral direction, thus giving the stock under treatment a longer course through the drier, and also subjecting every part of it to heat, so that the moisture can be readily absorbed therefrom.

In Figure 2 I have shown at "a" a series of shelves on one level, at "b" those on the next level, and at "c" those on the next level, from which it will be seen that supposing the stock to be dropped off one edge of the shelf "a", it will fall upon the center of the next lower shelf "b", and from this it will fall to the center of the next lower shelf "c". This arrangement is not arbitrary, but it is preferred, and works out perfectly in practice. The shelves 21 can be conveniently made of cast iron, although they may be made of any suitable material. They may be supported at their outer ends on pins 22 which are let into the concrete wall as shown at 23, and at the inner ends the shelves have down-turned flanges 24 fastened to similar flanges 25 on collars 26, which have openings 27 therethrough (see Figure 3) for the passage of the vertical shaft 28. The manner of supporting the shelves and of providing for the passage of the shaft, can of course be varied greatly without affecting the invention.

The shaft 28 extends vertically and centrally through the body 10, and is held in a suitable bearing 29 at the top, and a bearing 30 at the bottom. It also can be stayed at necessary intervals by bearings 31 secured to supporting arms 32 attached to or imbedded in the concrete body 10.

The shaft 28 rotates slowly, and at each shelf level it has at least one radiating arm 33, and obviously there can be as many of these arms as desired. The arms are rigidly secured to the shaft 28 as shown at 34 in any convenient way, and each carries a detach-

able brush 35, which should be slightly flexible, and which brushes the material under treatment from the shelves 21. The brush can conveniently be made from some of the fibrous materials which have a substantial quantity of asbestos in their composition, so that they will not corrode, and will not be injured by heat. As these wear they can be renewed or adjusted, and I do not show or limit myself to any particular means of securing the brushes to their carrying arms.

The shaft 28 can be driven in any suitable manner, and I have illustrated it as being driven by means of a gear wheel 36 at the lower end of the shaft (see Figure 1), which is in turn driven by a pinion 37 on the shaft 38, this passing through the wall of the drier and having suitable collars 38^a to prevent the escape of heat. The shaft is suitably supported and can be driven in any suitable manner, as for instance by a pulley 39. There is a decided advantage, however, in having the driving arrangement shown, in which the driving gears for turning the main shaft 28 are located at the bottom of the shaft. These driers are usually made in large units, the shaft 28 is long and heavy, and is liable to a substantial variation in length due to contraction and expansion under varying temperatures, and with the driving arrangement made as shown, the expansion has to be upward, and the gears 36 and 37 are always in mesh, whereas if the driving arrangement is at the top, there is a good deal of difficulty because the gears are not sure to be in good driving connection.

Obviously the material to be dried can be placed in the hopper 15 in any suitable manner, and might even be dumped in by hand; but I prefer to have it fed evenly and continuously from a suitable conveyor 40, which in the present instance is an ordinary screw conveyor, receiving its supply from the hopper 41, and delivering into the hopper 15 from a spout 42.

Near the bottom of the body 10 is a floor 43 having an opening 44 through which the dried stock is delivered into a hopper 45 of a conveyor 46 which carries the dried stock away. Obviously the driers 40 and 46 can be of any preferred type. Just above the floor 43 is a chamber 46, and the vertical space in this is a little greater than that between the shelves 21, so as to provide for any possible accumulation of material, and the shaft 28 is preferably provided with a plurality of wiper arms 33 and brushes 35 in the chamber, to be sure that the material is passed rapidly into the conveyor 46. The exhaust from the drier is through a pipe 47 located just above the floor 43, and an apron 48 (see Figure 1) is arranged diagonally above the

pipe 47 and within the chamber 46, so as to in a measure prevent material from passing into the pipe 47.

The exhaust pipe 47 can lead to any desired point, but in many instances it is desirable to have it lead to a stack 49, which should be of wood, or some non-corrosive material, although it can be made of any suitable stuff, and it can be conveniently supported from the body 10 by means of braces or stirrups 50.

