

No. 622,521.

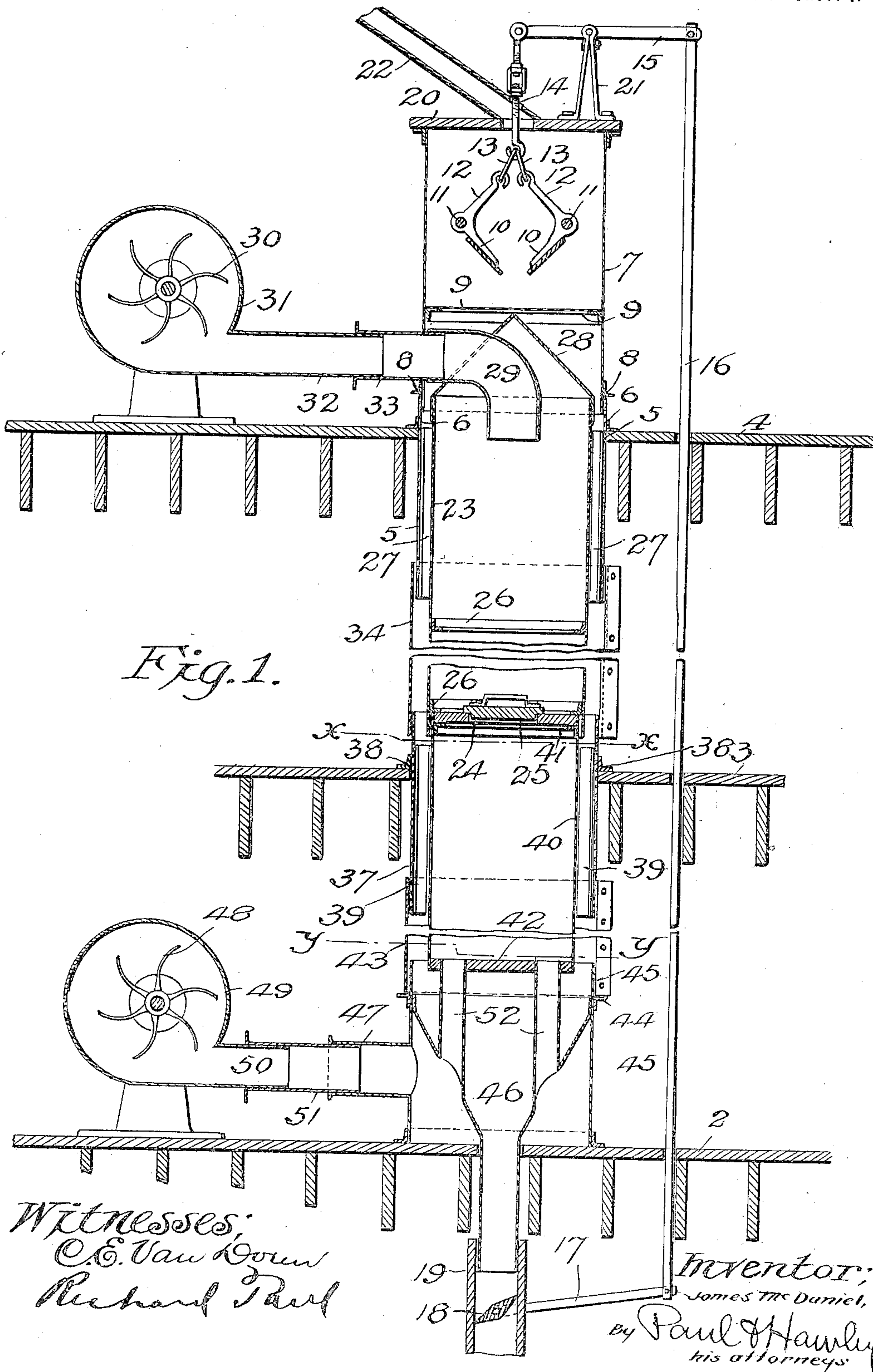
Patented Apr. 4, 1899.

J. McDANIEL.
GRAIN DRIER.

(Application filed Sept. 3, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
C. E. Van Horn
Richard Paul

Inventor:
James M. Daniel,
By Paul & Hawley
his attorneys

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2 Sheets—Sheet 2.

