

Dec. 13, 1949

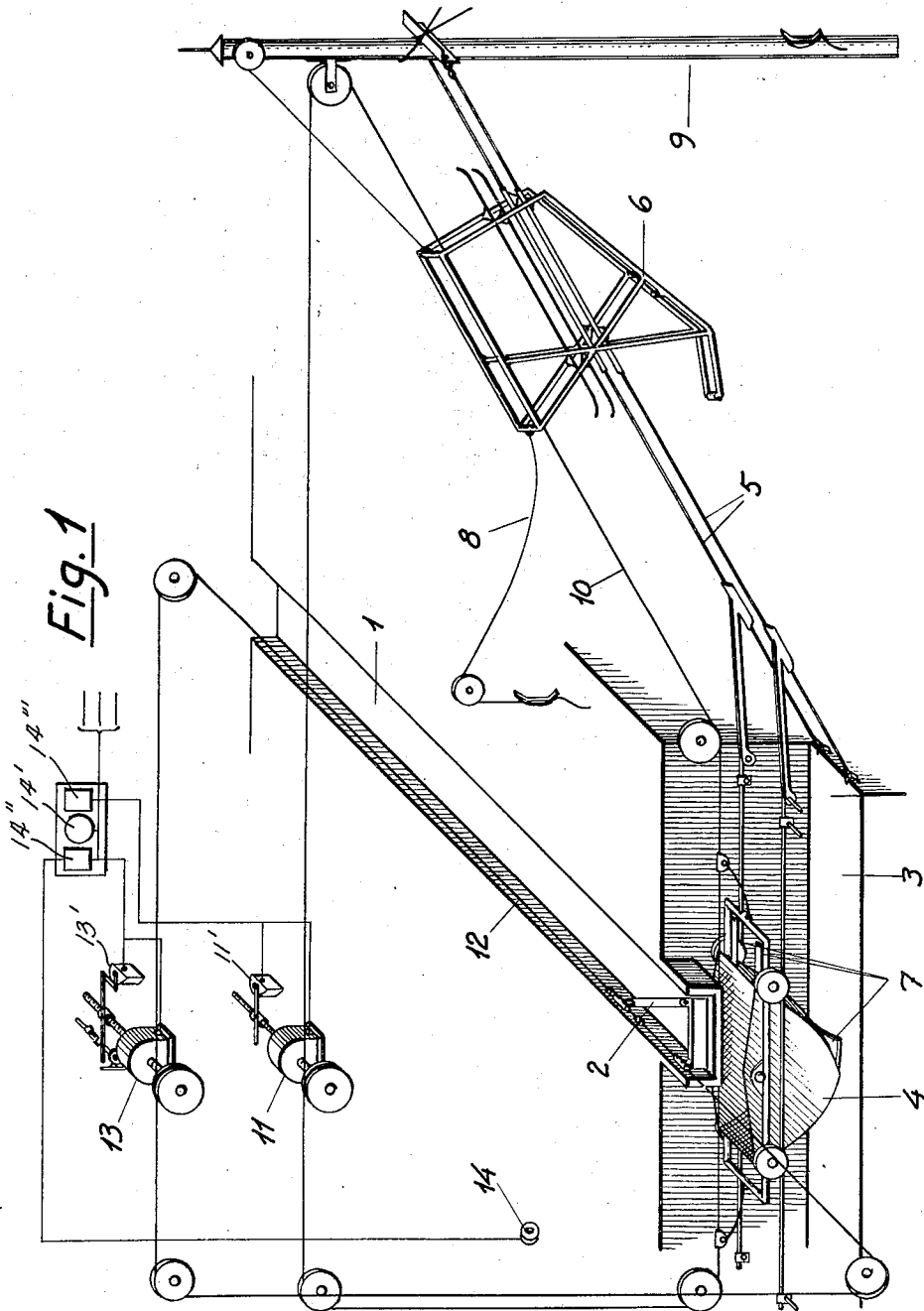
L. G. BERGMAN

2,491,245

MEANS FOR MECHANICAL REMOVAL OF DUNG

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INVENTOR
LARS GUNNAR BERGMAN
BY *Hasseltine, Lake & Co.*
AGENTS

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Fig. 2.

