

(No Model.)

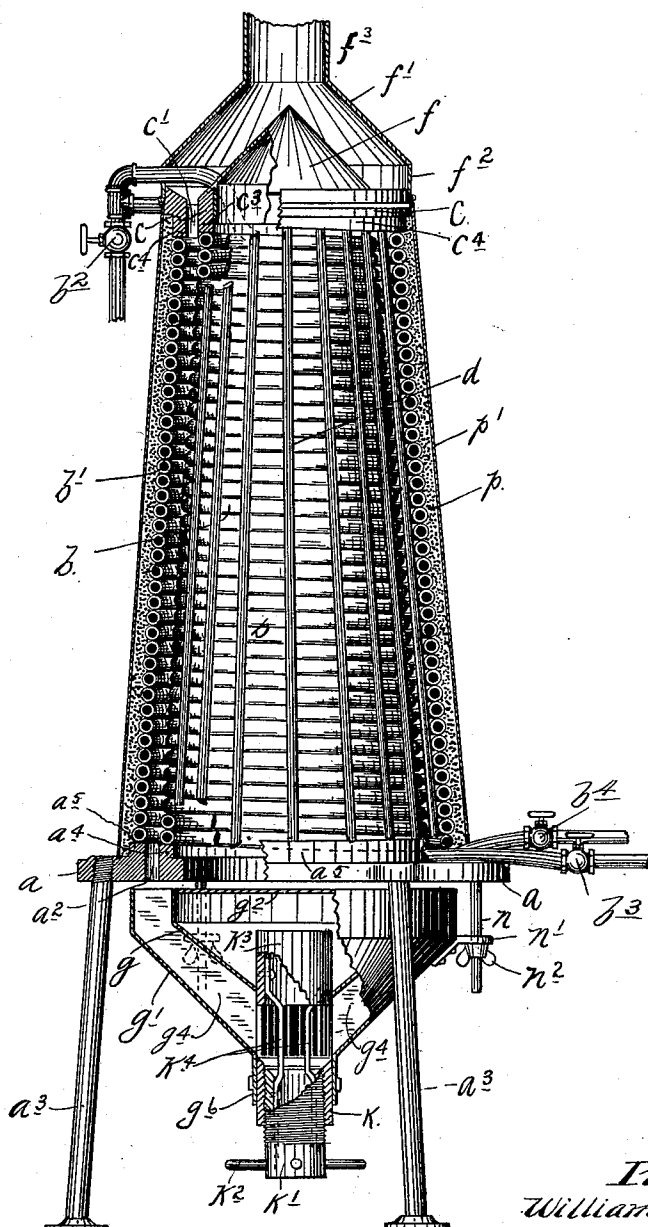
2 Sheets—Sheet 1.

W. APELT.
GRAVITY WHEAT HEATER.

No. 592,041.

Patented Oct. 19, 1897.

Fig. 1.



Witnesses,

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Fig. 2.

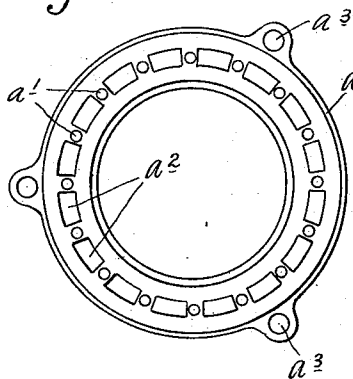


Fig. 4.

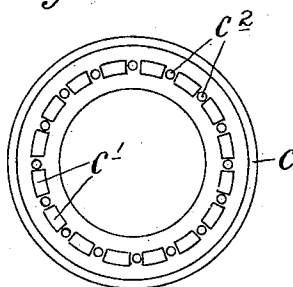


Fig. 7.



Fig. 5.