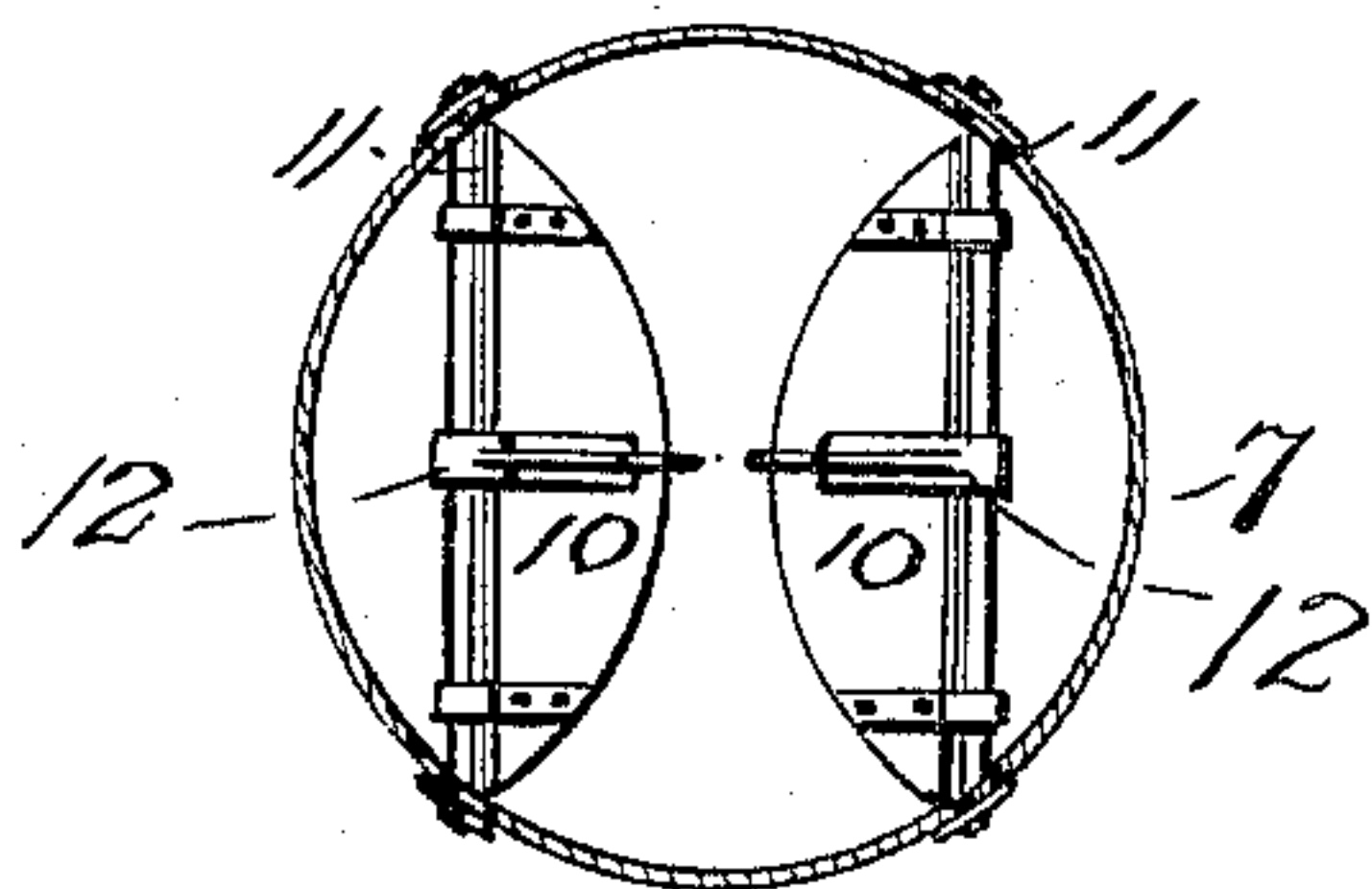


Fig. 2.

