July 14, 1931. C. C. PALMER 1,813,948

DOCKAGE COLLECTING AND SEPARATING DEVICE

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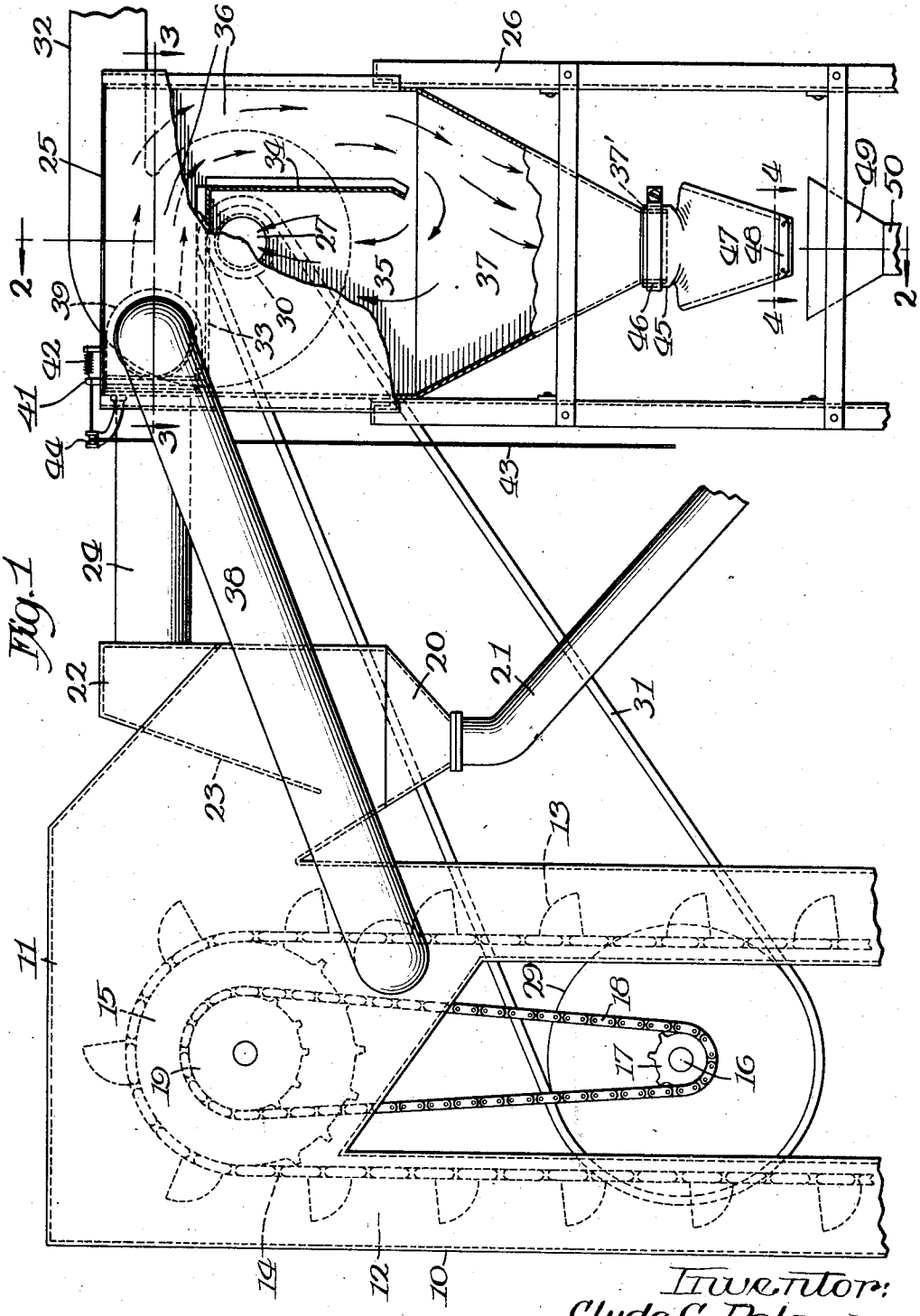


Fig. 1

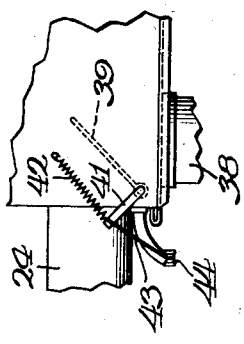
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Fig. 5



