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APPARATUS FOR THE TREATMENT OF WHEAT

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Fig. 1.

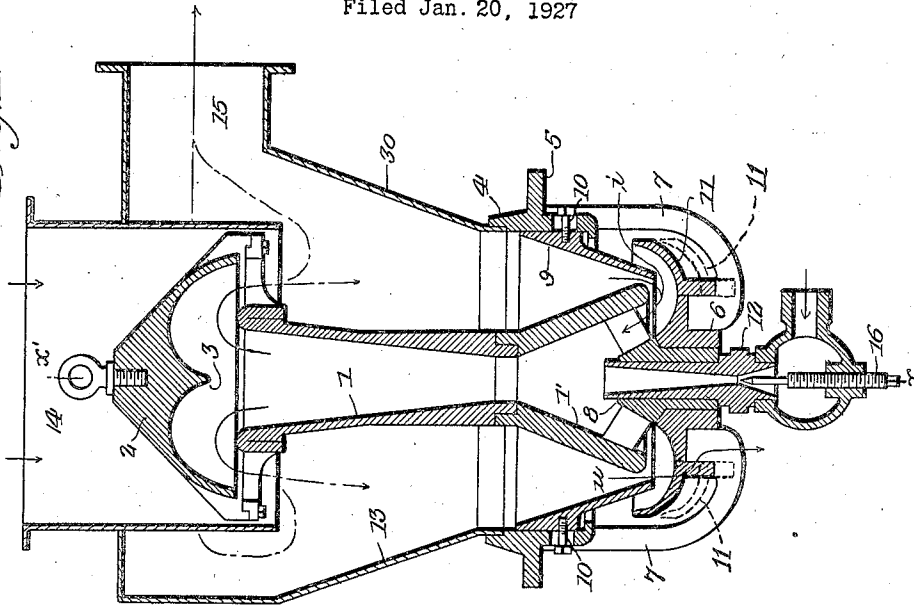


Fig. 2.

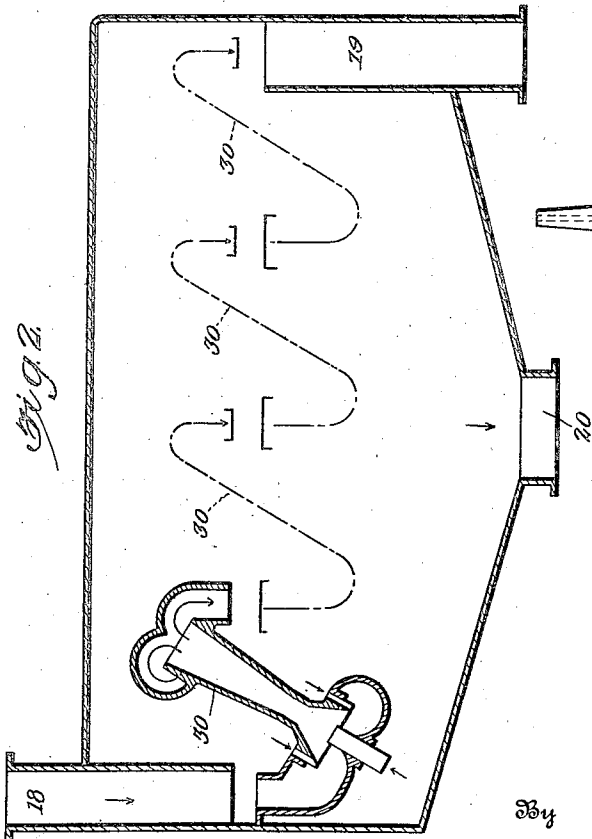
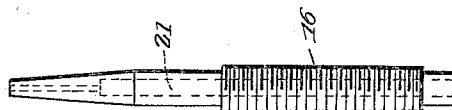


Fig. 3.

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APPARATUS FOR THE TREATMENT OF WHEAT.

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This invention relates to improvements in machines for husking grain or the like.

The object of the present machine is to treat the grain in such a manner as to:

5 (a) Render inactive the diastase, which is contained in the husks and which would otherwise become active during either the making or baking of the bread, impairing the nutrient constituents and particularly, the starch and gluten.

(b) Remove completely the woody, non-assimilable parts of the grain.

For this purpose the grain, according to the present invention is forcibly moved with great velocity through a conduit with the aid of a jet of steam or air or both, the husks being separated from the grain by the combined action of friction, heat and any moisture present.

20 A machine for carrying this into effect preferably comprises one or more Venturi or injector like devices through which the grain is forced by steam or air or both to impact on one or more curved deflecting surfaces where-
25 by the direction of movement of the grain is reversed. If a single device is employed the grain is repeatedly circulated there-through until completely husked, the separated husks being removed with the steam or
30 air. Where a plurality of such devices are employed, however, the grain is passed successively through the same and leaves the last device fully husked.