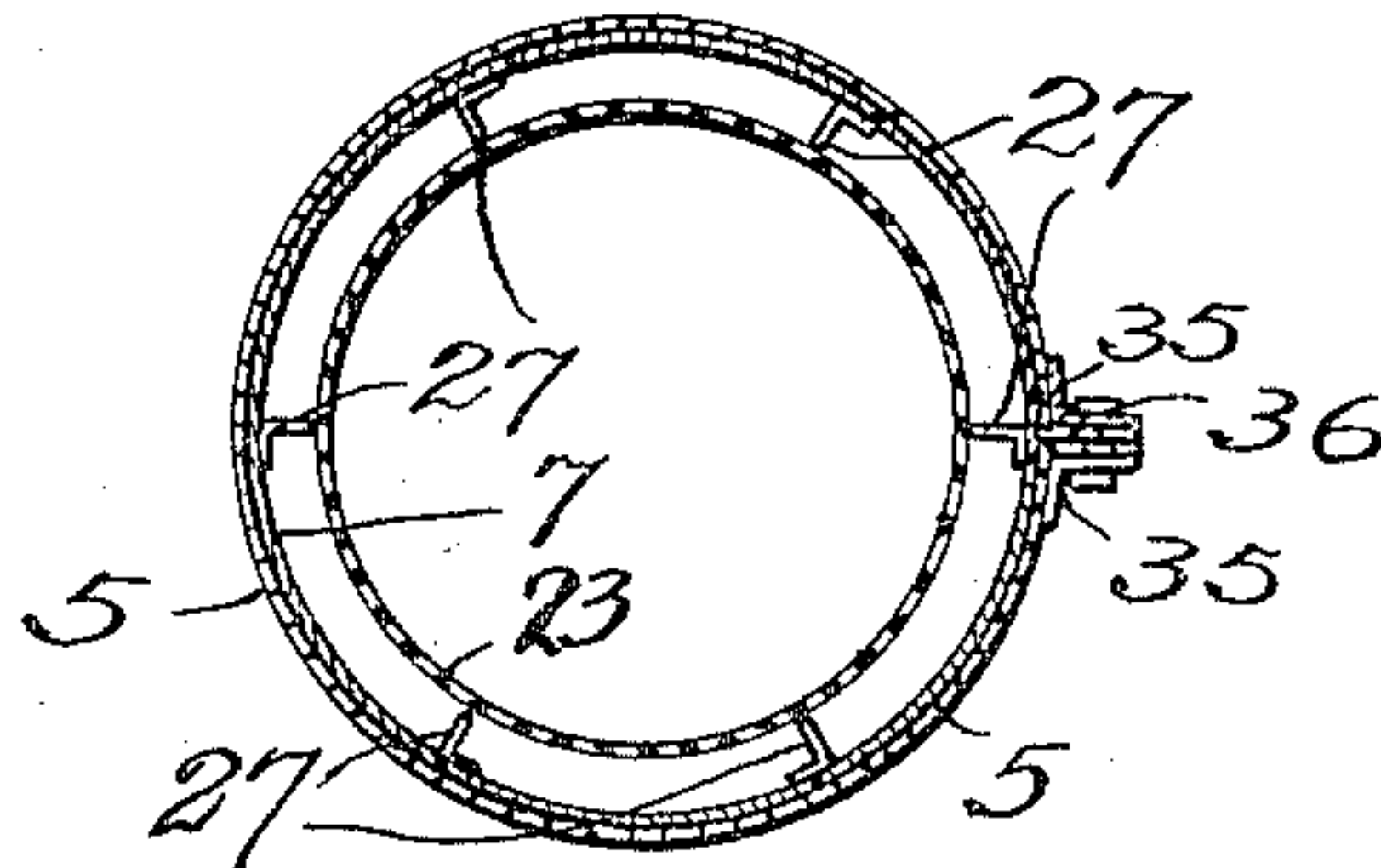


Fig. 3.

