No. 882,156. PATENTED MAR. 17, 1908.

A. P. MacDONALD.

MACHINE FOR SEPARATING HULLED FROM UNHULLED GRAIN.

APPLICATION FILED APR. 18, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

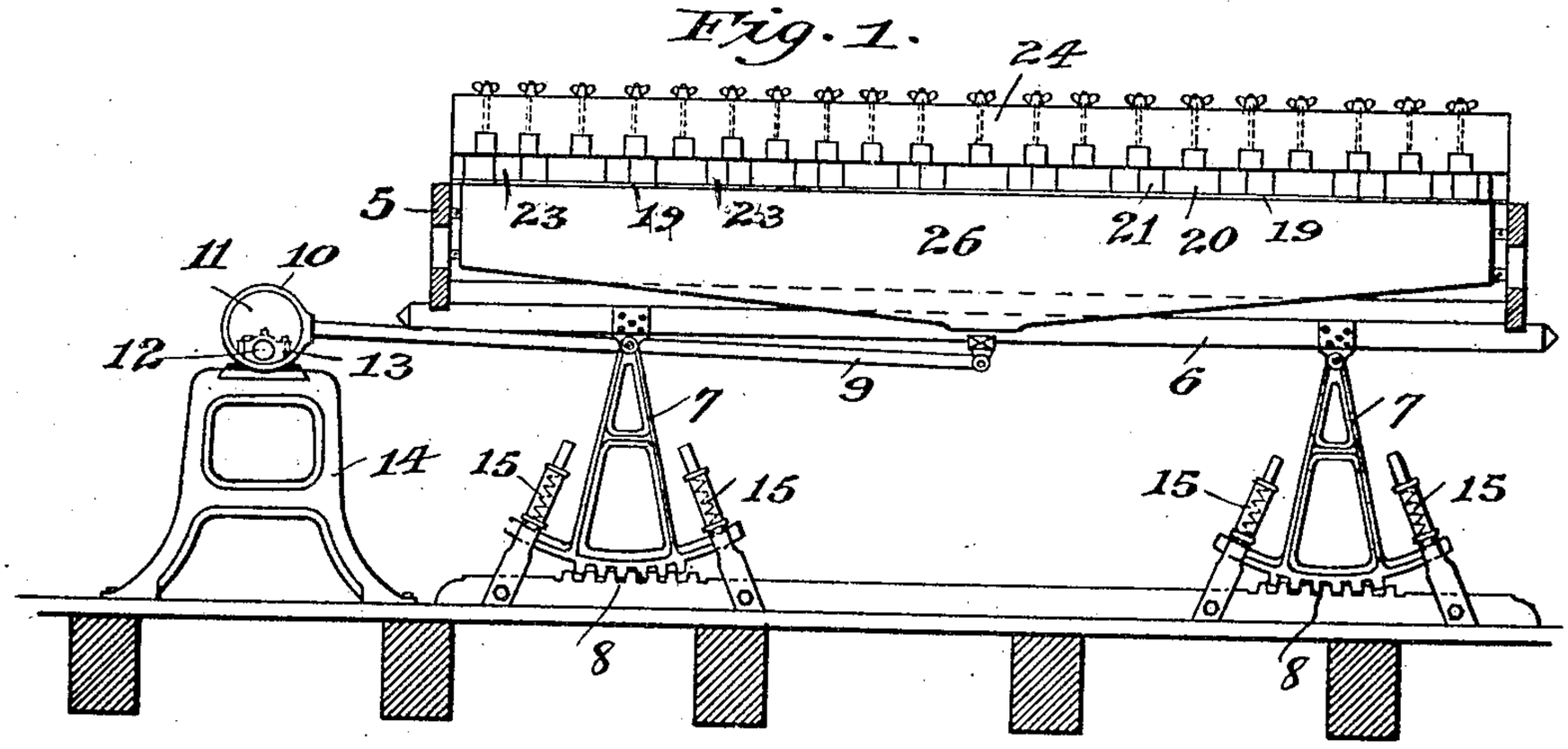
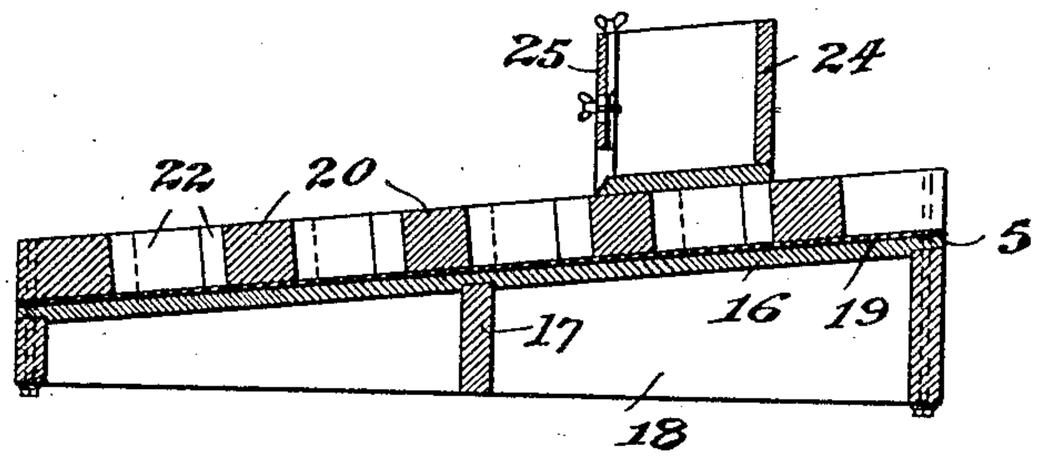


