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R. LIEBING ET AL

2,256,719

RECLAIMING AND EXCAVATING APPLIANCE

Filed Nov. 1, 1938

2 Sheets—Sheet 1

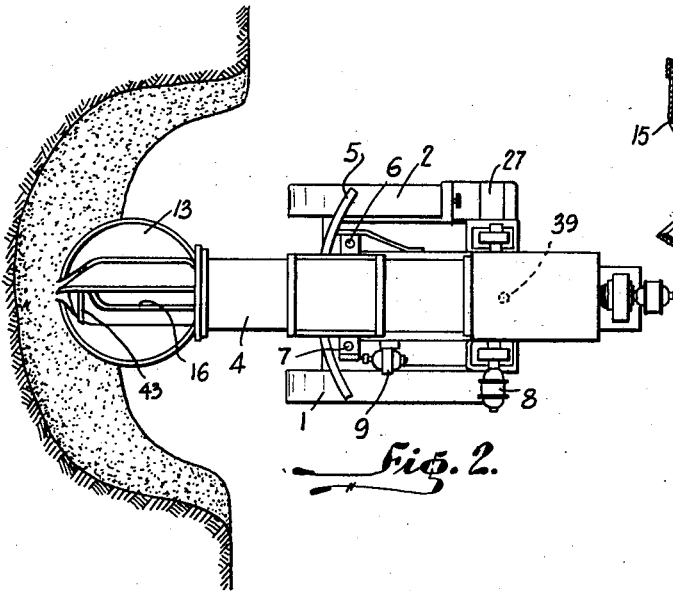


Fig. 2.

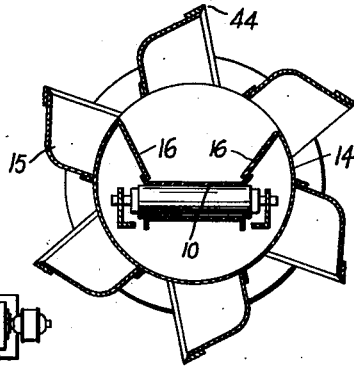


Fig. 4.

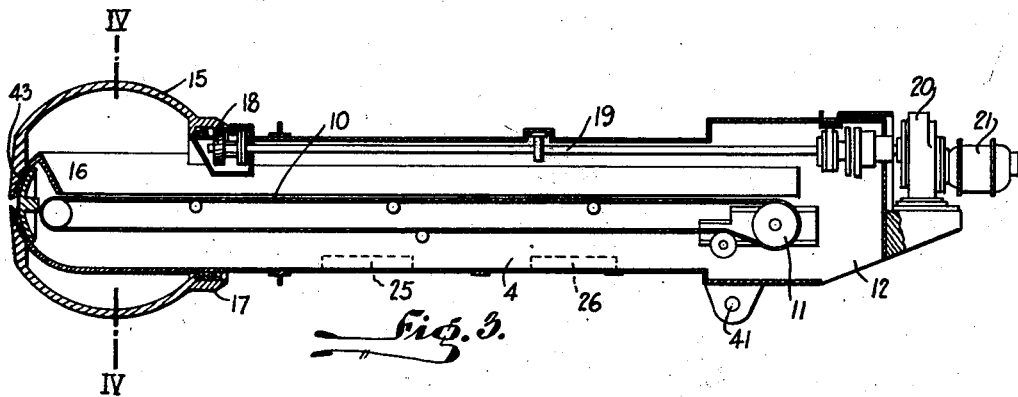


Fig. 3.