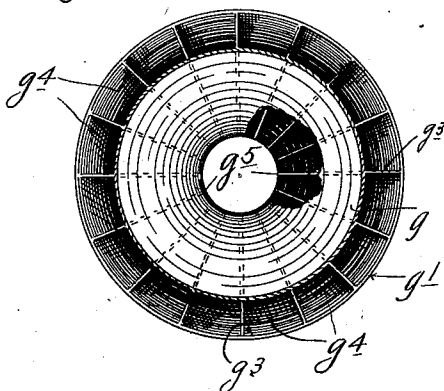


Fig. 6.

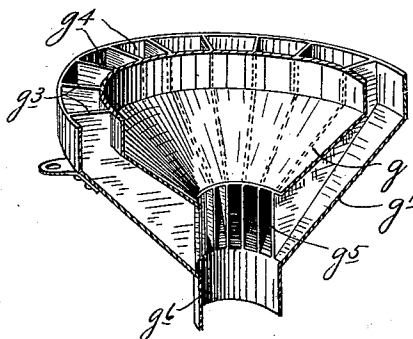
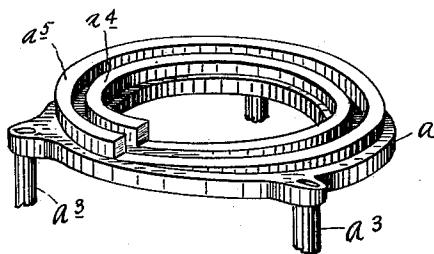


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM APELT, OF MINNEAPOLIS, MINNESOTA.

GRAVITY WHEAT-HEATER.

SPECIFICATION forming part of Letters Patent No. 592,041, dated October 19, 1897.

Application filed February 11, 1896. Serial No. 578,901. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM APELT, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and useful Gravity Wheat-Heater, of which the following is a specification.

My invention has for its object to provide an improved heater especially adapted for heating or tempering wheat or other cereals, but adapted in general for heating or drying finely-divided particles.

To the above ends my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The preferred form of my invention is illustrated in the accompanying drawings, wherein, like letters referring to like parts throughout the several views—

Figure 1 is a view, partly in side elevation and partly in central vertical section, with some parts broken away, showing my improved grain-heater. Fig. 2 is a plan view of the annular base-casting removed from working position. Fig. 3 is a perspective view of said base-casting shown in Fig. 2. Fig. 4 is a plan view of the upper annular casting or head. Fig. 5 is a plan view, with some parts sectioned and others broken away, showing the base-hopper removed from the machine. Fig. 6 is a perspective view showing a central vertical section of the parts of the hopper illustrated in Fig. 5, and Fig. 7 is a side view of one of the tie-rods or vertical partitions removed from the apparatus.

Referring to the details of the parts shown, a indicates an annular base-casting provided with an annular channel which would cut the said base a into two rings but for a series of perforated radial bolt-lugs a' , which divide the said annular channel or slot into a series of segmental passages a^2 . As shown, the casting a is supported in a horizontal position, at some little distance above the floor or ground, by means of supporting-legs a^3 , and on its upper face is provided with a pair of supporting-flanges $a^4 a^5$, which extend, one on the inner edge and the other on the outer edge of the broken annular channel formed by the segmental passages a^2 . By reference to Fig. 1, and particularly to Fig. 2, it will be

seen that these supporting-flanges $a^4 a^5$ start from about the face of the casting a and gradually rise until they make a complete circle, at which point they reach the altitude of the diameter of the pipe of which the coils, presently to be described, are formed.

b and b' indicate conical heaters formed by sections of pipe closely wound together in the form of cone-frustums. These conical coils b and b' are located concentric to each other and rest, respectively, upon the supporting-flanges $a^4 a^5$ of the casting a , with their opposing heating-surfaces spaced apart about the width of the radial cross-section of the segmental passages a^2 and in line therewith. At the top of the coils b and b' is supported an annular head-casting c , which in form is very similar to that of the casting a , in that it is provided with a series of segmental passages c' , formed by a groove cut in the face of the same and divided by perforated bolt-lugs c^2 , and also provided with winding-flanges $c^3 c^4$, which rest, respectively, on the tops of the coils b and b' .