35 Two embodiments of the invention are illustrated, by way of examples of the two above mentioned alternatives, in the accompanying drawings in which:

40 Fig. 1 is a vertical section through a husking device through which the grain is circulated,

Fig. 2 is a diagrammatic section of a machine, comprising a number of devices, similar to that shown in Fig. 1, arranged in series, and

45 Fig. 3 is a detail on an enlarged scale.

50 The machine illustrated in Fig. 1 performs simultaneously the two operations mentioned in the foregoing and consists in an injector body which is composed of two cones 1 and 1' connected together in such a manner that the tapering portions are in opposite directions. A hood 2, so shaped that the fluid encountering the curved lower surface 3 thereof is deflected through an angle of about

170°, is arranged above the cone 1. A central seat 6 is connected by guide ribs 7 with a ring 4 having a supporting rim 5.

The supporting ring 4 carries a funnel shaped casing 9 which is secured thereto by screws 10.

60 An annular member 11 which in its normal position rests on the guide ribs 7 is mounted on the seat 6 which together with said ring 11 forms a concave surface or trough. Grooves corresponding to the guide ribs 7 are provided in the ring 11 which is carried by said ribs 7. It is thus possible for the ring 11 to be lowered when the recesses are in register with the ribs.

70 A nozzle 12 through which steam or compressed air or both may be forced into the main body of the ejector 1 and 1' is screwed in a mounting 8 which is in turn screwed in the seat 6.

75 The entire device is enclosed in an outer casing 13 which is made of metal and is supported by the ring 4. In the upper part of the said casing there is an opening 14 through which the grain is introduced and a further opening 15 through which the steam and air may escape. The main body 1 of the injector, the upper hood 2, the supporting ring 4 and the casing 13 are of circular shape with a common axis x, x' .

85 Modifications of a constructional nature may naturally be made not only in the various parts of the machine but also in the machine as a whole without exceeding the scope of the invention.

90 The grain is subjected by the device to a heat treatment the purpose of which is the neutralization of the harmful influences of the diastase contained in the husks of the grain. The said treatment consists in bringing the grain in stages, observing the conditions prescribed, to a temperature of 60 to 80° C. and subjecting said grain at the same time to mechanical treatment to free it from the husks. To effect this both compressed air and steam are employed after a preliminary heating.

100 Due to the use of steam the grain is sterilized by the heating and furthermore the woody substance is softened, the latter being necessary for the removal of the husks.

105 If warm air is employed, the sterilization takes place precisely as by the application of steam. The husks are in this case softened

by the introduction of a fine jet of water which can be regulated by a needle 16 (Fig. 3).

Whether, as in the first case, steam or, the second case, compressed air is employed the rather too energetic action of these agents is weakened by the quantity of replacement air which automatically enters the body of the injector during its operation. This results from the fact that said air amounts to about 80% of the mixture formed.

The device operates as follows:

The grain is introduced through the opening 14 and falls downwardly therefrom. The steam and compressed air entering through the nozzle 12 cause a suction in the double cone, 1, 1' such that the grain is drawn in with the desired quantity of air which enters (arrow *i*) from the exterior annular opening formed by the cone 9 and the ring 11. The grain is projected from the cone 1 against the hood 2 whence, due to the curved inner surface thereof, it falls back into the lower part of the device. From there it is then drawn in fresh with a further quantity of air.

The mixture of air, steam and grain separates upon emerging from the hood 2. The grain, which is substantially heavier is projected vertically downward while the air and steam are removed through the outlet 15. When the husks commence to separate they are removed together with the air and steam since they are much lighter than the grain.

It must be emphasized that the separation of the husks occurs comparatively rapidly. In 3 to 4 minutes at the most the grain is freed from the husks in which time the steam employed is able to soften the husks although it has not sufficient time to penetrate into the core underneath the same. At the end of the operation it will be found that the increase of moisture in the core does not amount to more than 1%.

The construction of the machine is such that all factors which co-operate in the husking of the grain are regulable. The steam and compressed air are controlled by the needle 16 (Fig. 3) and the quantity of grain entering the cone and the air by raising or lowering the level of the grain in the cone 9 until the desired quantities are obtained. If the level of the grain rises in the cone the quantity passed decreases and that of the air increases and vice versa. This regulation is necessary since various qualities of grain are commercially available.

The weight of the husked grain causes the ring 11 to sink, as illustrated by dotted lines in Fig. 1, so that the grain may emerge in the direction of the arrow.