The drying medium is naturally hot air, and this can be let in through the pipe 51 above the upper shelves 21 (see Figures 1 and 4). Opposite the inlet end of the pipe and a little above the same, is an apron 51^a on the shaft 28, which has a tendency to prevent the material from flying upward.

The air coming in through the pipe 51 can be heated in any usual or preferred way. I have found a practical means to be to force the air through a blower 52 and casing 53 in which are arranged steam coils 54. In the drawing the heater is not to scale, and obviously a substantial heater should be used. There is nothing novel about this arrangement, and a heater of necessary size and of preferred construction can be substituted for that which I have shown.

It will now be readily seen from the description given that even if the shaft 28 is revolved very slowly, say four or five revolutions a minute, the stock will be forced through the tube fast, and there will be little wear on the structure; and by reason of the spiral course of the material, it will have a long travel, and as it drops from shelf to shelf urged by the wiping arms 33, it will be turned and distributed in such a way that it will not be injured, but all its parts will be subjected to the air current which rapidly absorbs the moisture from the stock. It will be further noticed that by blowing the air in at the top where the wet material comes in, there will be no great condensation, as the trend of the vapor is downward, and the air will fill the drier with a gentle pressure, and the vapor caused by the absorption of moisture from the stock, will pass out through the pipe 47 and stack 49. It will be seen, therefore, that the structure is very substantial, economical, and efficient. Furthermore, that it occupies very little floor space, and takes little power.

I claim:—

1. A drier comprising a vertical hollow body having a series of transverse shelves therein arranged at different elevations and delivering one to the other, means for forcing the material from shelf to shelf, means for forcing a drying medium into the upper part of the drier body, means for exhausting the moist air from the lower part of

said body, and means for withdrawing the dried stock from the lower part of the body.

2. A drier comprising a vertical hollow body having a series of transverse shelves one above the other therein, the shelves of each level being spaced apart and staggered with respect to the shelves on the next level whereby the material forced over the edge of one series of shelves will fall upon the shelves below, means for forcing the material from one set of shelves to the other, means for feeding the stock to the shelves, and means for forcing a drying medium into the upper part of the drier and exhausting it from the lower part of the drier.

3. A drier comprising a vertical hollow body having a series of transverse shelves one above the other and with the shelves on each level spaced apart to provide openings between them, the shelves being arranged so that stock will drop from one set of shelves to the shelves below, means for forcing material over the edges of the shelves, and means for passing a drying medium through the body in the same direction as the travel of the stock under treatment.

4. A drier comprising a vertical hollow body having a series of transverse shelves therein arranged one above the other, and with the shelves on the same level spaced apart, the shelves being arranged so that the stock forced from one set of shelves will drop on the shelves below, means for feeding stock to the top shelves, means for forcing the stock from shelf to shelf, and means for passing a drying medium through the drier from the upper to the lower part thereof.

5. A drier comprising a vertical body having transverse shelves therein arranged in series one above the other and with the shelves of each series spaced apart and staggered with respect to the shelves of the next series so that the shelves of one series will catch material falling from the shelves above, and rotary wipers arranged to push the material from the shelves.

6. A drier comprising a vertical hollow body having a series of shelves transversely therein, the shelves of each series being spaced apart and staggered with respect to the shelves of the next series so that the shelves of one series will catch material from the shelves above, and horizontally moving wipers arranged to push the material off the shelves.

7. A drier comprising a vertical hollow body having transverse shelves therein arranged in series one above the other and with the shelves of each series spaced apart, the shelves of one series being staggered with respect to those of the next series so that the shelves of one series will catch material fall-

ing over the edges of the shelves above, and horizontally movable non-metallic brushes arranged to push the material from the shelves.