It will be noted by reference particularly to Fig. 1 that the face of the casting c is beveled downward toward the segmental passages c' , so as to give a good delivery of the grain thereto.

When the castings a and c are properly positioned, the segmental passages a^2 and c' , respectively, thereof are brought into radial alinement with each other. This is also true with respect to the bolt-passages through the bolt-lugs a' and c^2 of said castings a and c , respectively. It of course follows from these statements that the segmental passages and the bolt-passages above referred to are, in each of said castings, equal in number. Long bolts or rods d are passed through the radially-alined bolt-passages of the perforated bolt-lugs a' and c^2 . These bolts d serve to divide a thin conical chamber formed between the pipe-coils b and b' into a multiplicity of nearly-vertical channels or spouts, which, while they retain the constant dimension radially or between the coils, flare or expand toward their lower ends. The purpose of this construction will more clearly appear in the description of the action of the apparatus. As shown, the rods d have screw-threaded engagement with the perforated lugs a' of the

base-casting a , and more or less of the said rods are screw-threaded at their upper ends and are provided with nuts d' , which are adapted to bear against the upper faces of the lugs c^2 of the head-casting c , when tightened, and serve to clamp the said castings a and c onto the coils b and b' . Three or four nutted bolts, thus tightened, will be sufficient for this purpose, and the rest of the bolts may consequently be left loose at their upper ends.

A center opening or bore of the upper casting c is closed by means of a conical deflector f , which loosely telescopes into the same. This cone f is surrounded and covered by means of an inverted hopper-like section f' , which is provided with a depending cylindrical flange f^2 , that telescopes over the upper peripheral edge of the casting. The grain to be heated or tempered is delivered to the inverted hopper f' through a supply-pipe f^3 , which opens through the apex of the same immediately over the apex of the conical deflector f .

Supported from the under side of the base-casting a is a conical hopper, made up principally of an inner and an outer cone g and g' , respectively. The upper end of the inner cone is closed by a disk or head g^2 , and the said cones are rigidly secured together by means of a series of radial partitions g^3 , which separate the conical chambers formed between the said cones into a series of converging spouts or troughs g^4 . The apexes of the cones g and g' and the converging ends of the radial partitions g^3 are cut away to form a centrally-located valve-seat g^5 , and the lower extremity of the outer cone g' is provided with a depending cylindrical extension g^6 .

Removably secured within the depending cylindrical extension g^6 is a collar k , and working with screw-threaded engagement within the same is a hollow sleeve or pipe-section k' , provided at its lower end with radial pins k^2 , by means of which it may be turned.

k^3 indicates a cylindrical valve, as shown in the form of a hollow pipe-section, which is adapted to work telescopically within the valve-seat g^5 , and, by longitudinal movement, either to completely open or to completely close the converging spouts g^4 simultaneously. To accomplish this movement of the valve k^3 , it is, as shown, rigidly connected to the hollow screw-threaded pipe-section k' , by means of bars or brackets k^4 .

It will be noted that the converging spouts g^4 are increased in their vertical cross-section toward their lower ends, so as to offset their contracted cross-section in a horizontal plane, thus giving the said spouts practically the same cross-section throughout their entire length.

As shown, the hopper g g' is supported as above stated, but with freedom for vertical adjustments, by means of depending studs n , as shown, three in number, from the base-casting a , the lower ends of which work through

coöperating lug-irons n' , secured on the outer cone g' , and provided, at their screw-threaded ends, with nuts n^2 , which engage the under sides of said lugs n' .

The spouts g^4 are, in number, equal to the number of passages a^2 and c' of the castings a and c , respectively, and, when properly positioned, directly underlie and register, one with each of said perforations a^2 . The mouths of the spouts g^4 are, however, in cross-section, much larger than the cross-section of said passages a^2 , and hence readily receive all of the grain delivered thereto.