Fig. 3.



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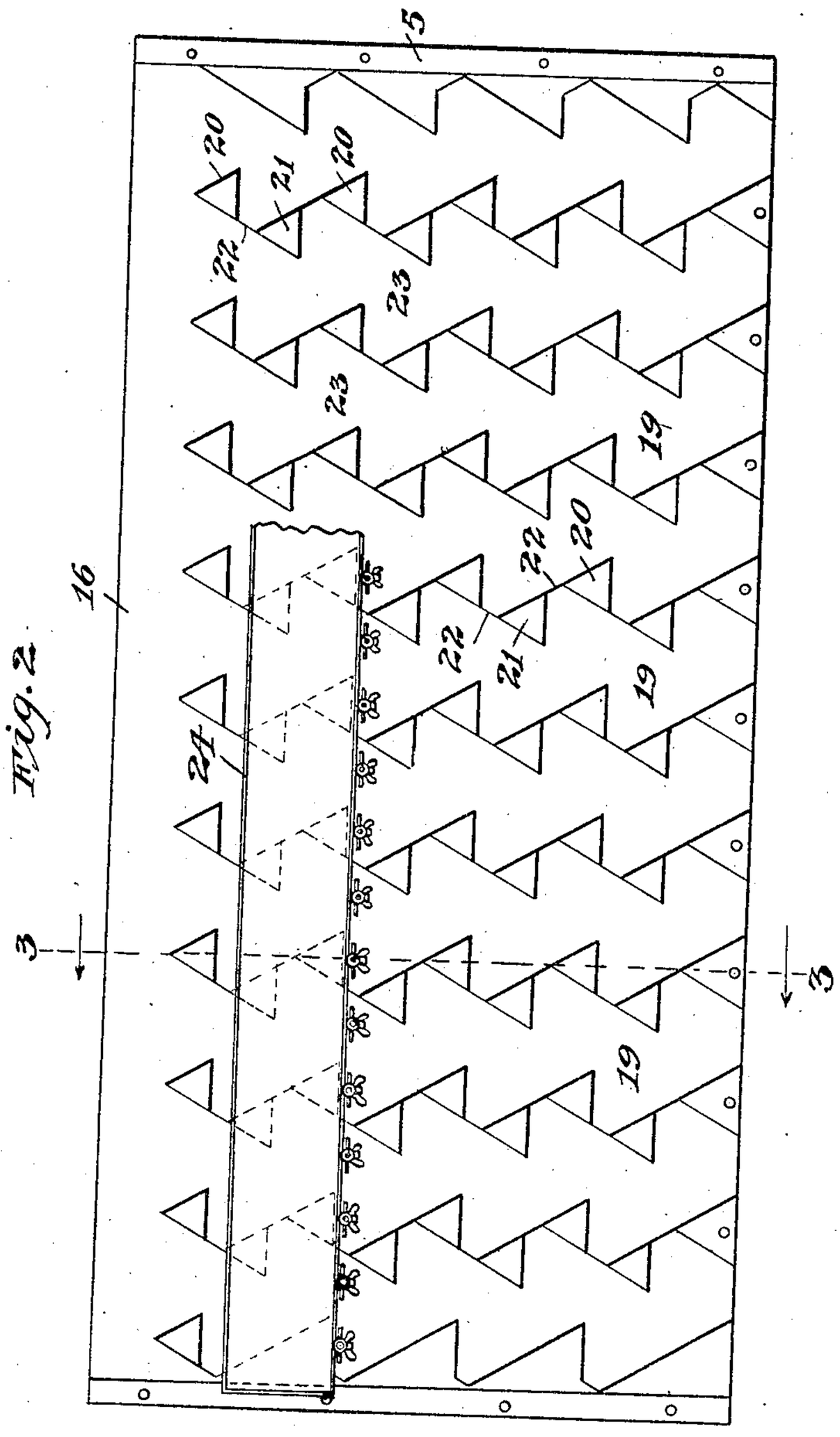
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR SEPARATING HULLED FROM UNHULLED GRAIN.