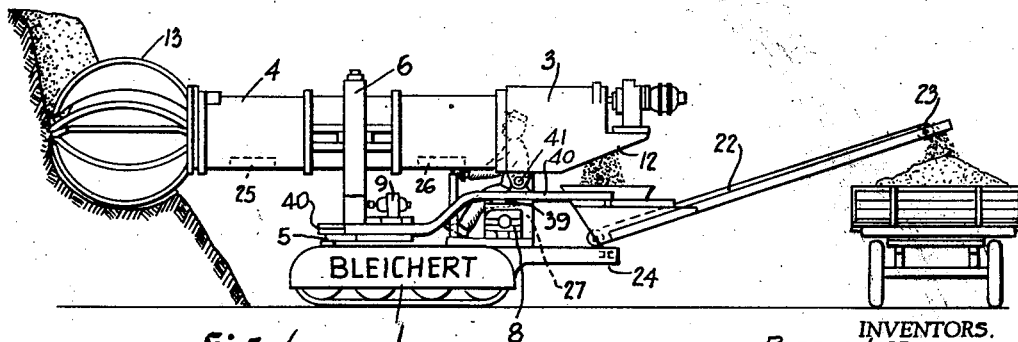


Fig. 1.

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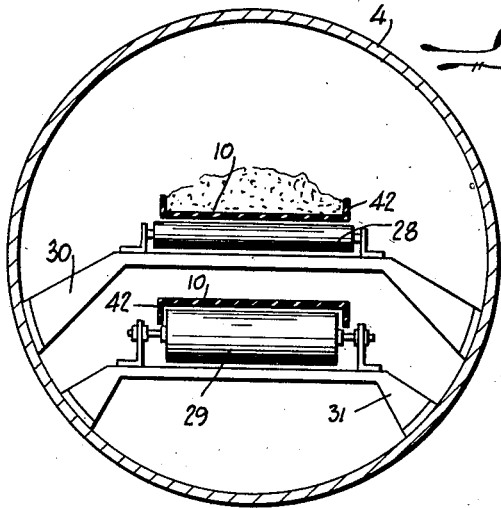
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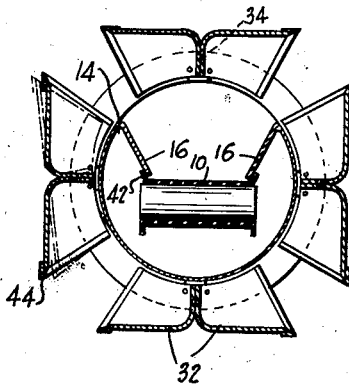
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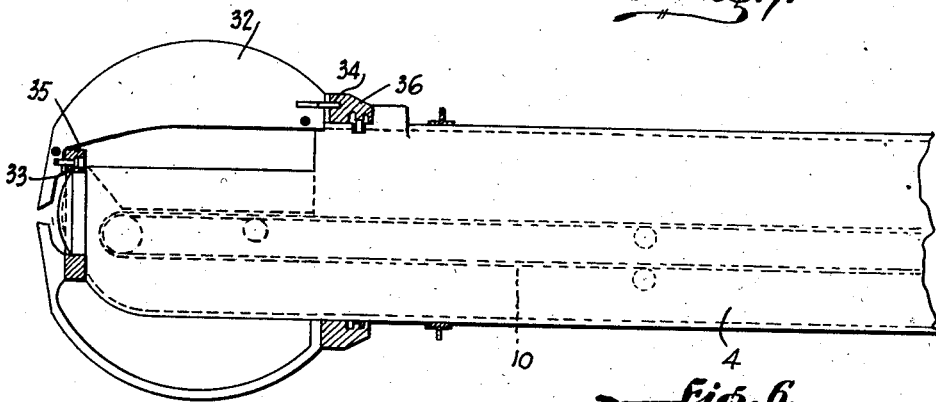
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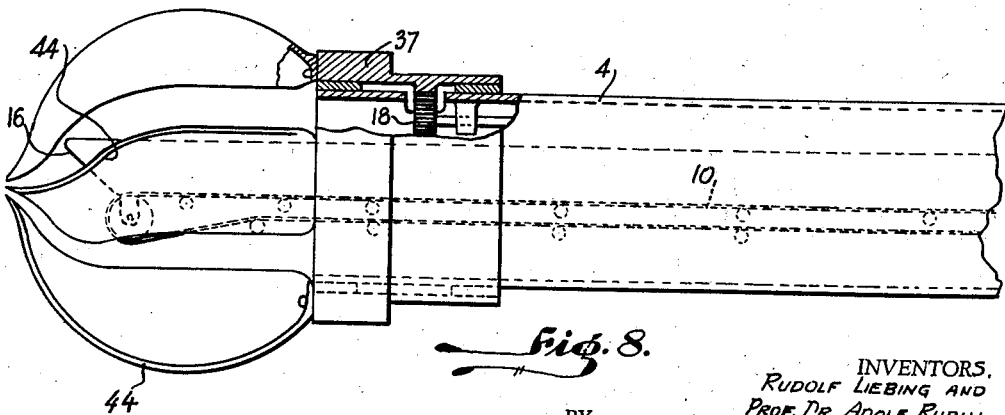
*Fig. 5.*