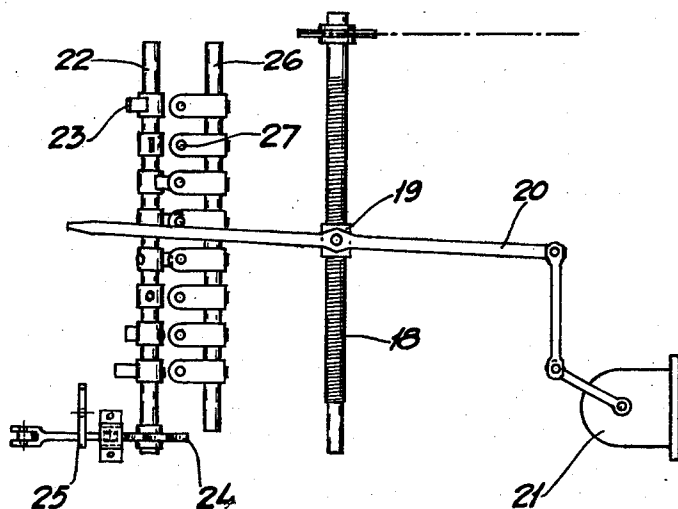


Fig. 3.

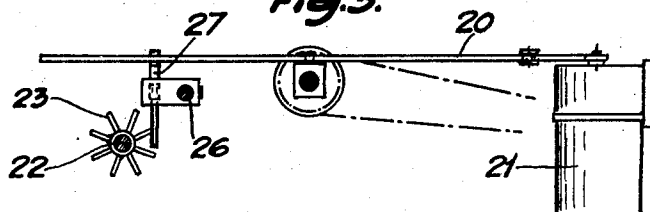


Fig. 4.

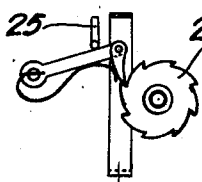
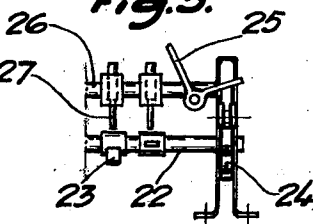


Fig. 5.



INVENTOR:

Lars Gunnar Bergman

By: Haseltine Lake & Co

AGENTS

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L. G. BERGMAN

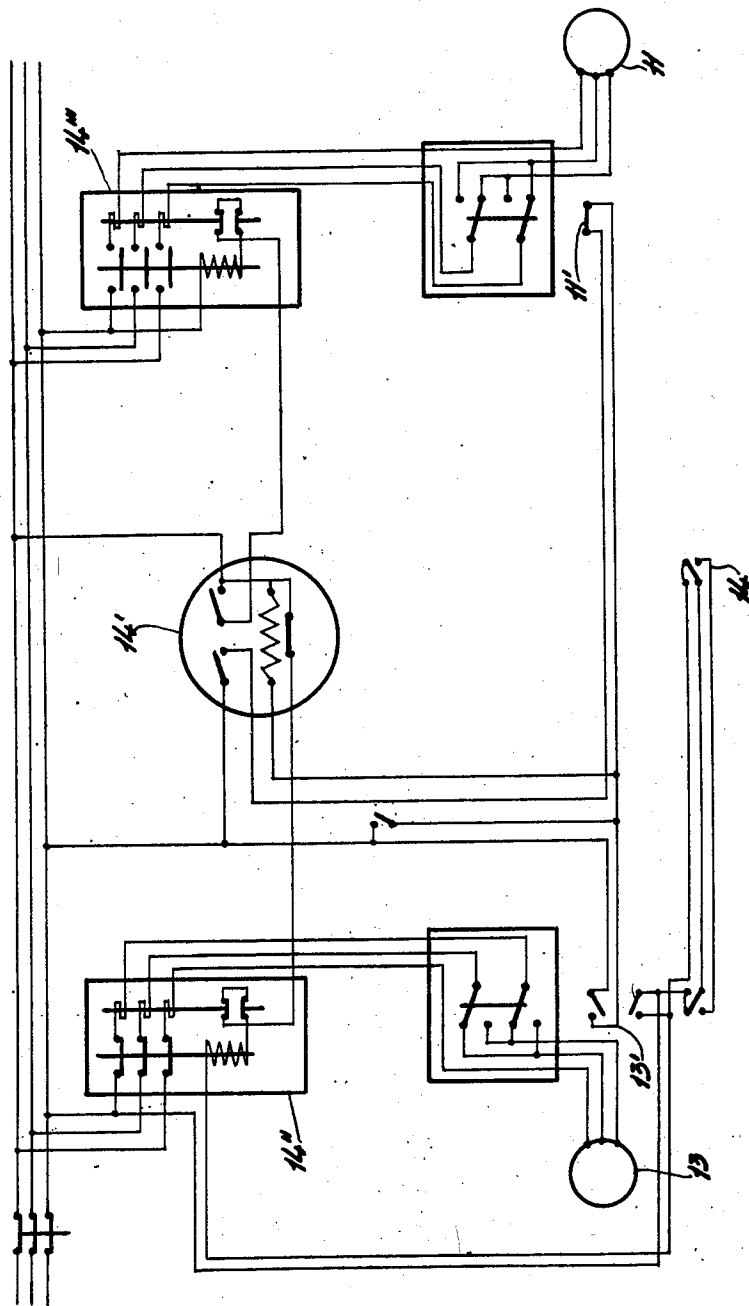
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Fig. 6.



INVENTOR:
Lars Gunnar Bergman
By: Haseltine Lake & Co
AGENTS

UNITED STATES PATENT OFFICE

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MEANS FOR MECHANICAL REMOVAL OF DUNG

Lars Gunnar Bergman, Traneberg, Sweden

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5 Claims. (Cl. 214—101)

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In order to facilitate the work in stables or the like one has for a long time tried to find some suitable method of removing the dung from the cattle by mechanical means. The liquid dung has been removed by means of stable conduits without any difficulty, but for the solid part of the dung more complicated devices, so-called mechanical or automatic means for removal of dung, have been required. Several different constructions of this kind are known, for example conveyors consisting of chain, rope or band.

However, these devices have been connected with certain inconveniences. With regard to the quantity of dung, which is very varying from case to case, it has been very difficult to obtain a construction which does not demand too much energy and which, from the point of view of erection and maintenance, could be adapted to the economy of the farms. The devices in question were usually intended for a few dung removals (two or three) for a period of twenty-four hours. Thus, a simple and robust construction was obtained, which construction, however, especially in large farms, required too great dimensions, thereby becoming both expensive and energy-consuming. In recent years it has become the practice to use devices for reciprocating drive, and by arranging them for several removals per twenty-four hours it has become possible to reduce their dimensions considerably. As the dung quantity may vary considerably from case to case even in these devices, still it has been impossible to completely eliminate the earlier inconveniences. Moreover, especially in districts with cold climate these devices have proved less reliable, irrespective of the risk of accidents which is always at hand in automatic continuous drive.

The present invention is based upon comprehensive experiments with such devices. It has appeared that in those cases in which the removed quantity of dung is below a certain maximum the devices work more satisfactorily. This discovery led to the construction of a device by means of which the said removed dung quantity can be maximized. It appeared among other things that thanks to this arrangement the whole device can be simplified both as to construction and to management. Further the construction of the exterior conveyors, which in earlier means for removal of dung were very hard to build and unsafe in drive, can be very much simplified. The essential feature of the present invention is that the conveying carriers or drivers have been arranged to remove the dung in portions beginning at one end of the manure-gutter, and that during

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its continued transport from the stable the dung is moved to the discharge place by means of bucket, car or the like either on a cableway or hanging in the drawing rope.