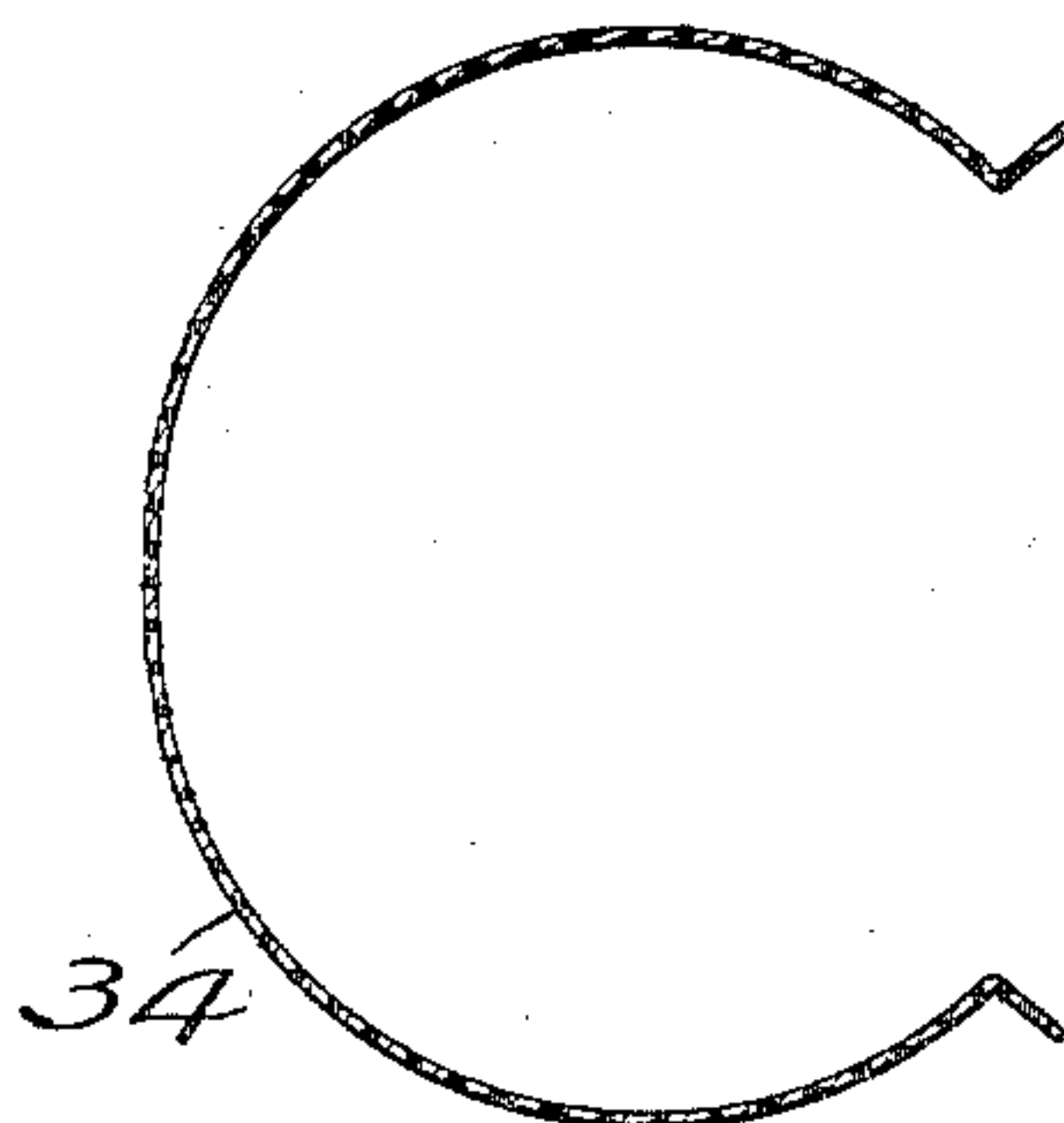


Fig. 4.

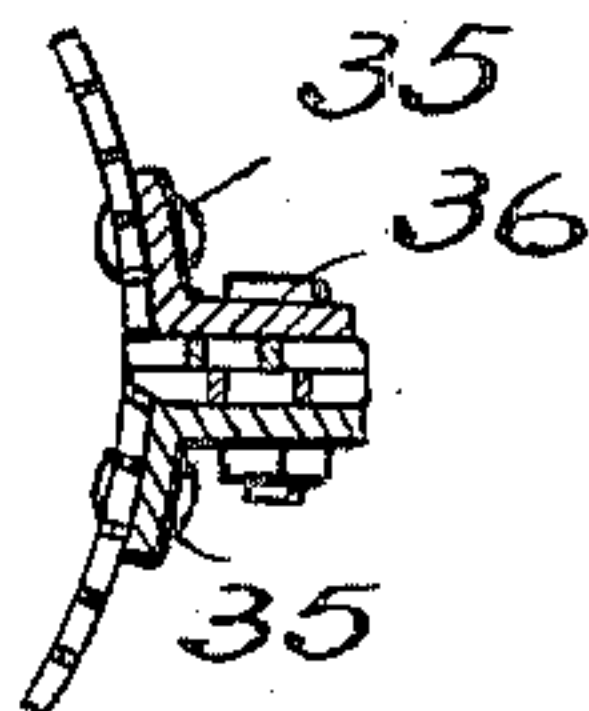


Fig. 5.

