No. 746,822. PATENTED DEC. 15, 1903.

G. R. GORHAM.

DRYING APPARATUS.

APPLICATION FILED APR. 3, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

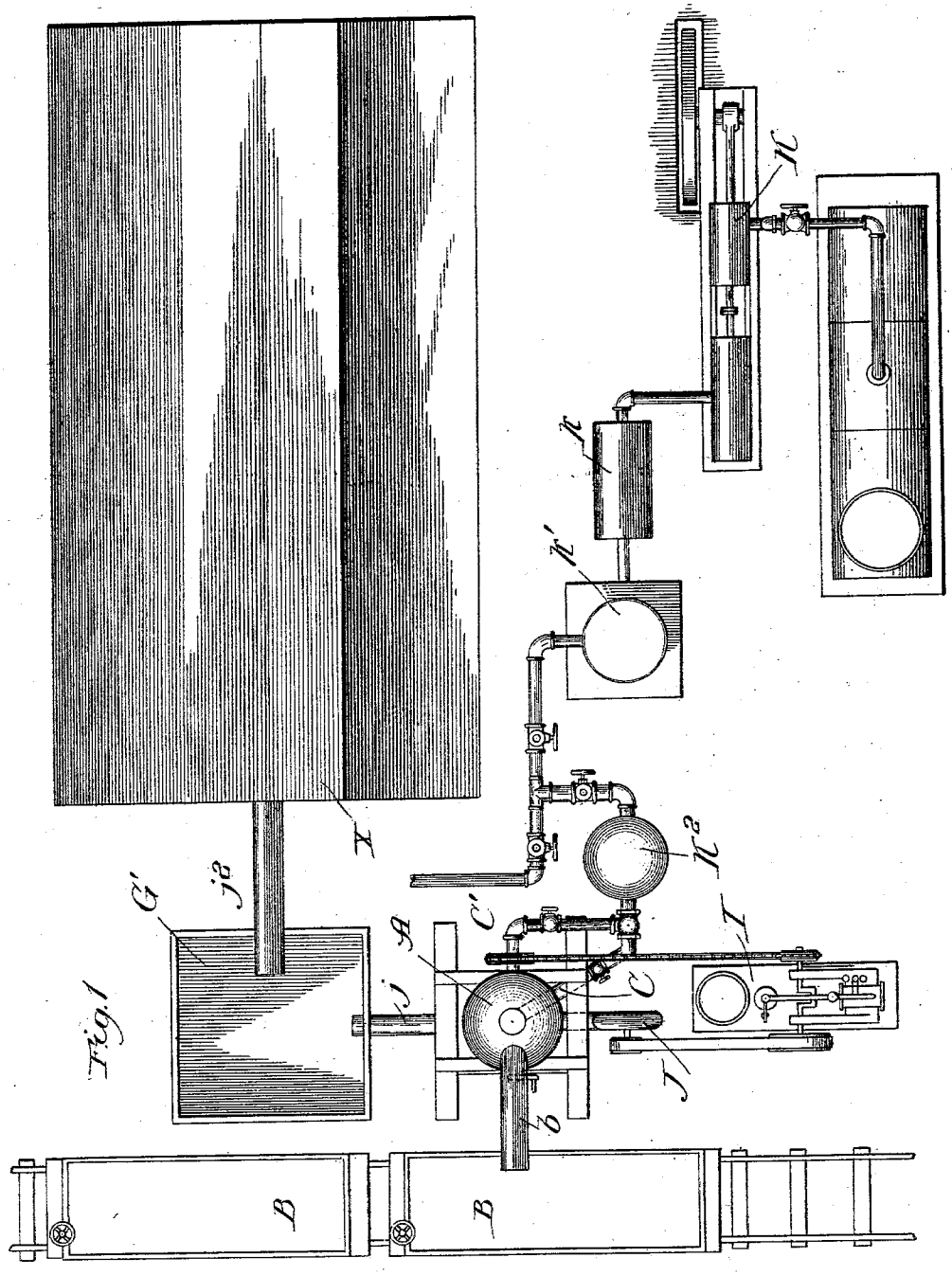


Fig. 1