By slightly lowering the hopper g g' , as shown in Fig. 1, the passage of the multiplicity of streams of grain may be readily observed; and if the said hopper be sufficiently lowered access may be had at any time to the grain to enable inspection thereof, with a view of ascertaining its temperature or other condition.

The upper ends of the coils b and b' are turned outward and terminate in a common valved pipe-section b^2 ; and at their lower ends the said coils b and b' are likewise turned outward at the abrupt shoulders formed in the supporting-flanges a^1 and a^5 of the casting a , and terminate in independent valved branches b^3 and b^4 , respectively. These pipe-sections b^2 , b^3 , and b^4 are intended for communication with a suitable source of steam-supply, such as a boiler.

The outer surface of the outside conical coil b' is covered with a thick layer of heat-insulating material p , which, in turn, is covered by a thin conical sheet of metal or other suitable material p' . This insulating cover or jacket p p' of course serves to prevent the radiation and waste of heat from the coil b' .

The action of the apparatus, as an entirety, will now be described.

The parts of the apparatus being adjusted or positioned as indicated in Fig. 1, and the chilled or cold grain being delivered through the spout f^3 will fall onto the conical deflector f , and be thereby deflected outward toward the periphery of the shield f^2 , thus forming an annular accumulation of grain immediately over the annular series of passages c' in the head-casting c . Right here it is desirable to call attention to the fact that grain, as well as other finely-divided particles which are adapted to flow in streams, under the action of gravity, will, when permitted to flow in large or extended streams, tend to form channels or center drafts which accelerate the flow of the grain at such portion of the stream. This action, so far as I am aware, is a common fault found in all grain-heaters and similar devices now in use. It is a serious objection, inasmuch as it causes certain particles of the grain to pass more rapidly through the heater than certain other particles, thus causing an uneven heating or tempering of the same. In my improved heater, above described, I entirely obviate this defect by the use of the vertical partitions d ,

which form the annular heating-chamber into the series of spouts or vertical troughs, as above described. With this construction, the grain which, as above described, is discharged in bulk over the annular series of perforations c' , will, before it has had an opportunity to acquire much speed or to form currents, be separated into a multiplicity of evenly-divided small streams. As these streams pass on downward through the channels formed between the partitions d the friction on the grain will be gradually lessened, thus accelerating the fall thereof, due to the circumferential expansion of said spouts toward their lower ends. It will, however, be noted that the said spouts retain their same radial dimensions throughout their length, so that the grain, while relieved of a certain amount of friction, will, nevertheless, be held just as closely to the heating-surfaces of the coils b and b' . The inside coil b is given sufficient flare or taper toward its bottom to cause the grain, in passing through the drier, to hug or bear against the heating-surface of the same, thus causing the grain to roll and turn, so that the grain will become well mixed and consequently evenly heated or tempered in passing through the drier; and the corrugated heating-surface formed by the said coil greatly increases the rolling and mixing action on the grain. The flare of the said heating-coils and spouts formed therebetween also serves to prevent clogging or choking of the grain in passing the same.

To briefly sum up the above action, the grain while in bulk is divided into a multiplicity of duplicate streams which, in their passage through the heater, are well stirred and evenly subjected to the heat-radiating surfaces, with the result that the grain is rapidly and evenly heated or tempered.

From the vertical spouts of the heater the duplicate streams of grain pass through the passages a^2 of the bottom casting a into the coincident mouths of the hopper troughs or spouts g^4 , through which they pass, and from the lower ends of which they are discharged into the valve-seat g^5 , from which they pass downward through the hollow valve-sleeve k' in a concentrated stream.