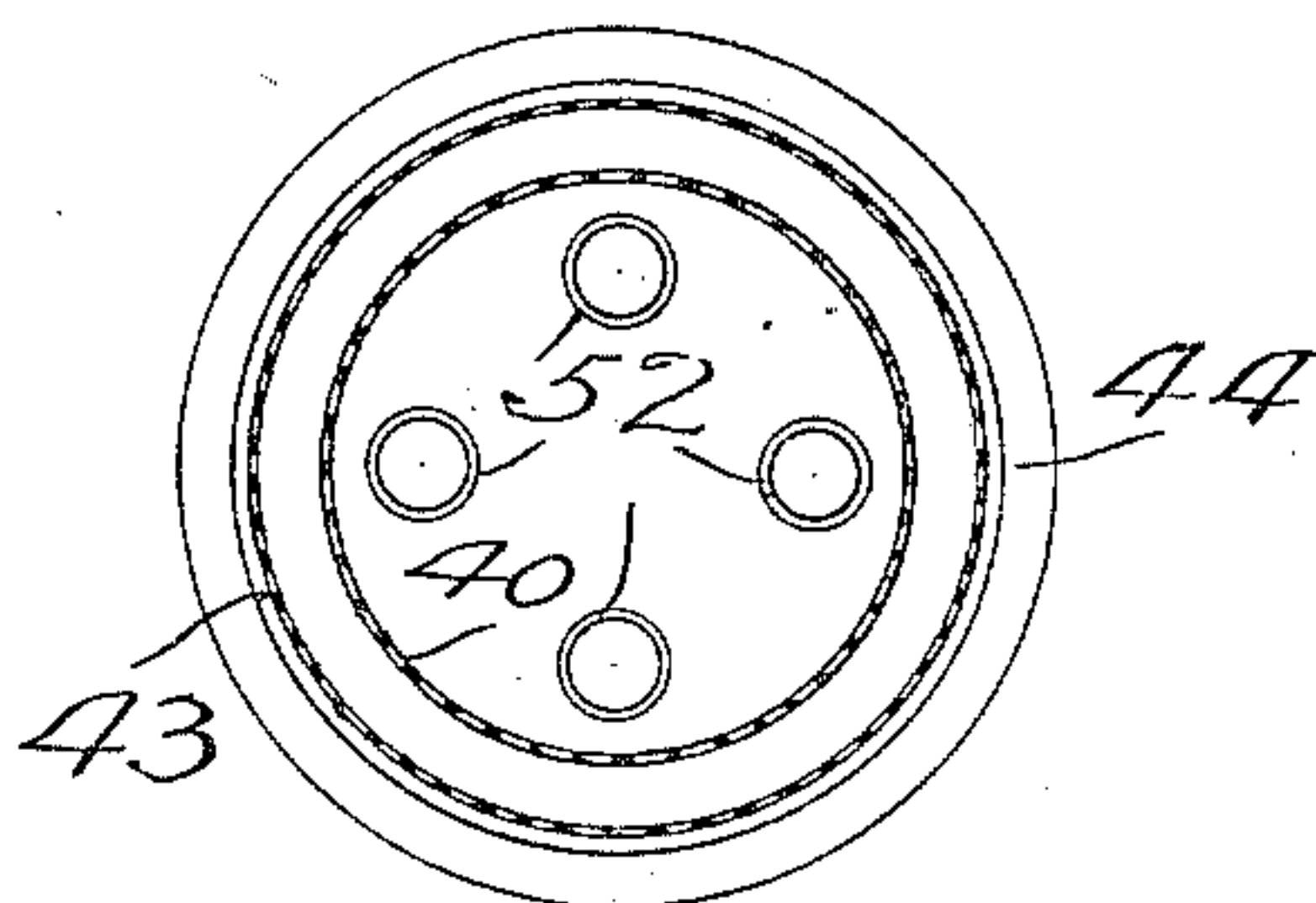


Fig. 6.

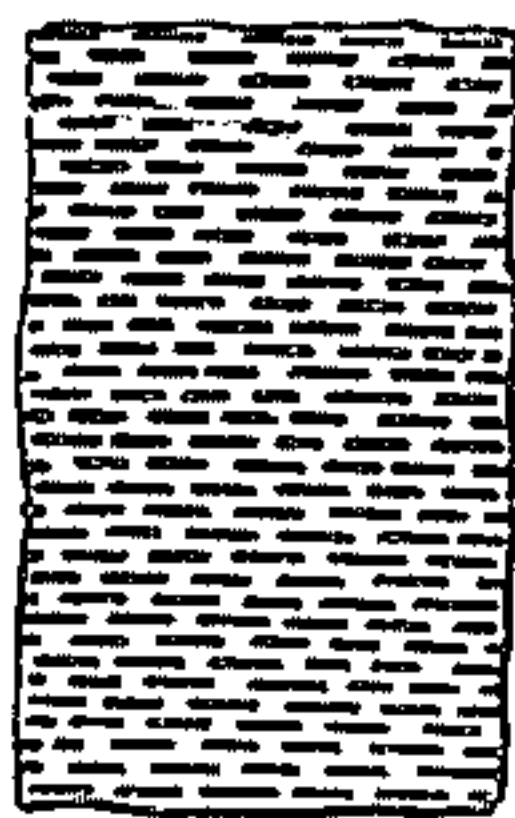


Fig. 7.

Witnesses;
C. E. Van Doren
Richard Paul

Inventor;
James McDaniel,
By Paul & Hanbury
his attorneys.

UNITED STATES PATENT OFFICE.

JAMES MCDANIEL, OF MINNEAPOLIS, MINNESOTA.

GRAIN-DRIER.