No. 882,156. Specification of Letters Patent. Patented March 17, 1908.

Application filed April 18, 1907. Serial No. 368,976.

To all whom it may concern:

Be it known that I, ALEXANDER P. MacDONALD, a citizen of the United States, residing at Morris, in the county of Grundy and State of Illinois, have invented certain new and useful Improvements in Machines for Separating Hulled from Unhulled Grain, of which the following is a specification.

This invention relates to the general art of grain-separating machines, and has reference more particularly to that class of machines which is designed and adapted to take the product of the hulling or decorticating machine and effect a separation of the hulled grains or kernels from the unhulled.

The type of machine on which my present improvements are based is illustrated by the grain-separating machine shown in United States Letters Patent to Friedrich H. Schule, No. 559,815, dated May 12, 1896, and No. 726,996, dated May 5, 1903; the principal features of said machine residing in a sloping table having formed across its top a plurality of parallel channels with staggered zigzag walls and reëntrant angles, in combination with means for reciprocating or shaking the table in a direction transverse to the channels, and means for feeding the material into said channels, whereby the heavier grain particles settle to the bottom and slide down the channels, discharging at the lower ends of the latter, while the lighter particles, consisting of the unhulled grain, blind grains, seeds, and foreign matter generally, is buffeted back and forth between the oppositely inclined walls of the channels, which thus act as a conveyer to deliver such material off at the upper ends of the channels. In the practical operation of these machines it has been found necessary to pass the grain through a series of such machines or through a series of operations in a single machine, in order to get fairly satisfactory results.

My present invention resides chiefly in an improvement on this type of machine whereby I am enabled to effect a thoroughly clean separation of the hulled grain from the unhulled grain and waste matter at a single operation, thus saving the waste of time and expense involved in passing the material through several machines or operations, as has heretofore been necessary.