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

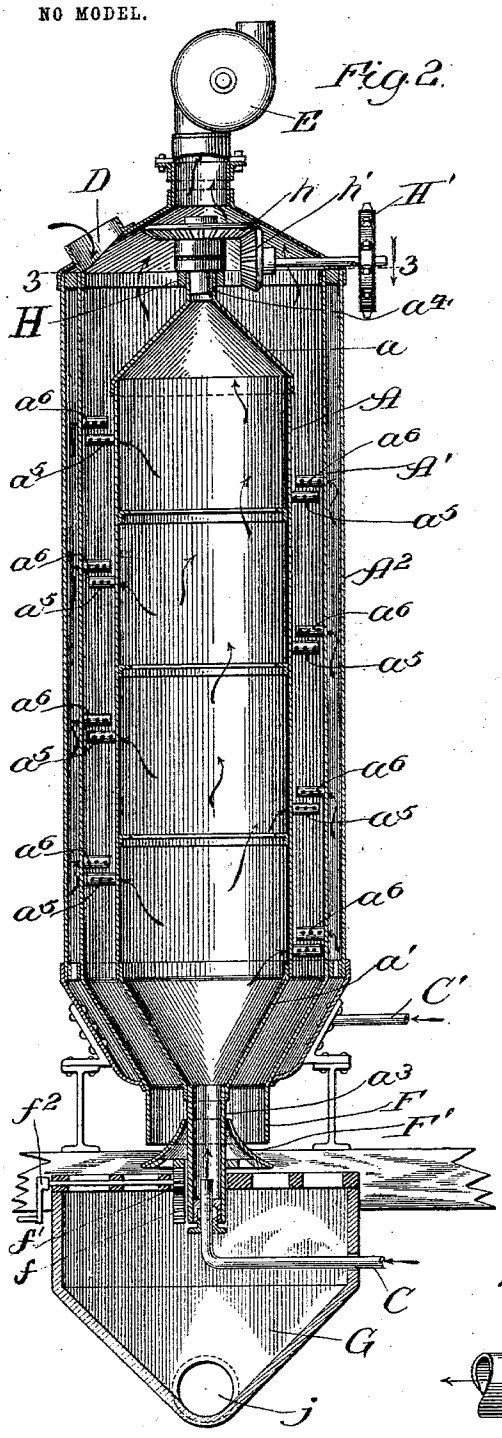


Fig. 3.

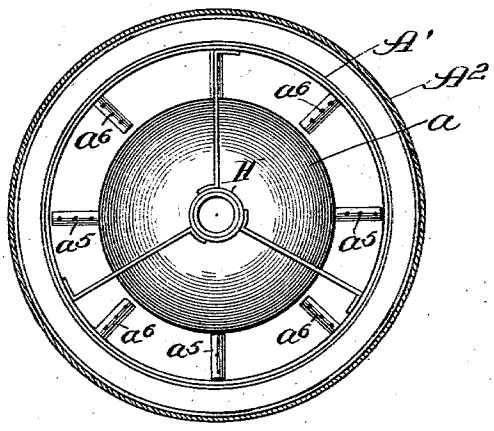
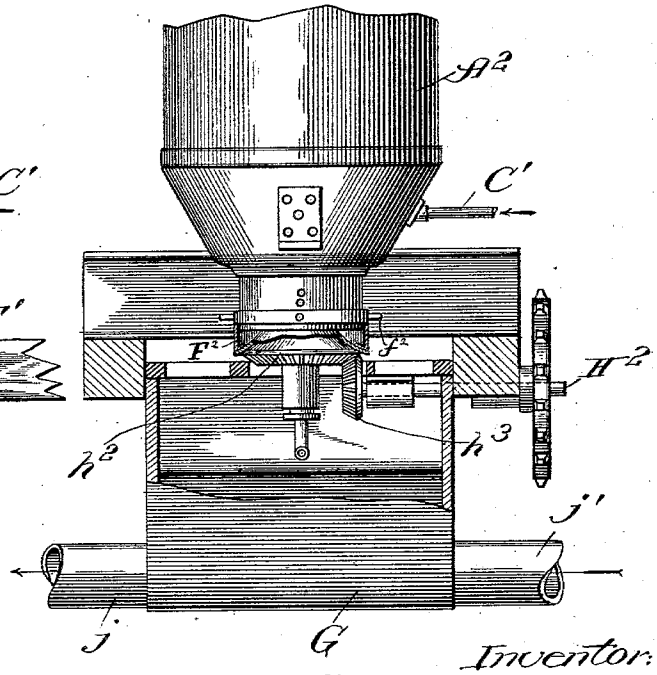


Fig. 4.