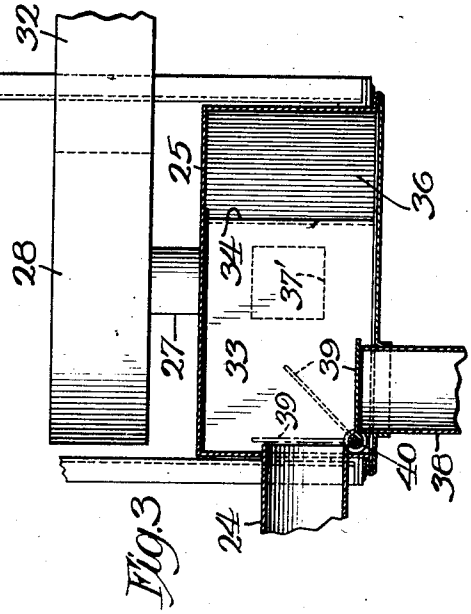
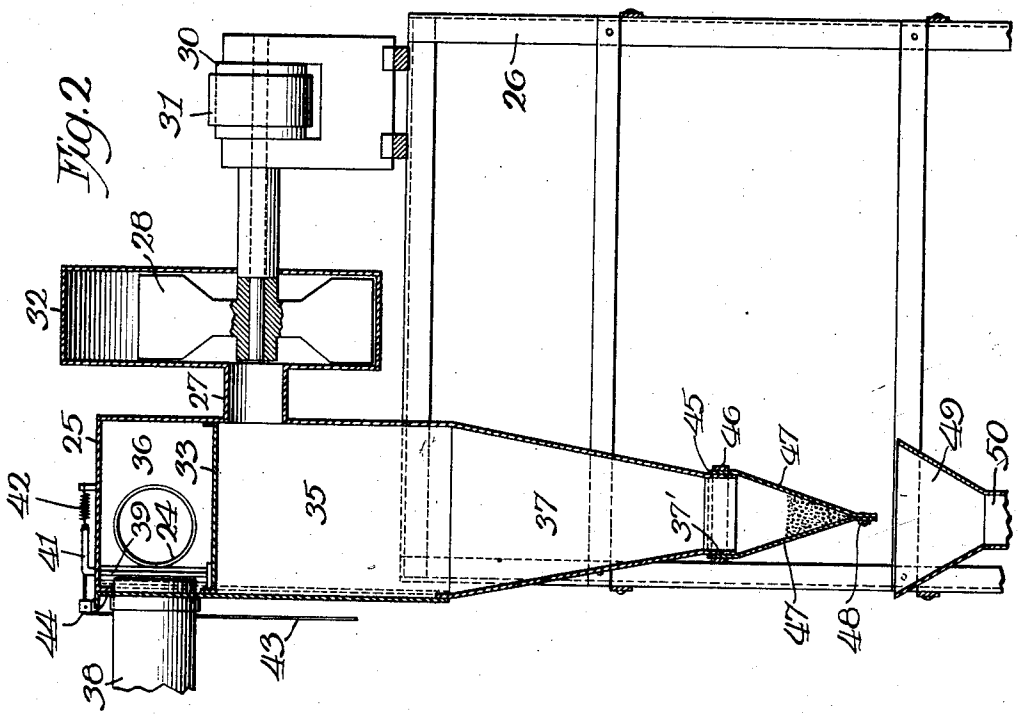


Fig. 3

Fig. 4



Fig. 2



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UNITED STATES PATENT OFFICE

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DOCKAGE COLLECTING AND SEPARATING DEVICE

Application filed April 2, 1928. Serial No. 266,502.

This invention relates to the general art of grain cleaning devices, and has reference more particularly to an improved dockage collecting and separating structure designed to effect separation of light and defective particles of grain from the dust and chaff accompanying the same.

Numerous devices have heretofore been proposed for removing dust from grain elevators, terminals and mills and cleaning the grain handled therein on the pneumatic principle; and some of these devices also aim at effecting a separation of the light and defective particles of grain, which are valuable as chicken and stock feed, from the worthless dust and chaff. In one grain cleaner and separator of this type with which I am acquainted there is employed between the suction fan and the head of the elevator a dockage collecting and separating chamber, including a rectangular casing having a hopper bottom for collection of the grain particles brought over with the dust and chaff, and a downwardly flaring hood within and separated on all sides from the chamber and communicating with the suction fan. Actual tests with such a device have shown that the dust, chaff and particles of grain drawn over from the elevator head are not efficiently separated in the separating chamber for the reason that such matter, under the suction urge, seeks the shortest path from the point of entrance to the separating chamber to the suction pipe of the fan, and where the suction is maintained at sufficient strength to clear the elevator pit, booth and hood of dust, not only are the dust and chaff drawn off from the separating chamber but most of the light grain as well. If the suction is reduced sufficiently to permit gravity separation of the particles of light grain from the dust and chaff, the cleaning effect on the elevator is imperfect.

