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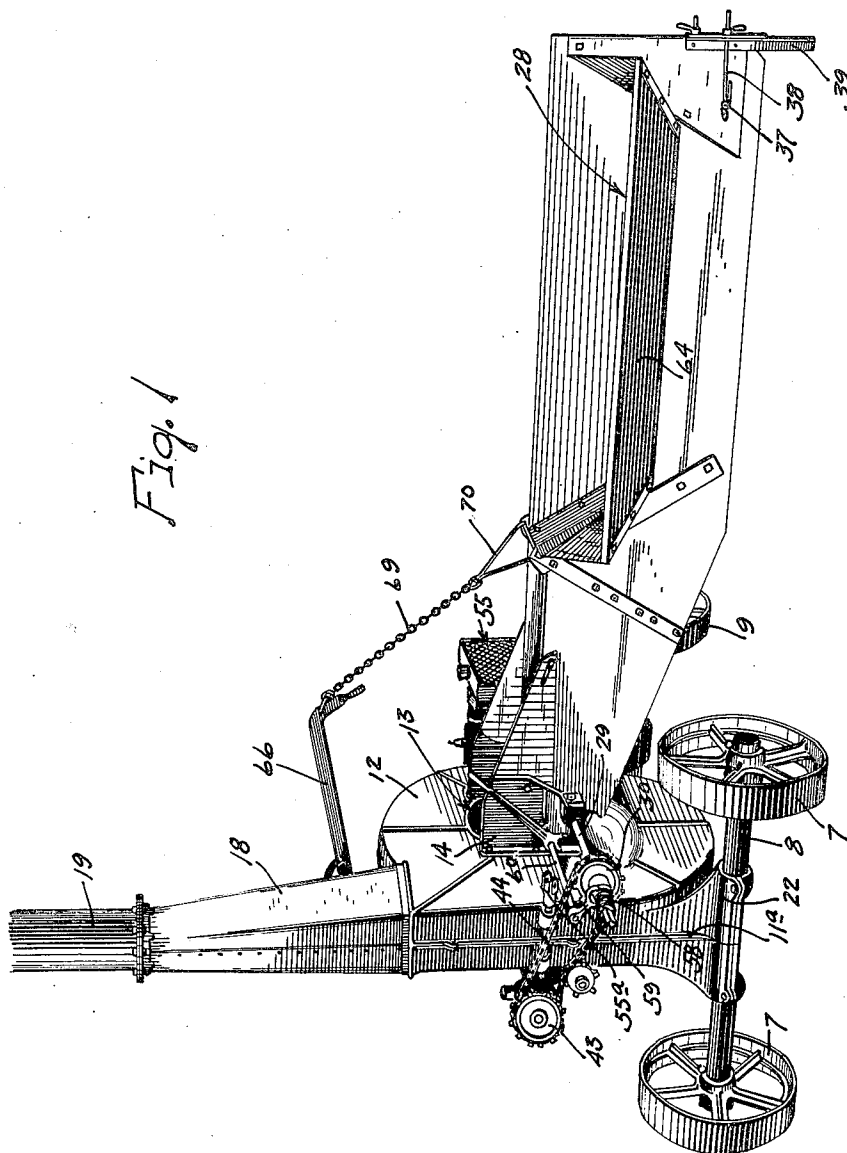
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A. G. RONNING ET AL

PNEUMATIC ELEVATOR

Original Filed Aug. 2, 1920

3 Sheets-Sheet 1



INVENTORS  
Andreas G. Ronning  
Adolph Ronning  
BY THEIR ATTORNEYS  
*William H. H. H. H.*