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NO MODEL. 3 SHEETS—SHEET 3.

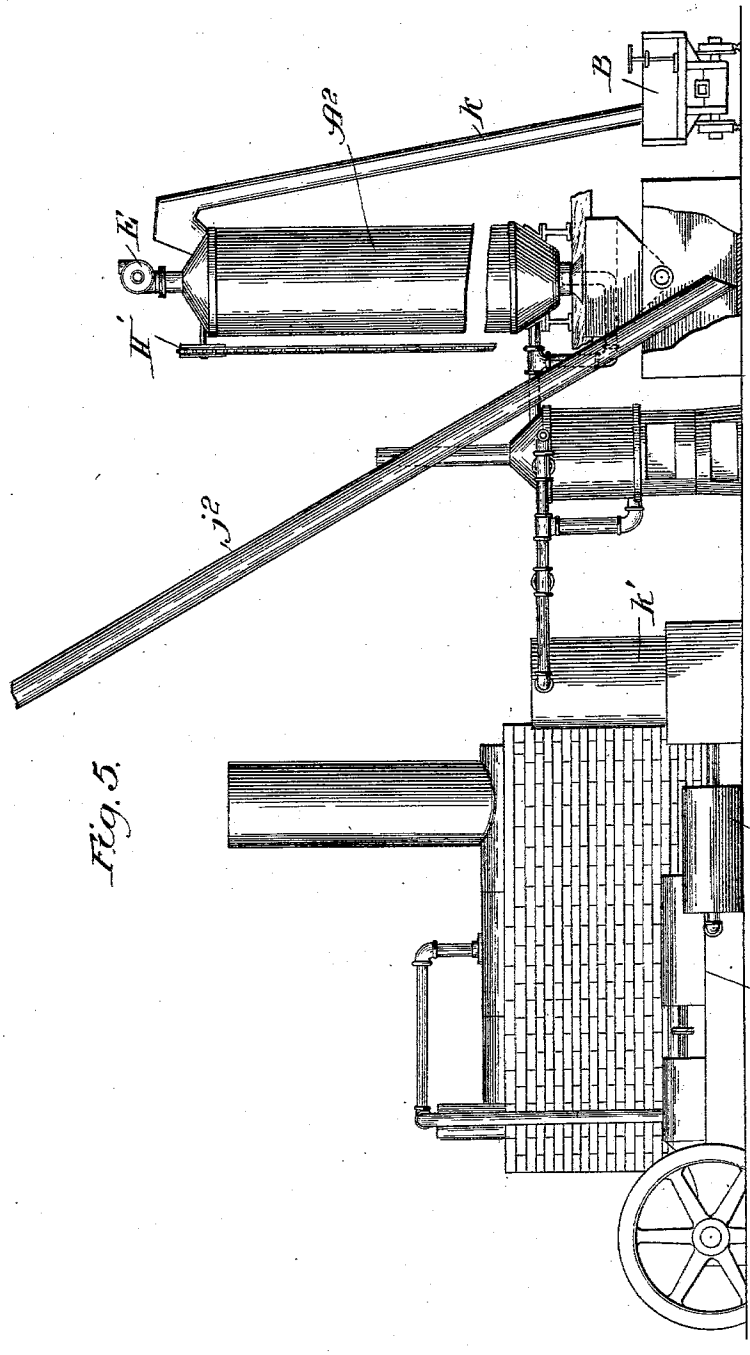


Fig. 5.

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No. 746,822. Patented December 15, 1903.

UNITED STATES PATENT OFFICE.

GEORGE R. GORHAM, OF CHICAGO, ILLINOIS.

DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 746,822, dated December 15, 1903.

Application filed April 3, 1902. Serial No. 101,140. (No model.)

To all whom it may concern:

Be it known that I, GEORGE R. GORHAM, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, (whose post-office address is 3550 Western avenue, Chicago, Illinois,) have invented certain new and useful Improvements in Drying Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates more particularly to improvements in apparatus adapted for use in drying wet or salvaged grain.

Heretofore while many forms of drying apparatus have been provided for grain imperfectly cured no satisfactory device has existed adapted to receive wet or water-soaked grain and to rapidly and thoroughly dry the same during the operation of transferring the same from the car or vessel to storage-bin in an elevator.