SPECIFICATION forming part of Letters Patent No. 622,521, dated April 4, 1899.

Application filed September 3, 1898. Serial No. 690,175. (No model.)

To all whom it may concern:

Be it known that I, JAMES MCDANIEL, of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Grain-Driers, of which the following is a specification.

This invention relates to improvements in devices designed for use in drying grain, and particularly for drying wheat after it has been passed through a washing device for removing smut; and the objects I have in view are to provide a machine of this character having a large capacity and in which the wheat or other grain can be thoroughly dried in a short space of time, to provide a machine of this character that is readily put together or taken down when desired, and to provide a machine of this character in which the grain is first subjected to a current of hot air and then to a current of cold air and in which the passage of the grain into and from the machine is automatically regulated.

The invention consists generally in the constructions and combinations hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a vertical section of my improved machine. Fig. 2 is a transverse section taken above the feed-regulating valve and showing the construction and arrangement of such valve. Fig. 3 is a transverse section on line *xx* of Fig. 1, showing the angle-irons arranged between the two cylinders for the purpose of properly spacing said cylinders. Fig. 4 is a detail view of the removable cylinder. Fig. 5 is a detail view showing the means for securing the edges of the removable cylinder after it has been placed in position in the device. Fig. 6 is a transverse section on line *yy* of Fig. 1, showing the pipes for conducting the cold air from the lower fan through the hopper and into the interior of the device. Fig. 7 is a detail showing the preferable arrangement of the perforations that are provided in the inner and outer cylinders.

In the drawings, 2, 3, and 4 represent the floors of the mill, elevator, or other building in which the device is placed, and, as here shown, the device is arranged to extend through three stories of the building, al-

though, if preferred, the device may be all arranged upon one floor or in any other suitable relation to the building in which it is located. A perforated cylinder 5 is provided near its upper end with a shoulder or angle-iron 6, and this cylinder is preferably arranged to drop through the floor 4, so as to have the angle-iron 6 rest upon said floor and supporting said cylinder. Above this cylinder is another cylinder 7, preferably imperforate and provided with the angle-iron 8 near its lower end, and the end of the cylinder 7 preferably fits into the upper end of the cylinder 5, and the angle-iron 8 rests upon the top end of the cylinder 5, and thereby supports said cylinder in position. The cylinder 7 is also preferably provided with the wire-screen 9, extending transversely across it, and also with the regulating-valve, comprising the two curved pivoted plates 10, mounted upon rods or shafts 11, that are supported in bearings in the wall of the cylinder 7, and said plates are also provided with levers 12, connected by links 13 with an adjustable connecting-rod 14, which extends above the cylinder and has its upper end connected to the lever 15. The opposite end of this lever is connected to the rod 16, which extends to the lower end of the drier and is connected by means of a rod 17 with the discharge-valve 18, located in a suitable spout 19, as shown in Fig. 1. This valve is arranged to automatically govern the flow of grain from the machine and is in turn automatically controlled by the valve-plates 10, as hereinafter described. The cylinder 7 is preferably provided with a top 20, and this may furnish a support for a bearing 21 for the lever 15. A spout 22 is preferably arranged to conduct the grain to the center of the upper end of the cylinder 7, where it falls directly upon the inner surface of the valve-plates 10. Within the cylinder 5 I prefer to arrange a cylinder 23, whose upper end is substantially at the same height as the upper end of the cylinder 5, and this cylinder preferably extends to a point near the floor 3 and to a transverse head or partition 24, which is provided with a central opening and with a cover 25. The cylinder 23 is preferably perforated throughout its entire length, the perforations being preferably of the form and arrangement shown in detail in Fig. 7, and