The machines of the type above referred to operate as described principally by reason of the fact that the kernel or hulled grain itself is heavier in proportion to its volume than the unhulled, partly hulled, blind grains, and foreign matter, by virtue of which it settles to the bottom where it rests on the floor of the channel, and is therefore somewhat less subject to the agitating action of the table than the lighter material, which latter, rising to the top and possessing greater smoothness of surface, is thrown back and forth between the side walls of the channel and, by virtue of the peculiar form of the latter, is worked out of the channels in a direction opposite to the flow of the hulled grain. Heretofore, so far as I am aware, the bottoms of the channels of these machines have been made with smooth polished metal surfaces. The result of this has been that both the hulled and the unhulled grain moves from side to side of the channel in a body, and quite a percentage of the hulled grain finds lodgment in the reëntrant angles of the channels out of the path of the main flow of the hulled grain and is thrown back and forth between the side walls with the unhulled grain and finds its way out with the latter, thus going to waste unless subjected to a further separating operation.

I have discovered, as a result of numerous experiments and tests, that if the bottom wall of the channel, instead of being made perfectly smooth as heretofore, be given a frictional character, such as to retard and check the transverse movement of the hulled grain on the bottom under the shaking of the table, the hulled grain will remain in the center of the channel unaffected by the action of the side walls and readily flow down the channel, while the unhulled grain on top is buffeted back and forth between the oppositely inclined side walls of the channel and is conveyed and discharged in the opposite direction. For the purpose of a frictional surface to the bottom wall or floor of the channel, I prefer a covering or carpet of India rubber; but the gist of my invention resides in making such bottom wall or floor of the channel of a roughened or frictional character, irrespective of the particular material employed, for the purpose of checking the transverse flow of the hulled grain under a throw of the table sufficient to buffet the unhulled grains between the side walls of the channel.

My invention will be readily understood when considered in connection with the accompanying drawings, wherein,—

Figure 1 is a side elevational view of a

grain-separating machine equipped with my present improvements. Fig. 2 is a plan view on an enlarged scale of the channeled table, with the feed-trough broken away at one end; and Fig. 3 is a cross-sectional view on the line 3—3 of Fig. 2.

Referring to the drawings, and first briefly describing the principal mechanical elements of the machine, such as are shown in both of the Schule patents above referred to, to which reference may be had for a fuller description, 5 indicates as an entirety the separating table, which is secured to longitudinal beams 6, mounted on sectoral rockers 7, the segmental faces of which latter are provided with gear teeth meshing with racks 8 on a suitable base-plate or on longitudinal beams of a floor frame; and to the longitudinal beams 6 about midway of their length is connected one end of a connecting rod 9, whose opposite end receives an eccentric strap 10 surrounding an eccentric 11 on a driving shaft 12 mounted in journal bearings 13 on suitable pedestals 14. Spring chusioning devices 15 are applied to the opposite ends of the rockers 7, in order to cushion the shocks of the machine.

Referring now to the structural features of the separating table proper, 16 designates the flat top of the table that may be supported on proper longitudinal and transverse frame members 17 and 18, and is given an inclination or slope in the direction of its shortest dimension, as clearly shown in Fig. 3. To the upper surface of the table top is applied, in the embodiment of the invention herein shown, a friction surface in the nature of a carpet or covering of rubber, leather, felt, or other similar friction material indicated at 19; and on said carpet or covering are secured the zigzag walls of the channels. Each wall is conveniently formed, as herein shown, by a series of alternately laterally offset prism blocks 20 and 21, the alined parallel faces of adjacent blocks being connected by sheet metal or other strips or plates 22. By virtue of this construction there are formed between adjacent rows of prism blocks zigzag channels indicated by 23 extending from one longitudinal side or edge of the table to the other, into which channels the grain to be separated is fed through a superposed feed-box or trough 24 provided with adjustable valves 25 (Fig. 3). It will be observed that the ends of any inclined wall on one side of a channel lie opposite the centers of similar walls on the opposite side of a channel, the purpose and result of which is to throw the unhulled grains forming the upper layer of the material in the channels back and forth across the latter in a zigzag manner of travel toward the upper edge of the table. The hulled grain, on the contrary, being finer and heavier, and furthermore possessing a less smooth surface than the unhulled grain, clings to the frictional surface of the bottom wall of the channel, and by virtue of the frictional or adhesive character of the latter, is kept out of the reentrant angles, and under the continuous shaking movement, aided by the effect of gravity, slides downwardly of the channels and is discharged from the lower edge of the separating table into a trough or channel indicated at 26 (Fig. 1) suitably placed to receive it.