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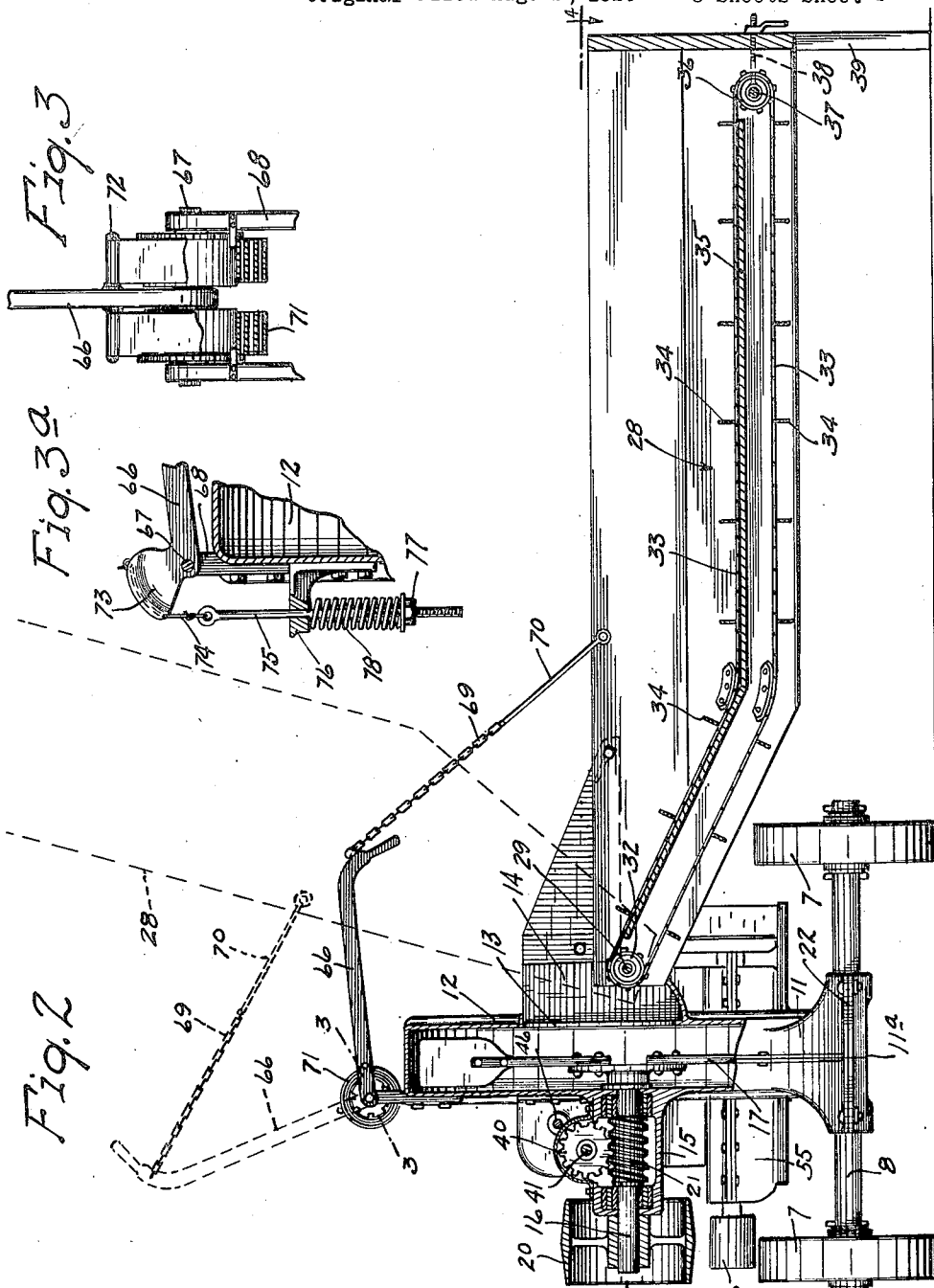
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PNEUMATIC ELEVATOR

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3 Sheets-Sheet 2



INVENTORS  
Andreas G. Ronning  
Adolph Ronning  
BY THEIR ATTORNEYS

William H. Meekins

April 15, 1924.