it is provided at suitable intervals upon its inner surface with the angle-iron rings 26, the lower one of which forms a bearing or rests upon the transverse partition 24. The cylinder 23 is of less diameter than the cylinder 5, so that a space, preferably an inch and a half, in the machine as actually constructed is left between the outer surface of the cylinder 23 and the inner surface of the cylinder 5, and for the purpose of holding these cylinders in the correct relation to each other I prefer to provide a series of vertical angle-iron strips 27, (see Fig. 3,) that are secured upon the inner surface of the cylinder 5 and extend in vertical lines between said cylinders 5 and 23, the length of these angle-irons being substantially equal to the length of the cylinder 5. For convenience of illustration the cylinder 23 is broken off at the center in Fig. 1 of the drawings; but it will be understood that this cylinder in actual practice will be of considerable length and it may be of any desired length. Above the cylinder 23 and preferably fitting onto the upper end of said cylinder is a suitable cone 28, and to this is preferably secured the pipe-elbow 29, the lower end of which is arranged centrally within the cylinder 23 when the cone 28 is in position, as shown in Fig. 1. The outer end of the elbow 29 is preferably just within the cylinder 7, as shown in Fig. 1. A fan 30 is preferably arranged in a suitable casing 31 and mounted, preferably, upon the floor 4 and near the cylinder 7. The casing 31 of this fan is provided with the exit-spout 32, which is arranged opposite an opening in the cylinder 7, and a pipe 33 is arranged to slide on the pipe 32 and to make connection between said pipe 32 and the pipe-elbow 29, as shown in Fig. 1 of the drawings. With this arrangement when it is desired to disconnect the fan from the drier the pipe 33 is slipped back on the pipe 32 and is thereby disconnected from the pipe-elbow 29. When the parts are in this position, the lever 15 being uncoupled from the rod 16, the cylinder 7 may be lifted off the cone 28. The pipe-elbow 29 may then be lifted off from the end of the cylinder 23, and the cylinder 5 and the cylinder 23 may then both be removed, preferably by lifting them up through the opening in the floor 4. As above stated, the cylinder 5 is preferably quite short, and below said cylinder, surrounding the cylinder 23, I prefer to arrange the removable cylinder 34. This cylinder is preferably perforated throughout, and it is preferably formed of galvanized sheet metal, so that it may be put around the cylinder 23, and it is then secured in position by having its edges brought together, as shown in Fig. 5, with angle-irons 35 placed upon the opposite sides of said edges and bolts 36 put through said angle-irons and said edges of the cylinder. A cylinder 37, corresponding substantially to the cylinder 5, provided at its upper end with angle-irons 38, is arranged below the cylinder 23, and it is preferably supported

by means of said angle-irons upon the floor 3, through which it extends. The cylinder 37 is preferably substantially the same length as the cylinder 5, and the lower end of the cylinder 34 is carried around the upper end of said cylinder 37, as shown in Fig. 1 of the drawings. The cylinder 37 is preferably short, extending only a short distance below the floor 3, and within it is arranged a vertical series of angle-irons 39, corresponding to the angle-irons 27, arranged within the cylinder 5, as shown in Fig. 3 of the drawings. Within the cylinder 37 is a cylinder 40, whose upper end, provided with an angle-iron 41, supports the division or head 24, and the lower end of the cylinder 40 rests upon a division or head 42 at the lower end of the drier. An outer cylinder 43 is arranged outside of and below the cylinder 37 and outside of the cylinder 40, and its lower end is supported upon an angle-iron or ring 44, that is arranged below the upper end of the imperforate cylinder 45, that rests upon the floor 2 and within which is arranged the hopper 46, that discharges into the pipe 19. The cylinder 45 is provided with the inlet-pipe 47, and the fan 48, arranged in a suitable fan-casing 49, is provided with a discharge-pipe 50, and the pipe 51 is arranged to slide upon the discharge-pipe 50 and to make connection with the pipe 47. Four upright pipes or tubes 52 extend from the space within the cylinder 45 and below the hopper 46 up through said hopper and through the head 42 into the space within the cylinder 40, as shown in Fig. 1 of the drawings. The cylinder 43 is preferably constructed in the same manner as the cylinder 34 and is adapted to be placed in position and secured by having its edges connected by means of suitable angle-iron strips and bolts, as shown in detail in Fig. 5.

The cylinders 5, 23, 34, 37, 40, and 43 are all perforated, and the style of perforation that I prefer is that shown in detail in Fig. 7 of the drawings, although it will be understood that I do not limit myself to any preferred style, arrangement, or size of perforations.

The operation of the device is as follows: The valve 18 in the discharge-pipe 19 is normally closed, and the wheat or other grain passing through the spout 22 falls through the screen 9 and, passing down over the upper surface of the cone 28, enters the annular space between the upper cylinder 23 and the outer upper cylinders 5 and 34, and thence passes on into the annular space between the lower cylinder 40 and the lower outer cylinders 37 and 43 and completely fills this space. By means of the fan 30 hot air is blown into the space within the upper cylinder 23, and this air passes out through the perforations in said cylinder, passes through the annular body of wheat between the cylinders, and escapes through the perforations in the cylinders 5 and 34. Cold air is blown into the space within the lower cylinder 40 and passes

out through the perforations in said cylinder and through the annular body of wheat and escapes through the perforations in the cylinders 37 and 43. After this operation has gone on for a certain length of time the grain piling up on the cone 28 fills up the space below the valve 10 10, and the weight of the grain accumulating upon the upper surface of said valve swings the plates outward, thereby drawing down the rod 14, raising the rod 16, and opening the valve 18. The grain begins to run out through the pipe 19, and this continues until the lowering of the grain at the upper end of the drier permits the valve 10 10 to return to its normal position and closes the valve 18. This operation is repeated so long as the grain flows into the drier. It will thus be seen that the annular space between the perforated cylinders is constantly filled with grain, and through this grain first the hot air and then the cold air is constantly passing, and thereby the grain is very rapidly dried, so that when it passes out of the drier it is completely dried and may be passed at once to the milling machinery.