*Fig. 7.*



*Fig. 6.*



*Fig. 8.*

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# UNITED STATES PATENT OFFICE

2,256,719

## RECLAIMING AND EXCAVATING APPLIANCE

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In Germany November 1, 1937

20 Claims. (Cl. 37—190)

The invention refers to a reclaiming and excavating appliance, e. g. bucket dredger, the excavating member of which is rotating on a backbone structure.

Up to now appliances of this kind were equipped either with so-called scoop wheels, the shafts of which extended across the axis of the backbone; or a tube shaped body with slots was provided for, and into the slots fitted scoops by which the material was delivered to a conveying medium which ran inside the tubular body. In the first case, an excavation in front of the head was possible but no side movements were allowed and therefore the excavation of predetermined cross-sections was very difficult. Other appliances were also limited to this result, since there the excavator merely closed the front end of the tube. In the second case it is impossible to excavate in front of the head.

It is the general object of this invention to provide an appliance which can excavate towards all sides, in front of the head and at any cross-section.

For such purpose an excavating member which loads out sideways, is rotative at the front end of a backbone which is mounted on a bogie so that it can either be raised or lowered or swung in a horizontal plane. The excavating member consists of a number of scoops which converge at the front end, and are joined in a common ring at the rear end, which ring is rotated by a driving motor. It is of advantage to mount the driving motor at the end of the backbone which is opposite the excavating member. The transmission from motor to member may be made by a shaft and pinion. The backbone is preferably of tubular shape and inside thereof a conveying medium is suitably driven by a special drive which is controlled independently of the movements of the excavating member.

The conveying medium can be constructed as a belt conveyor. As the appliance is used for many purposes the backbone will be of rather short construction. Therefore a trough-shaped belt conveyor cannot be readily suspended, and it will be of advantage to use belt conveyors to which the rims are vulcanized. This allows also a deep dipping of the backbone as such belt conveyors allow steeper gradients than flat or trough-shaped belt conveyors. A trolley motor will be the best drive for the belt conveyor. The backbone can be of telescopic construction, and the belt conveyor can be adapted in its interior to the different lengths by means of a loop.

It is suitable to make the excavating member

in two parts namely a stationary and a rotating part, the stationary part being interrupted at the delivery point of the material and being bent down to the conveying medium, e. g. a belt conveyor, by means of side sheets. Thus the conveyor is preferably extended into the excavating member.

The shovels or scoops of the excavating member can be constructed so as to protrude over the front end of the backbone in order to facilitate work in front of the member. It is suitable to enlarge the shovel or scoop in cross-section from the front to the back so that any jammed material which would not fall onto the conveying medium is loosened up in travelling back and drops down. The cutting blades of the excavating member might also be helically disposed and it is of advantage that the pitch of the helix increase from head to tail. This construction is best adapted to excavate broken stone. In this case scoops might be used which do not converge into one point at the front end and are affixed to a ring at the rear only. Where a stack of material requires an excavation in different directions it is of advantage to use twin scoops joined at their backs. In this case the twin scoops might have a hinged arrangement so that those of the scoops protrude which are facing in the working direction.

The invention further provides that the backbone be raised or lowered and swung in a horizontal direction at or about the point where the material is delivered to some other means of transport, e. g. a jib or a portable belt conveyor or the like.