The machine, illustrated in Fig. 1 operates intermittently that is a definite quantity, corresponding to the capacity and power of the machine, of the grain to be husked is operated upon for a time and when husked is with-

drawn from the machine. Experience has demonstrated that the grain must pass 20 to 25 times from below upwardly through the machine, and back before the husking is completed. If therefore a continuous delivery of husked grain is desired, approximately 25 to 30 devices of this type must be arranged in series in the manner diagrammatically illustrated in Fig. 2. In this case the grain enters through the passage 18 and passes into the first device which is substantially similar to that illustrated in Fig. 1. The grain is then conveyed from said first device to a second and third and so on until it leaves the last device husked and emerges through the passage 19. All the devices are disposed in a casing and the air, steam and husks are discharged through the lower opening 20.

The inlet pipe for the steam or compressed air may be regulated by a needle 16 the provision of which is of considerable importance, particularly when compressed air is employed for the husking. The latter treatment is necessary when steam is not at disposal. In this case the regulating needle 16 may serve for the introduction of water. The compressed air flows through the tube, atomizes the water, which mixes intimately with the secondary air, and moistens the grain, the husking thus being simplified.

The husking is complete not only at the round part of the grain but also at the furrow and the skin of the seed is not damaged in any way, since the grain is not subjected to any mechanical friction caused by moving metal members. The skin of the seed itself is also not destroyed since it separates, free from any impurity, from the remainder of the grain in the form of small laminae, constituting a valuable material for the industries in which cellulose is an important constituent of the originating material.

Thus the heat treatment and the mechanical action are, according to the present invention, intimately connected.

I claim as my invention:—

1. A device for husking grain comprising an injector body; a hood arranged above the injector body having a curved lower surface adapted to deflect the grain forced from the body; a nozzle for directing a fluid into the injector body; and a funnel-shaped casing for directing the grain into the injector body.

2. A device for husking grain comprising an injector body consisting of two cone-shaped members connected together at their smaller ends; a hood arranged above the injector body and adapted to deflect the grain forced from the body; a nozzle for directing a fluid into the injector body; and a funnel-shaped casing for directing the grain into the injector body.

3. A device for husking grain comprising an injector body; a hood arranged above the injector body and adapted to deflect the grain

forced from the body; a nozzle for directing a fluid into the injector body; a funnel-shaped casing for directing the grain into the injector body; and a surrounding casing for
5 said body having an inlet and outlet for the grain and an opening for the escape of the air and steam.

4. A device for husking grain comprising an injector body consisting of two cone-
10 shaped members connected together at their small ends; a hood arranged above one end of the injector and adapted to deflect the grain forced from the injector; a funnel-shaped casing arranged at the other end of the in-
15 jector to feed the grain thereto; a member arranged below the funnel-shaped casing and the injector; and means for enclosing the injector and the hood, said means having an inlet for the grain and an outlet for the fluid.

20 5. A device for husking grain comprising an injector body consisting of two cone-shaped members connected together at their small ends; a hood arranged above one end
25 of the injector and adapted to deflect the grain forced from the injector; a funnel-shaped casing arranged at the other end of the injector to feed the grain thereto; a member arranged below the funnel-shaped casing
30 and the injector; a nozzle cooperating with said injector to force a fluid under pressure therein; and means for enclosing the injector and the hood, said means having an inlet for the grain and an outlet for the fluid.

35 6. A device for husking grain comprising an injector body; a hood arranged above the injector body and adapted to deflect the grain forced from the body; a supporting rim; a funnel-shaped casing secured to said

rim and adapted to guide the grain to the bottom of the body; a member arranged be-
40 low the funnel-shaped casing and the injector for guiding the grain; and a casing on said rim and surrounding the body and hood and having an inlet and an outlet there-
45 in.

7. A device for husking grain comprising an injector body; a hood arranged above the injector body and adapted to deflect the grain
50 forced from the body; a supporting rim; a funnel-shaped casing secured to said rim and adapted to guide the grain to the bottom of the body; a member arranged below the fun-
55 nel-shaped casing and the injector for guiding the grain; a nozzle cooperating with said injector to force a fluid under pressure there-
in; and a casing on said rim and surrounding the body and hood and having an inlet and an outlet therein.

8. A device for husking grain comprising an injector body; a hood arranged above the
60 injector body and adapted to deflect the grain forced from the body; a supporting rim; a funnel-shaped casing secured to said rim and adapted to guide the grain to the bottom of the body; a member arranged below the fun-
65 nel-shaped casing and the injector for guiding the grain; a nozzle cooperating with said injector to force a fluid under pressure there-
in; a casing on said rim and surrounding the body and hood and having an inlet and an
70 outlet therein; and a needle valve in said nozzle for regulating the fluid.

In testimony whereof I have signed my name to this specification.

LUIGI NEGRO.