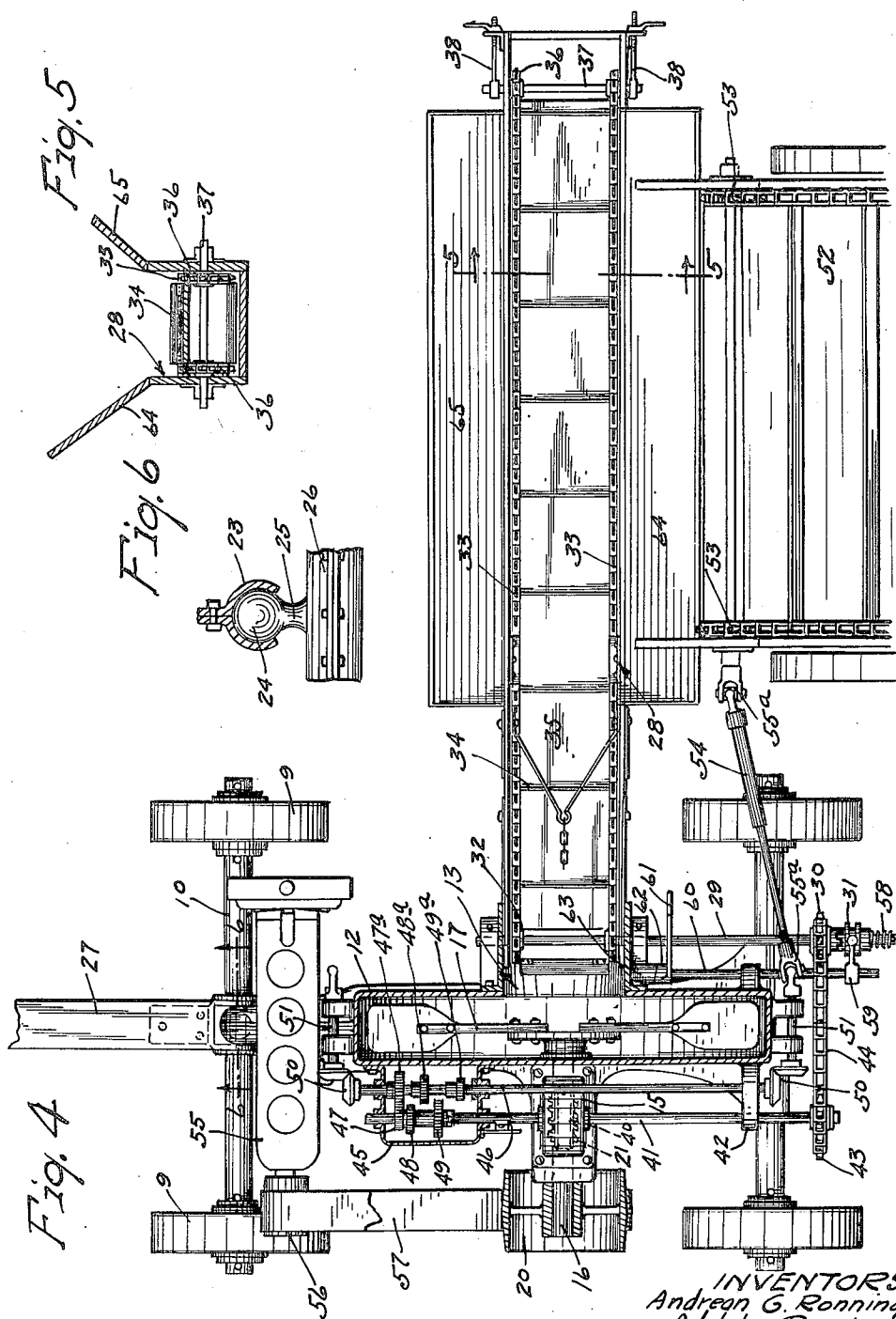
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PNEUMATIC ELEVATOR

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3 Sheets-Sheet 3



INVENTORS  
Andreas G. Ronning  
Adolph Ronning  
BY THEIR ATTORNEYS

William M. Muehler

## UNITED STATES PATENT OFFICE.

ANDREAN G. RONNING AND ADOLPH RONNING, OF MINNEAPOLIS, MINNESOTA.

## PNEUMATIC ELEVATOR.

Application filed August 2, 1920, Serial No. 400,623. Renewed November 2, 1923.

*To all whom it may concern:*

Be it known that we, ANDREAN G. RONNING and ADOLPH RONNING, citizens of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Pneumatic Elevators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our present invention relates to pneumatic elevators and is especially adapted for use in unloading materials, such as ensilage, grain, and the like, from vehicles and elevating and depositing the same in suitable places, such as a silo or bins.

The pneumatic elevator comprises a fan, a feed mechanism therefor and a source of power, such as a motor, which latter is preferably mounted with the other parts on and carried by a trough which supports the other parts of the elevator. Means is provided whereby, from the power motor, the discharge device of an independent vehicle may be coupled up and driven for delivery to the feed mechanism of the elevator.