One object of my present invention is to provide an improved dockage collecting and separating structure which will better effect the separation of the light grain from the dust and chaff than has heretofore been possible in devices of this character, and this object I attain chiefly by a novel structure of separating chamber which provides a relatively long, indirect flow passage from the top of the separating chamber to the bottom of the exhaust chamber that communicates directly with the suction side of the fan.

A practical and approved embodiment of the invention is illustrated in the accompanying drawings in which—

Fig. 1 is a side elevation partly broken away and in section of my improved dockage collecting and separating device showing also its connections to the elevator head and leg;

Fig. 2 is a vertical transverse section on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1;

Fig. 4 is a transverse section through the lower end of the grain discharge spout on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary top plan view of one corner of the separator casing, illustrating a valve shifting means;

Referring to the drawings, 10 designates as an entirety the vertical elevator leg, and 11 the head thereof, and 12 and 13 the rear and front vertical passageways of the leg, in which travel respectively the ascending and descending limbs of the usual bucket conveyor 14 running over a sprocket 15 journaled in the head 11, by which conveyor the grain is elevated from the pit to the head and discharged into the latter. With the means for driving the bucket conveyor the present invention is not concerned, but, I have herein illustrated a motor-driven shaft 16 carrying a sprocket wheel 17 which, through a sprocket chain 18, drives a sprocket wheel 19 on the shaft of the upper conveyor sprocket 15.

On that side of the head which is opposite the grain discharge from the bucket conveyor is located the usual distributor hopper 20 and tube 21; and directly above the hopper 20 and for the most part located within the head 11 is a hood 22 formed with an inclined transverse wall 23 against which the grain discharged from each bucket of

the conveyor impinges and down which it falls into the distributor hopper 20.

The upper rear portion of the hood 22 communicates through a suction pipe 24 with the interior of the grain collecting and separating device forming in part the subject-matter of the present invention. This device comprises preferably a substantially rectangular box or casing 25 mounted on a suitable upright skeleton frame 26. At one side of the separator casing 25 is a short pipe 27 (Fig. 2) which communicates with the suction side of a fan 28 also mounted on the frame structure 26, the fan shaft being driven from the shaft 16 through pulleys 29 and 30 and a belt 31. The fan casing is provided with the usual tangential discharge pipe 32, through which the dust and chaff are disposed of to atmosphere.

The interior of the casing 25 is divided transversely by horizontal and vertical partition sections 33 and 34 respectively into an exhaust chamber 35 and a rectangular flow passage 36 that extends across the top and down the rear side of the exhaust chamber 35. The dockage collecting and separating chamber also includes a hopper 37 that is below and continuous with the lower open end of the rectangular structure comprising the exhaust chamber 35 and the flow passage 36; and the lower end or neck of the hopper 34 is equipped with a flexible discharge spout, hereinafter described, that forms a means for sealing the interior of the hopper against any substantial impairment of the vacuum therein and also permits automatic discharge of the grain collecting therein. By reference to Fig. 1 it will be seen that the suction pipe 27 of the fan communicates with the top portion of the exhaust chamber 35, thus creating an upward suction entirely through the latter.

In addition to the main suction pipe or conduit 24 connecting the collecting and separating casing 25 with the elevator head there is also preferably employed an auxiliary suction pipe 38, one end of which communicates with one side of the head 11, preferably opposite the descending leg of the conveyor, and the other end of which enters the corresponding side of the casing 25 at a point on the same level with the pipe 24. As shown in Fig. 3, the suction pipes 24 and 38 enter the separator casing through ports at right angles to each other and adjacent to a corner of the casing. This makes it possible to control the relative suctions exerted through the pipes 24 and 38 by means of a single valve which, in the instance shown, consists of a vertically disposed valve disc 39 mounted on a vertical valve rod 40 that extends through the top wall of the casing 25 just within a corner of the latter and is equipped on its upper end with a horizontal operating arm 41 adapted to be swung to a position closing the pipe 38 by a pull spring 42, and to a position closing the pipe 24 by a pull cord 43 connected to the end of the arm 41 and extending over a guide pulley 44 and thence downwardly to the work floor of the elevator. By means of adjustment of the pull cord, the valve 39 may be set at any intermediate position so as to permit equal or unequal suctions through the pipes 24 and 38. In situations where the body of the grain carries but little dust and chaff, the auxiliary pipe 38 may be wholly or nearly closed; while with grain carrying a relatively large amount of dust and chaff, the valve 39 will be so manipulated as to permit suction through the pipe 38 in addition to the main suction through the pipe 24.