5 8. A drier comprising a vertical body having a series of transverse shelves one above the other therein, with the shelves of each series spaced apart and staggered with respect to the shelves below whereby material
10 pushed off the edge of one shelf will lodge on a shelf below, a rotary shaft extending vertically through the drier, and wipers carried by the shaft and arranged to move the material off the shelves.

15 9. A drier comprising a vertical hollow body having a floor at the top with openings therethrough, and a floor at the bottom with a discharge opening therethrough, a series of transverse shelves arranged between the two
20 floors and one above the other, with the shelves of each series spaced apart and staggered with respect to the shelves of the next series whereby material falling over the edge of the shelves will lodge upon the shelves below, means for feeding material
25 through the openings in the top floor, means for moving the material from the shelves and through the opening of the lower floor, and means for feeding a drying medium
30 through the drier.

10. A drier comprising a hollow vertically arranged body having a floor at the top with feeding openings therethrough, and a floor
35 at the bottom with a discharge opening therethrough, means for feeding material to the top floor, means for receiving material from the opening in the lower floor, a series of shelves transversely arranged between the two floors one above the other, and with the
40 shelves of each series spaced apart and arranged to deliver stock over the edge of one shelf to the next below, a vertical rotary shaft extending through the drier, and wipers carried by the shaft and arranged to
45 move the material through the openings in the floors and from shelf to shelf.

11. A drier comprising a vertical hollow body having a series of shelves transversely arranged therein and disposed so that the
50 material travelling from shelf to shelf will take a spiral course through the body, and means for passing a drying medium through the body in the same direction as the travel of the stock.

55 12. A drier comprising a vertical hollow non-corrosive body, a series of shelves transversely arranged therein and disposed so that the shelves of one series shall deliver over their edges to the next series below,
60 means for feeding material to the upper shelves and withdrawing it from below the lower shelves, means for forcing the material from shelf to shelf, and means for forc-

ing a drying medium downwardly through the drier body.

65 13. A drier having a vertical hollow body with a transverse floor in the upper part thereof and with a hopper on said floor having feed openings through the bottom thereof, means for delivering stock into the hop-
70 per, a series of shelves below the floor, the shelves of each series being spaced apart and arranged to deliver material over the edges of the shelves to the shelves of the next series below, means for forcing the ma-
75 terial from shelf to shelf, and means for passing a drying medium through the drier.

14. A drier comprising a vertical hollow body having a floor in the upper part there-
80 of, a hopper on said floor with feed openings therethrough, a walk-way around the hopper, and a door opening to the floor through the wall of the drier, a series of shelves arranged one above the other below the floor
85 and with the shelves of each series spaced apart and disposed so as to deliver material from one series of shelves to the next, a vertical rotary shaft in the drier, wipers carried by the shaft to force the material from
90 the shelves, and means for passing a drying medium through the drier.

15. A drier comprising a vertical hollow body having a series of shelves arranged one
95 above the other therein and disposed so as to discharge stock from one series of shelves to the next below, means for feeding material to the shelves, means for discharging the dried material from the lower part of the drier, means for forcing the material from
100 shelf to shelf, means for forcing hot air into the upper part of the drier, and means for withdrawing the vapor-charged air from the lower part of the drier.

16. The combination with the vertical drier body, means for feeding stock from
105 top to bottom therethrough in an interrupted course, means for forcing a drying medium into the upper part of the body, a vertical stack supported adjacent to the drier body, and an exhaust pipe leading to the
110 stack from the lower part of the drier body.

17. A drier comprising a vertical body having shelves arranged transversely there-
115 in and in different levels, the shelves of each level being spaced apart and staggered with respect to the shelves of the adjacent levels, whereby material will drop over the edge of one shelf to that of the shelf below, means for feeding material to the shelves, means for forcing a drying medium through the
120 body, a vertical drive shaft, means for driving the shaft at its lower extremity, and wipers carried by the shaft and arranged to force the material from the aforesaid shelves.

CHARLES OSCAR ERICSON.