The invention also provides for a control of the elevation and side movements by two independent motors, e. g. electrical motors. The caterpillars which carry the appliance are preferably also driven by two independent motors. Where no electric power is available it is of advantage to connect or couple the appliance with an engine-driven electric generator, which provides, in addition to a source of light, a readily controlled supply of power for further conveying means e. g. portable belt conveyors or the like which are to connect with a unit of this invention.

The tubular backbone can be equipped with doors which allow an easy cleaning and lubrication of the idlers, etc. It is best to make arrangements that the conveying medium is suspended in the tubular backbone in such fashion that it can be removed and replaced at will.

The appliance may find use in driving shafts of any kind and cross-section, as also for dump-

ing heavy materials as overburden, clay or sand layers in coal seams. The appliance can also be used with advantage for digging trenches and saps, etc., for military purposes. Contrary to devices of the prior art, it allows the digging of trenches of any cross-section and at sharp curvatures with sudden enlargements and narrowings.

By way of example, the appliance is shown in a preferred embodiment in the accompanying drawings, which present, in the main, schematic views, viz:

Fig. 1 is a side view,

Fig. 2 is a plan view,

Fig. 3 is a longitudinal section through the backbone,

Fig. 4 is a cross-section at line IV—IV of Fig. 3,

Fig. 5 is a cross-section through the tubular backbone,

Fig. 6 shows an excavating member with twin scoops in a schematic longitudinal section,

Fig. 7 is a corresponding cross-section,

Fig. 8 shows a construction of a head with shovels mounted at one of their ends only, partly in cross-section.

The invention operates as follows:

The tubular backbone 4 is mounted on the base of the caterpillars 1 and 2 and can be elevated and swung in a horizontal plane at and around points near the rear housing 3. Platform 40 is movable around a vertical axis at 39, in a horizontal plane on circular track 5 of said base. The backbone is fulcrumed at 41 upon platform 40, and elevated and lowered by means of spindles and nuts on the two pillars 6 and 7. The motor 8 serves for the movements in a horizontal plane, and the motor 9 for the elevating and lowering.

The tubular backbone 4 carries in its interior a conveying medium which is shown in the drawing as a belt conveyor 10 which is driven by the trolley motor 11; the excavated material is delivered at point 12.

The excavating member 13 consists of a stationary part 14, which appears as an extension of backbone 4, and the rotating shovels or buckets 15. The feed chute 16 is formed by skirts or flaps bent down and in from stationary part 14, and acts also as wearing sheets. The shovels 15 converge in the front and are journaled by way of a ring formation 43 upon the nose of part 14. They are affixed at the rear to a ring gear 17. Upon ring gear 17 engages a pinion 18 which is driven from motor 21 by way of gear 20 and shaft 19. The motors 11 and 21 are thus well removed from the excavating member and therefore not exposed to special loads.

The jib 22 is shown to be driven by a trolley motor 23, and can be swung around axis 24. It can also be elevated and lowered which movements are not especially indicated in the drawings.

The tubular backbone 4 is equipped with flaps or doors 25 and 26, which allow easy access for cleaning, lubrication and adjustment of the idlers of the belt conveyor. The whole belt conveyor unit is suspended in the tubular backbone so that it can be easily taken out and replaced.

All driving motors are controlled from the seat of the driver. From this seat the driver has a good view of the operation of the appliance and is well protected against dropping material etc., by reason of the arrangement of the seat; protection may also be provided by sheets above the seat.

A proposed suspension of the belt conveyor 10

in the tubular backbone 4 is shown in Fig. 5, which is a cross-section through the tubular backbone, and the belt conveyor comprises the belt 10 with vulcanized side rims 42. The idlers 28 and 29 rest on supports 30 and 31 which can be independent from each other or may be joined to each other in a suitable manner.

Figs. 6 and 7 show excavating members with twin scoops 32, each pair of which rests with its journals 33 and 34 on two rings 35 and 36. During the excavating process the weight of the material turns the edges of the scoops so that the ones which are disposed in working direction always protrude over the others which are not in working direction.