Devices for mechanical removal of dung according to this invention can be arranged according to two different systems with essentially the same effect. According to the first system the dung is removed in portions beginning at that end of the gutter which is situated next to the discharge place. According to the second system the dung is removed in the same way but beginning at that end of the gutter which is remote from the discharge place. Each of these two systems comprises chiefly two embodiments. In the first case the dung is brought to a discharge place by a device and from there another device is forwarding it to the manure-yard. In the second case the dung is brought direct to the manure-yard by the same member.

Two embodiments of the invention are shown by way of example on the accompanying drawings.

Fig. 1 is a perspective view of a device for mechanical removal of dung with gradual drive. Fig. 2 shows a regulation device for gradual increase of the transport way. Fig. 3 shows a side-view of the device according to Fig. 2, and Figs. 4 and 5 show detail views of Fig. 2 seen respectively from the end and from the side, while Fig. 6 is a diagram of the electric wiring.

According to Fig. 1 the dung is moved by a scraper to a car located at the end of the manure-gutter, the said car forwarding it to the discharge place. In the figure the reference number 1 indicates the gutter with the scraper 2, and 3 indicates the culvert in which a cableway car 4 is running. This car is preferably provided with a swingably suspended container. The car 4 is moved back and forth on a cableway 5 which is extending above the discharge place (manure-yard). On the cableway there is provided a release member 6 which actuates projections 7 on the underside of the car in such a way that the swinging container is tilted and empties its contents. The release member 6 is movable to the desired position on the cableway 5 by means of an operating rope 8 which cableway preferably can be fixed on a post 9.

The car 4 is moved back and forth on the cableway by means of a drawing rope 10 connected with the car and drawn by a motor hoist 11 provided with a pole changer or the like. The scraper 2 is also connected with a drawing rope 12 which is drawn by a motor hoist 13 provided with pole

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changer or the like and with a member regulating the way of the scraper. The two motor hoists are connected to a starting switch 14 via relay and motor contactors.

Figs. 2-5 show a regulation device for gradual increase of the transport way. On the threaded shaft 18, which is driven at suitable speed by the motor hoist, there is moving a nut 19 carrying a swingably mounted lever arm 20 which in one end guides a pole changing switch 21 connected with the motor and in the other end is actuated by a regulatable stop device. This stop device consists of a shaft 22 on which rings provided with projections 23 are located in such a way that the projections form a helical line, as well as of a toothed wheel 24 with an actuating member 25. 26 is a shaft carrying liftable stops 27 which can be raised. When the nut 19 is moved outwards the front end of the lever arm strikes against that stop which stops the way of the lever arm. The nut continues to move until the pole changing switch is changed over whereby the nut returns. The end of the lever arm strikes against the actuating member 25, the toothed wheel 24 is actuated and the shaft 22 swung so that the projection of the next ring raises its stop which stops the way when the lever arm strikes out next time. By this the stroke of the nut is increased and the way of the scraper is extended.

When dung is to be removed, the device is started by cutting in the start switch 14. The circuit to the motor hoist 13 of the conveyor 12 in the gutter is closed. The scraper 2 which in the position of rest is located at the discharge place, is moved towards one edge of the gutter and is in this position drawn out into the gutter 1 past the dung therein. The scraper continues in this way until the end position for the first step adjustment at the step breaker has been reached in which moment the motor hoist 13, through the action of a changing switch, changes its direction of motion. The scraper is now folded out and the quantity of dung which lies before the same is brought to the discharge place. When the scraper approaches its initial position at the discharge place, the dung falls down into the car 4 which stands below the discharge opening, and at the same moment as the initial position is reached, the pole changing switch is changed over. An electric impulse is given automatically to the relay by a separate contact, which relay begins to function and breaks the circuit of the first motor hoist at the same time as it closes the current of the motor hoist 11 of the exterior conveyor 10. The scraper 2 now stops but the car 4 is moved out on the cableway 5 towards the emptying place (the manure-yard). When the car comes into contact with the release member 6 so that its bottom projection 7 engages the first cross-bar or the like of the release member, the car, which is swingably mounted, is forced to assume an oblique position.