I have discovered that by giving to the bottom walls of the channels a frictional character in lieu of the smooth polished metal surface heretofore used, I effect a perfect and complete separation of the hulled from the unhulled grain by a single passage through the machine. The frictional surface so retards the transverse movement of the hulled grain at the bottom as to keep it in the center of the channel, thus not only giving a perfect separation in one operation, but eliminating all waste caused by the working of the hulled grain upwardly with the unhulled, which occurs to a considerable extent in the machines now in use. At the same time, this frictional surface has no effect upon the travel of the unhulled grain, inasmuch as its travel is on top of the hulled grain.

Different materials give slightly different degrees of efficiency; and the most efficient material I have thus far discovered for the purpose described is ordinary vulcanized rubber; but I would have it understood that my invention comprehends any material or roughened surfaces whatever having the character of what I term a friction surface or material.

I am aware that the use of a friction surface on an endless carrier in a grain-separating machine is old, in which the friction surface causes the rougher surfaced particles of the grain to cling thereto and be positively carried to the end of the carrier and discharged, and I make no claim to such use of a friction surface in a grain-separating machine; but the friction surface on the bottoms of the channels of my present invention operates in a different way and upon a different and novel principle. In the first place, this friction surface is not formed upon an endless belt or carrier, and consequently has no function to positively carry off a separated part of the grain through a clinging or adhering action; but rather it is formed upon a shaking surface that is inclined in the direction of the channels, and its function is to retard the momentum of the hulled grain on the bottom sufficiently to prevent its being thrown against the zigzag side walls, thus permitting the combined action of gravity and agitation to effect its discharge at the lower end of the channels, while the smoother and somewhat lighter unhulled grain, by vir-

tue both of the fact that it naturally rises to the top of the mixture under the agitation and of the further fact that it is of a smoother surface than the hulled grain, is buffeted back and forth between the side walls and thus directed toward the upper ends of the channels. In other words, the machine of my invention prevents the hulled grain on the bottom and the unhulled grain on the top from moving together in a body, as they do in machines wherein the bottom of the channel is of smooth or polished metal.

I claim:

1. In a machine for separating hulled from unhulled grain, a transversely inclined separating table provided on its upper surface with a series of transversely extending channels formed with zigzag side walls and friction-surfaced bottom walls, in combination with means for feeding grain to said channels at points intermediate the ends of the latter, and means for imparting a shaking movement to said separating table in a direction transverse to said channels whereby the unhulled grain is buffeted back and forth between the side walls and discharged at the higher end of said channels while the hulled grain is retarded by said friction-surfaced bottom walls against contact with said side walls and descends under the combined action of gravity and agitation to the lower ends of said channels from which it is discharged, substantially as described.

2. In a machine for separating hulled from unhulled grain, a transversely inclined separating table provided on its upper surface with a series of transversely extending channels formed with staggered zigzag side walls and rubber-surfaced bottom walls, in combination with means for feeding grain to said channels at points intermediate the ends of the latter, and means for imparting a shaking movement to said separating table in a direction transverse to said channels whereby the unhulled grain is buffeted back and forth between the side walls and discharged at the higher end of said channels while the hulled grain is retarded by said rubber-surfaced bottom walls against contact with said side walls and descends under the combined action of gravity and agitation to the lower ends of said channels from which it is discharged, substantially as described.

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