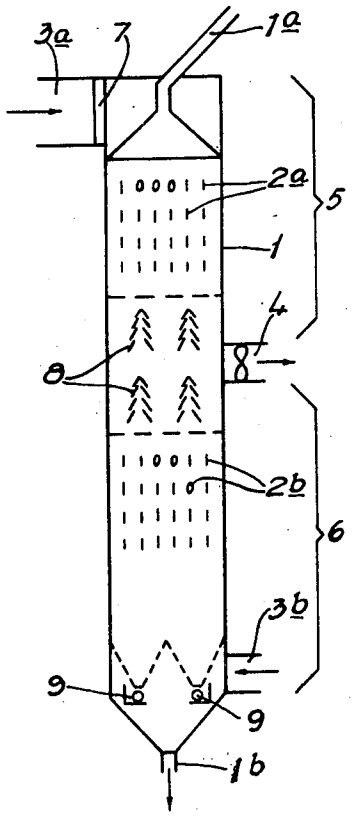
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METHOD AND ARRANGEMENT FOR DRYING GRAIN AND THE LIKE IN DRYING SILOS PROVIDED WITH DIRECT HEAT SUPPLY.

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METHOD AND ARRANGEMENT FOR DRYING GRAIN AND THE LIKE IN DRYING SILOS PROVIDED WITH DIRECT HEAT SUPPLY

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4 Claims. (Cl. 34—13)

By drying of grain and the like in drying silos the heat required for the drying as a rule is supplied either by heated air or by direct contact between the grain and heating elements situated in the silo which heating elements in their turn are heated by for instance warm water. In order to lead away the evaporated water a certain quantity of air always must pass through the grain and this quantity of air must be chosen so large that the dew point of the air does not reach a value where the grain may be damaged by the high temperature. It is to be presumed that the temperature of the grain rather rapidly rises to a temperature corresponding to the dew point of the air because of condensation of the grain when the temperature of the grain lies below the dew point. Heat is thus liberated causing the temperature of the grain to rise rapidly. By letting a greater or smaller quantity of air pass through the layer of grain between the heating elements a lower or respectively a higher dew point of the air is obtained. In this manner the quality of the grain may be prevented from being impaired by overheating when passing the heating elements. Experience has proved that the grain in such dryers during a so long time required for the drying may stand a temperature of about 50° C. without showing any harmful effects on the quality of the grain.

In the drying plants where the heat is supplied by means of air the dew point of the air will not increase to a temperature as high as 50° C. depending on that the air quantity required for supplying the heat is considerably greater than the quantity of air required for leading away the evaporated water.

Referring now to the drawing, the single figure is a diagrammatic view vertically through a drying silo made in accordance with the present invention. As shown, the drying silo comprises a vertically elongated housing **1** having an inlet **1***a* for grain at its upper end and an outlet **1***b* at its lower end through which the dried grain is discharged. Mounted in the housing **1** in relatively vertically spaced relation with respect to each other are groups or banks of pipes **2***a* and **2***b*, respectively, through which a suitable heated liquid, such as water, is circulated for the purpose of drying the grain passing vertically downward through the housing **1**.

Inlet ports **3***a* and **3***b* for admitting ventilating air to the housing **1** are provided at the upper and lower ends, respectively, of the housing, and an outlet port **4** for exhausting the ventilating air from the housing **1** is provided approximately midway of the height of the latter at a point between the two groups or banks of heating pipes **2***a* and **2***b*.

By this construction and arrangement ventilating air entering the housing **1** through inlet port **3***a* is caused to pass vertically downward in the direction of travel of the grain through the upper bank of heating pipes **2***a* and thence laterally outward from the housing through the exhaust port **4**. On the other hand, ventilating air entering the housing through the lower inlet port **3***b* is caused to pass upwardly within the housing **1** counter-current to the flow of the grain and through the lower bank of heating pipes **2***b* whence it passes laterally outward from the housing through the said exhaust port **4**. The ventilating air entering the inlet port **3***a* and passing downwardly through the upper part **5** of the silo is pre-heated by a suitable heating element **7** and assists in the drying of the grain, whereas the ventilating air entering the lower inlet

port **3***b* and passing upwardly through the lower silo part **6** is not preheated and, flowing counter-current to the direction of grain travel, is utilized initially to cool the heated dry grain before it is discharged from the lower end of the housing **1**.

Suction ducts for the ventilating air are provided as indicated at **8** in the space between the banks of pipes **2***a* and **2***b*, and suitable discharge feed rolls **9** are provided adjacent the lower end of the housing **1**. The speed of rotation of these rolls **9** may be adjusted to regulate the discharge velocity of the grain from the housing **1** through its discharge port **1***b*.