The longer the car is moved forward, the more oblique its position will be. When the car has assumed such a position that its bottom projection releases the first cross-bar, the front-side projection is in position for the second cross-bar of the release member. Now the car is further tilted so that its contents at last are emptied. If there are several cross-bars or the like, one after the other, a shaking effect of the car is obtained. When the car reaches its end position on the cable way its motor hoist 11 changes its direction of motion by the action of a changer and the car is moved back to the initial position at the discharge place

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of the gutter. At the same moment as this position is reached the changer is reversed again and at the same time a new impulse is given to the relay, whereby the car stops and the scraper is set in motion again. The scraper is now folded again and brought to the second step position which is adjusted by the step breaker. The scraper now returns and brings the dung portion located in front of the scraper to the car. When the scraper reaches its initial position again it stops, and the car brings away this new portion. The procedure is repeated in this way until all steps adjusted by the step breaker have been passed whereafter, the scraper stops in its initial position. At the same time the circuit of the whole device is broken automatically. At a new action of the start switch the whole procedure is repeated.

At the adjustment of the distance of the step it has appeared that distances corresponding to the width of about 3 stalls normally give a maximum load which corresponds to suitable dimensions of the separate machine details.

Referring now to Fig. 6, by the influence of the starting switch 14 the operating current to the relay 14' is switched, this causing in turn the switching of the motor contactor 14'', the motor hoist 13 being hereby started. When this is carried out the stroke in the gutter influences the relay 14' by a contact in the pole changer 13', whereby the motor contactor 14''' makes a stroke and the motor hoist 11 is started. In the same time the contactor 14'' becomes currentless this causing the stopping of the motor hoist 13. When the motor hoist 11 has carried out its stroke in the culvert and the cable way, a special contact in the pole changer 11' gives an impulse to the relay 14' with the result that the motor contactor 14''' becomes currentless and that the motor contactor 14'' receives current.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for the removal of dung in stables provided with at least one gutter, drawing rope means, conveyor means attached to said drawing rope means and adapted for reciprocating movement within said gutter, regulating means connected to said drawing rope means, said regulating means including means for moving said conveyor means by said drawing rope means within said gutter with progressive step by step increasing of the path of movement for each reciprocating movement of said conveyor means.

2. An apparatus according to claim 1, in which said regulating means consists of a threaded shaft, motor means drivingly engaging said shaft, a displaceable nut provided with a swingable lever arm, a pole changeover switch for said motor adapted to be operated by said lever and a stop device for the regulating of the length of the step, said device adapted to stop the deflection of the lever at the movement of the nut in one direction until the pole changeover switch reverses, and likewise adapted to stop the lever at the movement of the nut in the other direction.

3. An apparatus according to claim 1 in which the means for moving said conveyor means with progressive increasing of the path of movement consists of a shaft having rings, said rings being provided with projections forming a helix adapted to co-operate with the stop device regulating the length of the step, said shaft having mounted thereon a toothed wheel, said wheel having an actuating member whereby the stroke of the con-

veyor means is increased step by step during each reciprocation thereof.

4. An apparatus according to claim 1, comprising at least one gutter, said apparatus having a transport device consisting of carriers adapted to remove dung from the stable from the conveyors in the gutter on a declining cable way to the manure-yard.

5. An apparatus according to claim 4, in which the cable way consists of two parallel ropes.

LARS GUNNAR BERGMAN.

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The following references are of record in the file of this patent:

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1,437,358	Pratt	Nov. 28, 1922
1,668,815	Livingston	May 8, 1928
1,699,175	Yarn	Jan. 15, 1929
2,097,909	Atz	Nov. 2, 1937
2,303,649	Livingston	Dec. 1, 1942

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