The feed device for delivering the material to the fan casing is preferably an endless belt mounted on the frame that is pivoted for movements to and from operative approximately horizontal position. This frame is preferably subject to the upward force of an automatic lifting device, the arrangement thereof being such that when the conveyor supporting frame is turned down, it will overcome a yielding force of the lifting device and will be gravity-held in its operative position, but when turned upward into an inoperative position, will be held in that position by said lifting device. The invention also involves various other novel but important features, as will hereinafter appear.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective view showing the improved pneumatic elevator;

Fig. 2 is a transverse vertical section taken centrally through the elevator and its feeding mechanism, some parts shown in full;

Fig. 3 is a detail of the automatic lifting

device taken approximately on the line 3—3 of Fig. 2;

Fig. 3<sup>a</sup> is a fragmentary detail illustrating a modified form of the automatic lifting device shown in Fig. 3;

Fig. 4 is a horizontal section taken approximately on the line 4—4 of Fig. 2;

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 4;

Fig. 6 is a detail with some parts in full and some parts sectioned on the line 6—6 of Fig. 4.

As above indicated, the various parts of the elevator are carried on its own truck. Preferably, this truck comprises rear wheels 7 and a rear axle 8, front wheels 9 and front axle 10 and a connecting framework.

As a novel feature, this connecting framework is in the form of a two-part casting 11 which forms also the fan casing 12. This two-part casting is divided on the central parting line indicated at 11<sup>a</sup> and the sections are connected by bolts or rivets passed through the abutting flanges thereof. The fan casing 12, at one side, to wit, as shown in the drawings, at its right hand side, has a large axial intake eye 13 and an extended receiving hopper 14 adjacent thereto. This fan casing on its side opposite to its eyes 13; is formed with an outstanding axial gear casing 15. A short driving shaft 16 extends through the housing 15 and is journaled in suitable bearings therein. Working within the fan casing 12 and secured to the end of the shaft 16 is a blade-equipped fan head 17. The fan casing is provided with a tangential upwardly extended discharge spout 18 that is connected to an upwardly extended delivery pipe 19.

A driving element in the form of a pulley 20 is secured to the outer end of the shaft 16 and a worm 21 is secured to said shaft within the housing 15.

At its rear, the two-part casting 11 is provided with a divided sleeve 22 which, by bolts, is rigidly but detachably clamped onto the central portion of the rear axle 8. At its front end, the said divided casting 11 is extended and terminated in a two-part socket 23 that grips and engages a spherical head 24 which, by a stem 25, is connected to a two-part clamping sleeve 26 that is rigidly clamped to the central portion of the front axle 10. The numeral 27 indicates a pole suitably attached to the front axle.

For supporting the endless feed belt that

delivers to the fan, there is provided a trough-like conveyor frame 28 which, at its inner end, is pivotally connected to the side flanges of the hopper 14, either by or  
5 around a shaft 29 that is journaled in the side flanges of said hopper and is extended at its rear end and provided with a normally loose sprocket 30 adapted to be coupled thereto, at will, by a sliding clutch 31  
10 (see particularly Fig. 4). Between the sides of the hopper 28, the shaft 29 is provided with sprockets 32 over which runs an endless conveyor belt made up of sprocket chains 33 and connecting cross slats 34.  
15 This feed belt runs over and under a deck 35 which forms a bottom to the trough-like frame 24. The chains 33 also run over idle sprockets 36 on a shaft 37 that is mounted in adjustable bearings 38 supported from the outer or free end of the frame 28. By  
20 reference to Fig. 2, it will be noted that the frame 28, at its outer end, has a lug 39 which limits the downward movements and supports the same in an operative position.  
25 The worm 21, above noted, meshes with a worm gear 40 located within the housing 15 and carried by a shaft 41 (see Figs. 2 and 4). This shaft 41, at its rearwardly extended end, is journaled in a bearing 42  
30 on the fan case and rearward of said bearing is provided with a sprocket 43 over which, and the loose sprocket 30 of shaft 29, runs a sprocket chain 44. At its front end, the shaft 41 is extended into a transmission casing 45 that is secured to the fan  
35 case. This shaft is parallel to another shaft 46 journaled in the bearing 42 and in the case 45. The shaft 46 is adapted to be driven at variable speed from the shaft 41 through any suitable variable speed mechanism, but which, as shown, comprises gears  
40 47, 48 and 49 slidably carried by said shaft 41 and adapted to be engaged, progressively, with gears 47<sup>a</sup>, 48<sup>a</sup> and 49<sup>a</sup> on the shaft 46.  
45 At its front and rear ends, the shaft 46 is connected by miter gears 50 to shafts 51 journaled, one on the front and the other on the rear portion of the fan casing.