The invention consists in the matters hereinafter described, and more fully pointed out and defined in the appended claims.

In the drawings, Figure 1 is a top plan view of a device embodying my invention, showing the same somewhat diagrammatically. Fig. 2 is a vertical section of the drier. Fig. 3 is a section taken on line 3 3 of Fig. 2. Fig. 4 is a fragmentary view of the bottom of a drier adapted to be driven from the bottom. Fig. 5 is a side elevation, partly broken, of devices embodying my invention.

As shown in said drawings, a special drier is provided adapted to receive grain or the like direct from cars or other carriers, (indicated by B in Fig. 1.) Said drier comprises rotative inner cylindric hot-air chamber A, provided with conical ends $a\,a'$ and journaled axially in a non-rotative shell A′, inclosed in an outer rigidly-secured shell or jacket A^2, as shown in Figs. 2 and 3. Tubular journals $a^3\,a^4$ are provided for the inner shell, into the lower of which, a^3, extends the pressure-pipe C, provided with a suitable stuffing-box and adapted to admit hot air under pressure within said casing. A similar pipe C′ serves to admit hot air within the jacket of the outer casing, as shown in Figs. 2 and 4. Extending radially from the inner casing and communicating with the interior thereof are the relatively short perforated tubes or pipes a^5. Similar pipes a^6, communicably secured in the shell A′, project radially inwardly above and below the tube a^5 of the inner shell, so that hot air admitted within the casing A or into the jacketed portion of the outer casing will pass freely through said tubes a^5 and a^6 and into the grain-space between the inner and the outer casing.

An inlet spout or orifice D, through which grain is admitted into the drier, is located in the upper end of the casing, and an exhaust-fan E, driven from any source of power, is carried on the top of the drier and acts to rapidly withdraw steam or moist air arising from the drier during the operation.

A delivery-spout F, concentric with the tubular journal a^3, extends downwardly from the outer jacket, and a conical gate F′, slidably secured on the journal a^3, with its smaller end extending upwardly in the delivery-orifice, is adaptable to be adjusted on said journal to partly or entirely close the delivery-spout F when in an elevated position, but when in its lowered position admits of the grain in the drier falling freely therethrough into the hopper G. Means are provided for actuating said gate comprising a rack-bar f, rigidly secured thereon, while a pinion f' is journaled in operative relation thereto and adapted to be actuated by the crank f^2 and acts to move said gate upwardly or downwardly in the delivery-orifice.

In the construction illustrated in Figs. 2 and 5 said inner casing A is shown provided with means for rotating the same from the top, comprising a beveled gear h, rigidly secured on the upper tubular journal a^4 and having a bearing on the spider H. Said bearing may be of any type of antifriction ball or roller bearing. A beveled pinion h', journaled in the top of the outer casing, engages on said beveled gear. Power is communicated thereto by means of a chain drive and sprocket wheel in a familiar manner. In the construction illustrated in Fig. 4 said inner casing is driven from the bottom, in which instance the beveled gear h^2 is rigidly secured on the lower tubular journal a^3. A complemental beveled pinion h^3 engages therewith

and is driven from a shaft journaled on the hopper G and provided on its outer end with a sprocket H^2. In this construction the gate F′ is rigidly secured on the journal a^3, and the delivery-spout F is provided with a slidable sleeve F^2, on which are handles f^2 for adjusting the same. For the purpose of regulating the flow of grain from the delivery-spout said sleeve and spout are provided with registering apertures, through which a pin or the like may be inserted to hold the sleeve in position.

From the bottom of the hopper G extend the air-pipes j into a cooling hopper or bin G′ and a blower J, driven from the motor or engine I, which drives the inner shell of the drier, and the exhaust-fan E acts to blow the heated and dried grain from the bottom of the hopper into said cooling hopper or bin. The grain is elevated from the cooling-bin in the usual or any desired manner through the conveyer-pipes j^2 into the elevator X. Obviously it is a matter of great importance that the heated and compressed air forced into the inner casing and into the jacketed portion of the outer casing should be dry and compressed. For this purpose the compressing-engine K compresses atmospheric air, which is passed through the condensers k k', where the moisture is extracted by condensation or chemical means, as preferred, and the air passed therefrom in its compressed and dried state to the reheater K^2, where the same is raised to a comparatively high temperature, thereby increasing the pressure. From the heater it is permitted to escape through the pipes C and C′ into the interior of the inner casing A and into the jacket of the outer casing.