This arrangement involves among other things the following advantages:

1. The whole drying silo will work with negative pressure.

2. Only a so large part of the quantity of ventilating air required for cooling the heated out-going grain is admitted from below and first forced to pass through the grain in a special cooling zone before entering the lower drying zone.

3. While the cooling air is passing through the cooling zone an efficient drying is obtained because the entering cooling air has relatively low absolute contents of water and therefore has a great capacity of drying when heated.

4. The part of the required quantity of ventilating air which is admitted from above, may before meeting the grain be heated to a higher temperature than what normally can be allowed because this quantity of air always first is meeting the cold entering damp grain.

5. The required fan and air conduit arrangements can be made particularly simple because the arrangements of suction are concentrated to a smaller area in the centre of the dryer.

6. Inspection doors can be arranged easily on the sides of the dryer for cleaning and inspection because the air conduits are substantially omitted (see No. 5).

7. The space required for the dryer is small because the necessary arrangements of air conduits in the grain are reduced to a minimum and because the air conduit on the sides of the drying silo has nearly been omitted.

The dryer can be used for other goods preferably grained or otherwise penetratably to air.

Having now described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. Apparatus for drying grain comprising a vertical housing having an inlet for grain at its upper end and an outlet for the grain at its lower end, a plurality of horizontally disposed pipes for circulating hot water drying medium in said housing arranged in two groups vertically spaced with respect to each other, the first group of pipes being disposed in the upper portion of the housing immediately below the grain inlet, and the second group of pipes being disposed in the lower portion of the housing and spaced a substantial distance above the grain outlet to provide a cooling zone in the housing below the second group of pipes, ventilating air inlets adjacent the grain inlet and outlet respectively, outlet means from the housing for the ventilating air located between the vertically spaced groups of pipes, and exhaust means connected to said air outlet operable to cause the ventilating air entering the upper end of the housing to flow downwardly in the direction of grain travel through the grain and about the upper group of pipes to said air outlet and to cause ventilating air entering the lower end of the housing to flow upward counter-current to the grain travel through the grain both in said cooling zone and about the lower group of pipes to said air outlet.

2. Apparatus for drying grain comprising a vertical housing having an inlet for grain at its upper end and an outlet for the grain at its lower end, a plurality of horizontally disposed pipes for circulating hot water drying medium in said housing arranged in two groups vertically spaced with respect to each other, the first group of pipes being disposed in the upper portion of the housing immediately below the grain inlet, and the second group of pipes being disposed in the lower portion of the housing and spaced a substantial distance above the grain outlet, ventilating air inlets adjacent the grain inlet and outlet respectively, outlet means from the housing for

the ventilating air located between the vertically spaced groups of pipes, exhaust means connected to said air outlet being operable to cause the ventilating air entering the upper end of the housing to flow downwardly in the direction of grain travel through the grain and about the upper group of pipes to said air outlet and to cause ventilating air entering the lower end of the housing to flow upward counter-current to the grain travel through the grain both in said cooling zone and about the lower group of pipes to said air outlet, and means to preheat the ventilating air entering the housing through said upper air inlet.

3. The method of drying grain which comprises passing the grain vertically downward through a confined elongated passage having therein longitudinally spaced first and second heating zones, circulating hot water in said first and second heating zones to perform successive drying action on the grain, introducing a first source of ventilating air into said passage and causing the same to flow through the grain in the direction of travel thereof in the first heating zone of the passage, introducing a second source of ventilating air into the passage at a point substantially below the second heating zone and causing said air to flow counter-current successively through the grain below said second heating zone to cool said grain and heat the air and then through the grain in said second heating zone to dry the same and exhausting both the first and second air sources from the passage at a point intermediate the first and second heating zones.

4. The method of drying grain which comprises passing the grain vertically downward through a confined elongated passage having therein longitudinally spaced first and second heating zones, circulating hot water in said first and second heating zones to perform successive drying action on the grain, introducing a first source of ventilating air into said passage and causing the same to flow through the grain in the direction of travel thereof in the first heating zone of the passage, introducing a second source of ventilating air into the passage at a point substantially below the second heating zone and causing said air to flow counter-current successively through the grain below said second heating zone to cool said grain and heat the air and then through the grain in said second heating zone to dry the same exhausting both the first and second air sources from the passage at a point intermediate the first and second heating zones, and pre-heating said first source of ventilating air.

References Cited in the file of this patent

UNITED STATES PATENTS

128,707	Card	July 9, 1872
915,534	Arnold	Mar. 16, 1909
1,100,397	Reynolds	June 16, 1914
1,528,696	Robinson	Mar. 3, 1925
1,863,803	Pantenburg	June 21, 1932
2,333,089	Burkhardt	Nov. 2, 1943