Fig. 8 shows a construction in which the excavating member is open and unsupported at the front; therefore the collar or sleeve bearing 37 is of very long construction.

We claim:

1. A digging and excavating appliance comprising a vehicular base, a rigid, tubular backbone structure mounted swingably as a whole upon said base and projecting at its front from said base, a substantially ball shaped excavating member journaled at the front of said structure and projecting and converging to the front thereof, the axis of rotation of said excavating member being disposed in the direction of said structure, and said member being movable up, down and sideways relatively to said base by way of said swingable structure, control means on said base for swinging said structure in a substantially horizontal plane, control means for swinging said structure in a substantially vertical plane, and a source of power operatively connected with and rotating said member.

2. A digging and excavating appliance, comprising a vehicular base, a rigid, tubular backbone structure swingably mounted upon said base and projecting at its front from said base, a hollow excavating member journaled at and overlapping the front of said structure and projecting and converging to the front thereof, and a source of power operatively connected with and rotating said member.

3. A digging and excavating appliance, comprising a vehicular base, a tubular backbone structure swingable as a whole over said base and projecting at its front from said base, an excavating member journaled at the front of said structure and projecting and converging to the front thereof, the axis of rotation of said excavating member being disposed in the direction of said structure, and said member being hollow and having its largest diameter to the front of the point at which it is journaled upon said structure, a chute mounted on said structure and extending beyond said largest diameter into said member, and a source of power operatively connected with and rotating said member.

4. A digging and excavating appliance, comprising a vehicular base, a rigid tubular backbone structure swingably supported on said base and projecting therebeyond at its front, a substantially ball shaped excavating member journaled at the front of said structure upon and around the outside of said structure and projecting and converging to the front thereof, and a source of power operatively connected with and rotating said member.

5. A digging and excavating appliance, comprising a vehicular base, a rigid tubular backbone structure swingably mounted upon said base, a hollow excavating member journaled around the

outside of the front of said structure and projecting and converging to the front thereof, said member having its largest diameter to the front of the point at which it is journalled upon said structure and being made up of bucket-shaped excavating elements, a conveyor extending into said member into a position where the contents of said elements drop thereonto, and a source of power operatively connected with and rotating said member.

6. A digging and excavating appliance, comprising a vehicular base, a rigid tubular backbone structure swingably mounted on said base, a hollow excavating member journalled at the front of said structure and projecting and converging to the front thereof, a single power driven conveyor belt endlessly extending from the inside of said hollow member through said structure from the front to the back and adapted to receive excavated material from the said member and to discharge it from the back of the structure, a drive for said member, and controls for the drives of the conveyor and of the member.

7. A digging and excavating appliance, comprising a vehicular base, a swingable, rigid, tubular backbone structure extending over said base, a hollow excavating member journalled upon the front of said structure, a flat belt conveyor having upstanding vulcanized rims and extending from a point inside of said member through said structure from the front to the back and adapted to receive excavated material from the said member and to discharge it from the back of the structure, and drives for the conveyor and the member.

8. A digging and excavating appliance, comprising a vehicular base, a swingably tubular backbone structure extending over said base, a hollow excavating member journalled at the front of said structure and projecting and converging to the front thereof, a power driven belt conveyor extending substantially centrally in said structure from the front to the back and adapted to receive excavated material from the said member and to discharge it from the back of the structure, a skirted chute extending substantially from the inside of said member onto said conveyor, a drive for said member, and separate controls for the drives of the conveyor and of the member.

9. A digging and excavating appliance, comprising a vehicular base, a tubular backbone structure swingably disposed on said base, a substantially ball shaped, hollow excavating member journalled over the front of said structure, a power driven conveyor extending in said structure from the front to the back and adapted to receive excavated material from the said member and to discharge it from the back of the structure, a skirted chute struck up from said tubular structure and extending substantially from the inside of said member onto said conveyor, a drive for said member, and separate controls for the drives of the conveyor and of the member.