Either one of said shafts 51 is adapted  
50 to be connected, at will, to a transmission shaft for driving the discharge device of a carrying vehicle, such, for example, as the rotary discharging device of a manure spreader.

55 A manure spreader can be used to advantage for carrying and discharging ensilage, or the like. In Fig. 4, the body of a vehicle, such as a manure spreader, is indicated by the numeral 52 and its rotary discharge device is indicated by the numeral 53.

60 In Fig. 2, the numeral 54 indicates a telescopically extensible shaft which, by knuckle joints 55, is adapted to be readily attached to the shaft of the discharge device 53 and to the projecting end of either

one of the two above noted shafts 51. It will thus be seen that the manure spreader is one form of wheel vehicle or truck that is independent of the truck which carries the elevator.

70 The motor for driving the mechanism herein described is preferably a multi-cylinder internal combustion engine indicated as an entirety by the numeral 55. The base of this engine is rigidly secured on the forwardly projected portion of the main frame casting 11, and the crank shaft of said engine is equipped with a pulley 56, over which, and the pulley 20 of the driving shaft 16, runs a driving belt 57. This motor  
80 therefore affords power for driving all of the running parts of the pneumatic elevator and the delivery or discharge device of the independent vehicle herein illustrated as a manure spreader.

85 When the clutch 31 connects sprocket 30 to the shaft 29, the endless feed belt which delivers the material to the fan, will be driven, and this clutch is normally engaged with the said sprocket by a spring 58 (see  
90 Fig. 4). The hub of clutch 31 has a groove that is engaged by an ordinary shipper fork 59 on the thrust rod 60 mounted in suitable bearings on the fan casing provided with a lever 61 having a beveled cam-acting hub  
95 62 that is engageable with a fixed cam hub 63. By downward movement of the lever 61, clutch 31 can be disengaged from sprocket 30, so as to thereby throw the feed belt out of action. The discharge device  
100 of the independent vehicle can be thrown out of action at will by shifting of the gears of the above described variable speed transmission device into neutral or disengaged position.

105 The feed belt supporting frame 28 is provided with a hopper-like extension 64 that is movable from one side to the other thereof and is adapted to be exchanged with a detachable board 65 on the opposite side  
110 of the said frame (see Figs. 4 and 5).

The automatic lifting device, briefly referred to above may take different forms. The form illustrated in the main view in Fig. 3, comprises a lifting lever 66 (see particularly Figs. 2 and 3) pivoted at one end  
115 on a short spindle 67 rigidly secured to a small post 68 on top of the fan case. The free end of this lever is connected to the intermediate portions of the side boards of the frame 28 by a suitable connection shown  
120 as comprising a chain 69 and a bail 70. The numeral 71 indicates a pair of flat spiral springs anchored at their inner ends to the fixed shaft 67, or other fixed part,  
125 and attached at their outer ends to studs 72 projected from the sides of the lever 66. As already indicated, the power of these springs 71 is such that when the frame 28 is in its operative horizontal position with  
130

its center of gravity projected far from the pivot 32, the leverage and weight of the said frame will overcome the said springs and permit said frame and parts thereon to be gravity-held in their lowered or operative position, but when said frame is raised, as indicated by dotted lines in Fig. 2, the center of gravity much more nearly on the vertical line with the said pivot 32, the force from said springs 71 will then be in position to hold the said frame in such raised inoperative position.

In the modified forms of the automatic lifting device shown in Fig. 3<sup>a</sup>, the lever 66, at its pivoted end, has a sheave segment 77 connected to a short cable 74 which, in turn is attached to upper end of a rod 75. This rod 75 extends freely through a bracket 76 rigidly secured on the fan casing and provided with a threaded lower end equipped with a nut 77 between which and the bracket 76, is a coiled compression spring 78. This spring 78 will exert a force which will perform the same function as the spring 71 above described.