It will also be noted that the machine may be readily taken apart or set up wherever or whenever desired. In order to take the machine apart, the spout 22 is removed and the lever 15 is disconnected from the rod 16. The upper cylinder 7, with the valve and screen 9, may then be lifted off. The pipe 33 is then slipped back upon the pipe 32, and the cone 28 and pipe-elbow 29 can be lifted off the cylinder 23. The cylinder 34 may then be removed and the cylinder 5 lifted out of the opening in the floor. The cylinder 23 may then be lifted out. The head 24 may then be removed. The lower cylinder 43 may then be removed. Then the cylinder 37 may be lifted out of the opening in the floor. Then the cylinder 40 may be lifted out of the opening in the floor. The pipe 51 may be slipped back upon the pipe 50 and disconnected from the pipe 47. The cylinder 45 may then be removed and after that the hopper 46. In setting up the device these operations are reversed, and the various parts may readily be put in place and connected in the manner herein shown and described.

I do not limit myself to the details of the construction herein shown and described, as it is evident that the same may be varied in many particulars without departing from my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A grain-drier, comprising in combination, inner and outer perforated cylinders arranged with an annular space between them, a transverse division extending across said inner cylinder and dividing the space within said cylinders into two separate compartments, and means for forcing air into each of said compartments and permitting the same to escape through said perforated cylinders and

through the body of grain contained in the annular space between said cylinders, for the purpose set forth.

2. A grain-drier, comprising in combination, inner and outer perforated cylinders arranged with an annular space between them, a transverse division extending across said inner cylinder and dividing the space within said cylinders into separate compartments, means for forcing hot air into one of said compartments and means for forcing cold air into the other compartment, whereby the air from both compartments is permitted to escape through the perforated cylinders and through the body of grain contained within the annular space between said cylinders, for the purpose set forth.

3. A grain-drier, comprising in combination, upright inner and outer perforated cylinders arranged with an annular space between them, a transverse division extending across said inner cylinder and dividing the space within said cylinders into an upper and a lower compartment, means for feeding the grain by gravity into the annular space between said cylinders, means for forcing hot air into said upper compartment and means for forcing cold air into the lower compartment whereby said air is permitted to escape through said perforated cylinders and through the body of grain contained within the annular space between said cylinders, for the purpose set forth.

4. A grain-drier, comprising in combination, upright inner and outer perforated cylinders arranged with an annular space between them, a transverse division extending across said inner cylinder and dividing the space within said cylinders into upper and lower compartments, means for feeding grain by gravity into the annular space between said cylinders, and means for regulating the flow of grain from said annular space whereby said space is kept full of grain while the device is in operation, means for forcing hot air into said upper compartment and means for forcing cold air into said lower compartment, whereby said air is permitted to escape through said perforated cylinders and through the body of grain contained within the annular space between said cylinders, for the purpose set forth.

5. The combination, with the removable cylinders 5 and 7, of the removable perforated cylinder 23 arranged within the cylinder 5, the outer removable cylinder 34, means for feeding grain into the annular space between the inner cylinder 23 and the outer cylinders 5 and 34, and means for forcing air into the space within said cylinder 23, for the purpose set forth.

6. The combination, with the inner and outer perforated cylinders arranged with an annular space between them, means for feeding grain into said annular space and means for forcing air into the space within the inner cylinder of the discharge-pipe, a suitable

valve located in said discharge-pipe, a valve located below the inlet-pipe comprising pivoted plates 10 and means supporting the same, and means connecting said valve with the
5 valve in the discharge-pipe whereby the flow of grain from the drier is automatically regulated, substantially as described.

7. A grain-drier, comprising in combination, upright, inner and outer perforated cylinders
10 arranged with an annular space between them, means dividing the space within said cylinders into compartments, means for feeding grain by gravity into the annular space between said cylinders, and means for regu-
15 lating the flow of grain from said annular

space whereby said space is kept full of grain while the device is in operation, means for forcing hot air into one of said compartments and means for forcing cold air into another compartment, whereby said air is permitted to escape through said perforated cylinders and through the body of grain contained within the annular space between said cylinders, substantially as described.

In testimony whereof I have hereunto set my hand this 30th day of August, 1898.

JAMES McDANIEL.

Witnesses:

RICHARD PAUL,
M. C. NOONAN.