10. A digging and excavating appliance, comprising a vehicular base, a tubular backbone structure extending over said base and universally hinged thereon, a substantially ball shaped excavating member journalled at the front of said structure and projecting and converging near the front thereof, said member having its largest diameter to the front of the point at which it is journalled upon said structure and being made up of bucket-shaped excavating elements enlarg-

ing from the front to the back and arranged in a circle, and a source of power operatively connected with and rotating said member.

11. A digging and excavating appliance, comprising a vehicular base, a tubular backbone structure swingable on said base, a substantially ball shaped excavating member journalled over the front of said structure and consisting of bucket-shaped excavating elements which are interconnected at their ends, have bottoms converging to the axis of said member towards the rear of the appliance and are arranged in a circle, and a source of power operatively connected with and rotating said member.

12. A digging and excavating tool, comprising a tubular backbone structure, and a substantially ball shaped excavating member journalled over the front of said structure and consisting of bucket-shaped excavating elements arranged in a circle, said elements having spirally disposed edges, the pitch of the helices increasing from the front to the back.

13. In a digging and excavating tool, a tubular backbone structure extending over said base and projecting from said base substantially to the front thereof, and an excavating member having a ring journalled upon the outside of said structure, and buckets attached in a circle upon said ring and ending unsupportedly to the front of said structure.

14. In a digging and excavating tool, a tubular backbone structure, and a substantially ball shaped excavating member comprising a ring journalled around the periphery of said structure, and substantially crescent shaped buckets attached in a circle upon said ring and interconnected at their other ends.

15. In a digging and excavating tool, a tubular backbone structure extending over said base and projecting from said base substantially to the front thereof, and a substantially ball shaped excavating member having a ring extending around and journalled upon said structure, and buckets joined in pairs back to back, attached in a circle upon said ring and converging to the front of said structure.

16. In a digging and excavating tool, a tubular backbone structure comprising a nose converging endwise closing one end of said structure, excavating elements rotatably mounted upon the outside of said structure and converging over said nose, said structure having an opening allocated underneath the highest position of said elements, so that material excavated by said elements drops for purposes of removal through said opening into said structure, and driving means extending through the wall of said structure for operative engagement upon said elements.

17. In a digging and excavating tool, a tubular backbone structure comprising a nose converging endwise closing one end of said structure, excavating elements rotatably mounted upon the outside of said structure and converging over said nose, a conveyor in said structure, said structure having an opening allocated underneath the highest point of said elements, so that material excavated by said elements drops for purposes of removal through said opening onto said conveyor, and driving means extending through the wall of said structure for operative engagement upon said elements.

18. In a digging and excavating tool, a tubular backbone structure comprising a nose converging endwise closing one end of said structure, excavating elements rotatably mounted upon the

outside of said structure and converging over said nose, a conveyor in said structure, a separately controllable driving means on said conveyor, said structure having an opening allocated underneath the highest point of said elements, so that material excavated by said elements drop for purposes of removal through said opening onto said conveyor, and driving means extending through the wall of said structure for operative engagement upon said elements.

19. In a digging and excavating tool, a tubular backbone structure comprising a nose converging endwise closing one end of said structure, excavating elements rotatably mounted upon the outside of said structure and converging over said nose, said structure having an opening allocated underneath the highest position of said elements, so that material excavated by said elements drops for purposes of removal through said opening, a chute skirting said opening upon the inside of said structure and directing the discharge of ma-

terial dropped into said opening, and driving means extending through the wall of said structure for operative engagement upon said elements.

20. In a digging and excavating tool, a tubular backbone structure comprising a nose converging endwise closing one end of said structure, excavating elements rotatably mounted upon the outside and arranged in said structure, said structure having an opening over which said elements pass when rotated, and a chute disposed inside of said structure skirting said opening, and converging over said nose, a belt conveyor comprising vulcanized rims in said structure, spreading said rims apart and directing the discharge of material dropped into said opening onto said belt, and driving means extending through the wall of said structure for operative engagement upon said elements.

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