What we claim is:

1. The combination with a vehicle having a discharge device, of a vehicle arranged at an angle thereto comprising an elevator having a feed mechanism receiving from said discharge device, and a motor having connections for driving said elevator, its feed mechanism and said discharge device, the said driving connections and said feed mechanism including separable coupling devices located on each side of said feed mechanism.
2. A vehicle having mounted thereon a fan and fan casing with their axes extending transversely of said vehicle, a delivery spout connected to said fan casing, a motor on said vehicle, a fan shaft, a pulley thereon adapted to be driven from said motor, a transverse shaft adjacent each end of the vehicle, a driving shaft geared to each of said shafts and extending longitudinally of the vehicle, a second longitudinal shaft for driving said first mentioned longitudinal shaft, a series of change speed gears for variously connecting said longitudinal shafts for different speeds, a feeding mechanism delivering to said fan, a shaft extending longitudinally of the vehicle for driving said feeding mechanism, a clutch controlled driving connection between said latter shaft and said second mentioned longitudinal shaft, said transverse shafts being adapted to be connected to an elevating mechanism arranged to deliver to said feeding mechanism.
3. The combination with a vehicle and a fan and fan casing mounted thereon, said fan casing having a discharge spout, of a motor driven element on said vehicle having connections for driving said fan, a conveyor extended outward from said fan casing and arranged to deliver into the same, a second vehicle having an unloading device arranged to deliver rearwardly to the projected receiving portion of said conveyor, and means for driving said conveyor and the unloading mechanism of said second vehicle from the motor-driven element on the first noted vehicle.
4. The combination with a vehicle and a fan and fan casing mounted thereon, said fan casing having a discharge spout, of a motor on said vehicle having connections for driving said fan, a conveyor extended outward from said fan casing and arranged to deliver into the same, a second vehicle having an unloading device arranged to deliver rearwardly to the projected receiving portion of said conveyor, and means for driving said conveyor and the unloading mechanism of said second vehicle from the motor on the first noted vehicle, the driving connection to said unloading device being separable so that said second vehicle may be operatively disconnected at will.
5. The combination with a vehicle and a fan and fan casing mounted thereon, said fan casing having a discharge spout, of a motor on said vehicle having connections for driving said fan, a conveyor extended outward from said fan casing and arranged to deliver into the same, a second vehicle having an unloading device arranged to deliver rearwardly to the projected receiving portion of said conveyor, and means for driving said conveyor and the unloading mechanism of said second vehicle from the motor on the first noted vehicle, the driving connection to said unloading device being flexible and separable so that said second vehicle may be operatively connected without accurate setting and may at will be disconnected.
6. The combination with a vehicle and a fan and fan casing mounted thereon, said fan casing having a discharge spout, of a motor on said vehicle having connections for driving said fan, a conveyor extended outward from said fan casing and arranged to deliver into the same, a second vehicle having an unloading device arranged to deliver rearwardly to the projected receiving portion of said conveyor, and means for driving said conveyor and the unloading mechanism of said second vehicle from the motor on the first noted vehicle at different relative speeds.
7. The combination with a wheel-equipped vehicle having thereon a fan and fan casing, the latter being set longitudinally of said vehicle and provided with a discharge spout and with an intake opening facing one side of said vehicle, of a motor on said vehicle having connections for driving said fan, a conveyor connected to said

vehicle and extended laterally therefrom and arranged to deliver into the intake opening of said fan casing, a second wheel-equipped vehicle having an unloading device arranged to discharge at its rear end and to deliver to the extended receiving portion of said conveyor when the second vehicle is set parallel to the first but laterally offset therefrom, and connections for driving said conveyor and the unloading device of the second vehicle from the motor on the first noted vehicle.

8. The structure defined in claim 7 in which the driving connection to said unloading device is flexible.

9. The structure defined in claim 7 in which the driving connection to said unloading device has separable elements whereby said second vehicle may be operatively disconnected at will.

10. The structure defined in claim 7 in which the driving connections to said conveyor and unloading device include a variable speed transmission whereby said conveyor and unloading device may be driven at different relative speeds.

In testimony whereof we affix our signatures.

ANDREAN G. RONNING.  
ADOLPH RONNING.