As already indicated, the converging hopper-spouts g^4 may be completely opened or closed, or opened any desired amount, by the valve k^3 , under the control of the screw-threaded hollow sleeve k' . As is obvious, by opening or closing the said converging hopper-spouts g^4 to a greater or less extent the rapidity of the flow of the grain through the drier may be varied at will, and it is thought to be equally as obvious that the longer the grain is held within the heater the hotter it will be heated. Hence, of course, the heating or tempering of the grain may be varied to suit the requirements of the work to be performed.

It is thought to be evident from the foregoing description that I have provided an ex-

remely simple and efficient heater for the purposes had in view.

It may be stated that the heater above described is especially designed for heating or tempering wheat, an operation which is made imperative in cold climates in order to bring the wheat to the proper temperature for grinding. However, an apparatus constructed in accordance with my invention is, as has already been indicated, capable of general use, either as a heater or as a drier, and as such I desire to claim the same.

It must also be obvious from the foregoing description and statements therein made that various alterations in the specific details of construction set forth may be made without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a grain-heater or similar device, the combination with a pair of pipe-coils closely wound to form truncated cones, concentrically located large end downward and spaced apart to form a conical heating-chamber, of a series of straight-line vertical partitions dividing said heating-chamber into a multiplicity of channels which expand circumferentially toward their lower ends, substantially as described.

2. In a grain-heater or similar device, the combination with the pair of pipe-coils closely wound to form truncated cones, concentrically located but spaced apart to form a conical heating-chamber, of the base and head pieces clamped against the ends of said coils and provided with annular series of passages in line with said conical heating-chamber, and the partition bolts or rods passed through said base and head pieces and the conical heating-chamber, certain of said bolts serving to tie said base and head pieces together, substantially as described.

3. In a grain-heater or similar device, the combination with an annular heating-chamber divided into longitudinal spouts or sections, of a hopper receiving from the same, formed with a multiplicity of converging or concentrating spouts, substantially as described.

4. In a grain-heater or similar device, the combination with an annular heating-chamber divided into longitudinal spouts or sections, of a hopper receiving from the same, formed with a multiplicity of converging concentrating spouts or troughs which open to a central common discharge-passage or valve-seat, and a common valve in said discharge-passage or valve-seat for simultaneously opening or closing said concentric spouts, substantially as described.

5. In a grain-heater or similar device, the combination with a hopper formed with a multiplicity of converging concentrating spouts or troughs which deliver to a common discharge-passage or valve-seat, and a common valve in said discharge-passage or valve-seat,

for simultaneously opening and closing said concentric spouts, substantially as described.

6. In a grain-heater or similar device, the combination with a hopper provided with a central discharge-passage or valve-seat g^5 , of the valve k^3 movable vertically in said passage or seat g^5 , the screw-threaded sleeve or socket k secured with said hopper, the screw-threaded hollow pipe-section or follower k' provided with projections k^2 , and the connections k^4 between said parts k' and k^3 , whereby by turning the follower-section k' within the sleeve or socket k said valve k^3 may be opened or closed at will, substantially as described.
7. In a grain-heater or similar device, the combination with an annular heating-chamber, of a vertically-adjustable concentrating-hopper receiving therefrom, substantially as and for the purposes set forth.
8. In a grain-heater or similar device, the combination with the closely-wound conical coils $b b'$, of the base-casting a with passages

a^2 and perforated bolt-lugs a' , the head-casting c with passages c' and perforated bolt-lugs c^2 , the conical deflector f and shield f' removably supported by said head-casting c , the partition-bolts d passing through said castings a and c and the annular heating-chamber formed between the coils b and b' , the heat-insulating jacket surrounding the coil b' , the hopper $g g'$ adjustably supported from the base-casting a and formed with the converging concentrating-spouts g^4 which deliver to the common valve-seat g^5 , the vertically-movable common valve k^3 in said seat g^5 , the socket k secured with said hopper, the hollow pipe-section or follower working with screw-threaded engagement in said socket k , and the brackets k^4 secured to said valve k^3 and follower k' , substantially as described.

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Witnesses:

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