Referring to the hopper discharge spout, this preferably consists of a tubular member of rubber or rubberized fabric or other substantially air-proof flexible material formed with a circular neck portion 45 adapted to be clamped on the neck 37′ of the hopper by a fastening ring 46, and a pair of downwardly inclined convergent sides 47 that are also narrowed widthwise toward their lower ends, thereby forming a relatively narrow discharge mouth between them. The internal suction existing in the dockage collecting and separating chamber normally tends to draw the sides 47 of the spout together, and the grain collecting in the spout has an opposite or spreading tendency on the sides. To assist the suction in keeping the mouth of the spout closed, except when a sufficient weight of grain opens it, one or both sides of the spout are equipped at the lower end thereof with a thin flat steel strip 48 which will bend under the weight of the grain to permit the mouth to open, but will close the mouth of the spout when the latter is empty, so that the suction will not be impaired when the device is first starting up. The spout 47 delivers the grain in a substantially slow and steady stream into a hopper 49 on the upper end of a discharge pipe 50.

In Fig. 1 I have indicated by arrows the general course taken by the dust, chaff and light grain in passing through the collecting and separating chamber. The suction of the fan applied to the exhaust chamber 35 creates a draft through said exhaust chamber, the flow passage 36, the suction pipe 24 and the hood 22, and also through the suction pipe 38 when the valve 39 is shifted to permit the same. By reason of the relatively long and circuitous path of flow, by the time the material induced by the draft reaches the discharge end of the flow passage 36, the intensity of the suction is sufficiently reduced to insure the gravity deposit of the light and defective grain in the hopper 37 and its closure 47, while the

lighter dust and chaff flow upwardly through the exhaust chamber 35 out through pipe 27 to the fan being discharged through the exhaust pipe 32. When a sufficient weight of grain has accumulated in the hopper 37 to expand the sides of the discharge spout 47, the mouth of the latter opens, and the grain falls therethrough, after which the rate of discharge of the grain will be substantially equal to the increment added during the operation of the device, so that the discharge is both automatic and substantially continuous, with a sufficient body of grain filling the lower portion of the hopper and the discharge spout to prevent any serious impairment of the suction in the collecting and separating chamber.

I claim:

1. In a dockage cleaner attachment for grain elevator legs, the combination of a casing, a dockage collecting and discharge hopper below said casing, the side walls of said hopper being formed as continuations of the side walls of said casing, a partition in said casing dividing the same into an exhaust chamber and a flow duct extending across the top and down one side of said exhaust chamber, said flow duct at its upper end being closed by a side wall of said casing and the lower ends of said flow duct and exhaust chamber both opening into the upper end of said hopper, a dockage suction pipe from an elevator leg communicating directly with the portion of said flow duct that extends across the top of said exhaust chamber, a fan communicating on its suction side with said exhaust chamber and discharging to atmosphere, and a discharge valve on the lower end of said hopper.

2. In a dockage cleaner attachment for grain elevator legs, the combination of a casing, a dockage collecting and discharge hopper below said casing, the side walls of said hopper being formed as continuations of the side walls of said casing, a partition in said casing dividing the same into an exhaust chamber and a flow duct extending across the top and down one side of said exhaust chamber, said flow duct at its upper end being closed by a side wall of said casing and the lower ends of said flow duct and exhaust chamber both opening into the upper end of said hopper, a dockage suction pipe from an elevator leg communicating directly with the upper end of said flow duct, a regulating valve at the junction of said suction pipe and flow duct, manually operable means for actuating said regulating valve, a fan communicating on its suction side with said exhaust chamber through a side wall of said casing and discharging to atmosphere, and a discharge valve on the lower end of said hopper.

3. In a dockage cleaner attachment for grain elevator legs, the combination of a rectangular casing, a dockage collecting and discharge hopper below said casing, the side walls of said hopper being formed as continuations of the side walls of said casing, an inverted L-shaped partition extending between opposite sides and in contact with an intermediate side of said casing and dividing the latter into an exhaust chamber and a flow duct extending across the top and down one side of said exhaust chamber, said flow duct at its upper end being closed by said intermediate side of said casing and the lower ends of said flow duct and exhaust chamber both opening into the upper end of said hopper, a dockage suction pipe from an elevator leg communicating directly with the upper end of said flow duct through a wall of said casing, a regulating valve at the junction of said suction pipe and flow duct, manually operable means for actuating said regulating valve, a fan communicating on its suction side with the top portion of said exhaust chamber through a side wall of said casing and discharging to atmosphere, and a discharge valve on the lower end of said hopper.

CLYDE C. PALMER.