The operation is as follows: The grain is taken from cars or other carriers through the spout b and delivered into the top of the drier between the inner and the outer casing. The inner casing being made to revolve, the pipes a^5 and a^6 of the respective casings serve to constantly agitate the grain as the same passes downwardly between the casing and at the same time permits hot dry compressed air to be delivered to the grain through the apertures in said tube, thus rapidly evaporating the moisture contained therein. The moisture in the form of steam or vapor is exhausted from the drier by means of exhaust-fan located at the top of the same, thus aiding the compressors to force the dry air upwardly through the grain. Obviously both the inner wall of the inner casing and the inner wall of the outer casing are heated by the hot air contained therein, so that the grain resting against said wall is rapidly dried as it passes downwardly.

The delivery of the grain from the drier may be controlled at will by the adjustment of the gate F. As the grain passes into the hopper G the fan J operates to blow the same through the conveyer-pipe j into the cooling-bin G′, which may be of large size and of any desired material, preferably non-combustible. After the grain has partially cooled the same may be elevated into the warehouse X in any desired manner. Obviously the speed at which the grain is passed through the drier should vary with the amount of moisture contained therein. In the case of very wet or water-soaked grain the gate may be partly closed, confining the grain in the drier longer than is the case of grain containing less moisture. Obviously any desired source of power or form of motor may be used, and the type of compressor or reheater is immaterial, inasmuch as any of the usual commercial forms will answer the purpose. Obviously also, if preferred, a number of such driers may be used, so connected that, if preferred, the grain may be passed through more than one of the same.

Obviously many details of construction may be varied without departing from the principles of this invention.

I claim as my invention—

1. The combination with a drier, comprising an inner revoluble casing, an outer stationary casing, a heating-jacket inclosing same, tubular apertured arms communicating with the interior of said casing, means for heating the inner casing and tubular radial arms on said inner casing extending into close proximity with the outer and adapted to deliver heated air from the inner casing into the grain-space between the casings.

2. A drier of the class described, comprising an inner revoluble casing, means for admitting heated air into said casing, an outer casing concentric with the inner, and comprising an inner and an outer shell, means for delivering heated air into the space between the said outer and inner shell and tubular apertured arms extending outwardly from the inner and inwardly from the outer casing and adapted to admit said heated air into the space between said casings.

3. A drier of the class described, comprising a rotative inner and a non-rotative outer jacketed shell, means for admitting hot dry air into the inner shell and into the jacketed outer shell, tubular apertured arms extending into the space between said shells and adapted to admit the air from said jacket and said shell into the space between the same, an exhaust-fan located at the top of the drier and adapted to exhaust the air therefrom and means for rotating the inner shell.

4. A drier comprising a rotative cylindric casing provided with conical ends, tubes extending axially therefrom and forming the journals for the shell, a hot-air pipe communicating through one of said tubes with the interior of the casing and rigidly-secured radial tubes having apertures therein extending outwardly from said casing and adapted to permit the air in said casing to pass therethrough.

5. A device of the class described, an inner and an outer casing, means for heating the

adjacent walls of said casings and oppositely-extending apertured tubes on each of said casings and means for introducing therethrough into the space between the casing compressed, dried and heated air.

6. The combination with an outer jacketed casing, of a rotative casing axially disposed therein, means for delivering heated air into said casings, radially-disposed tubular arms between said casings, means for delivering grain into the space between the said casings at the top thereof, a discharge-orifice at the bottom and a gate adapted to regulate the size of the discharge-orifice.

7. The combination with a fixed casing, of an axial rotative casing therein, oppositely-directed perforated arms on the adjacent surfaces of said casings, means for heating the inner walls of said casings, means for an inlet and a regulable outlet and means for directing grain or the like passing therethrough into a cooling-bin.

8. The combination with a rotative inner shell, of a non-rotative shell inclosing the same, means for heating both shells, perforated arms on each, means for delivering heated dry air into the space between the casing therethrough, a gate-controlled delivery-orifice, a receiving-hopper and a fan acting to force the heated material from the receiving-hopper into a cooling-bin.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

GEORGE R. GORHAM.

Witnesses:
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ANNA B. HILLS.