Nov. 3, 1925. 1,560,203

J. A. CAREY

STOKER

Filed Nov. 1, 1919 3 Sheets-Sheet 1

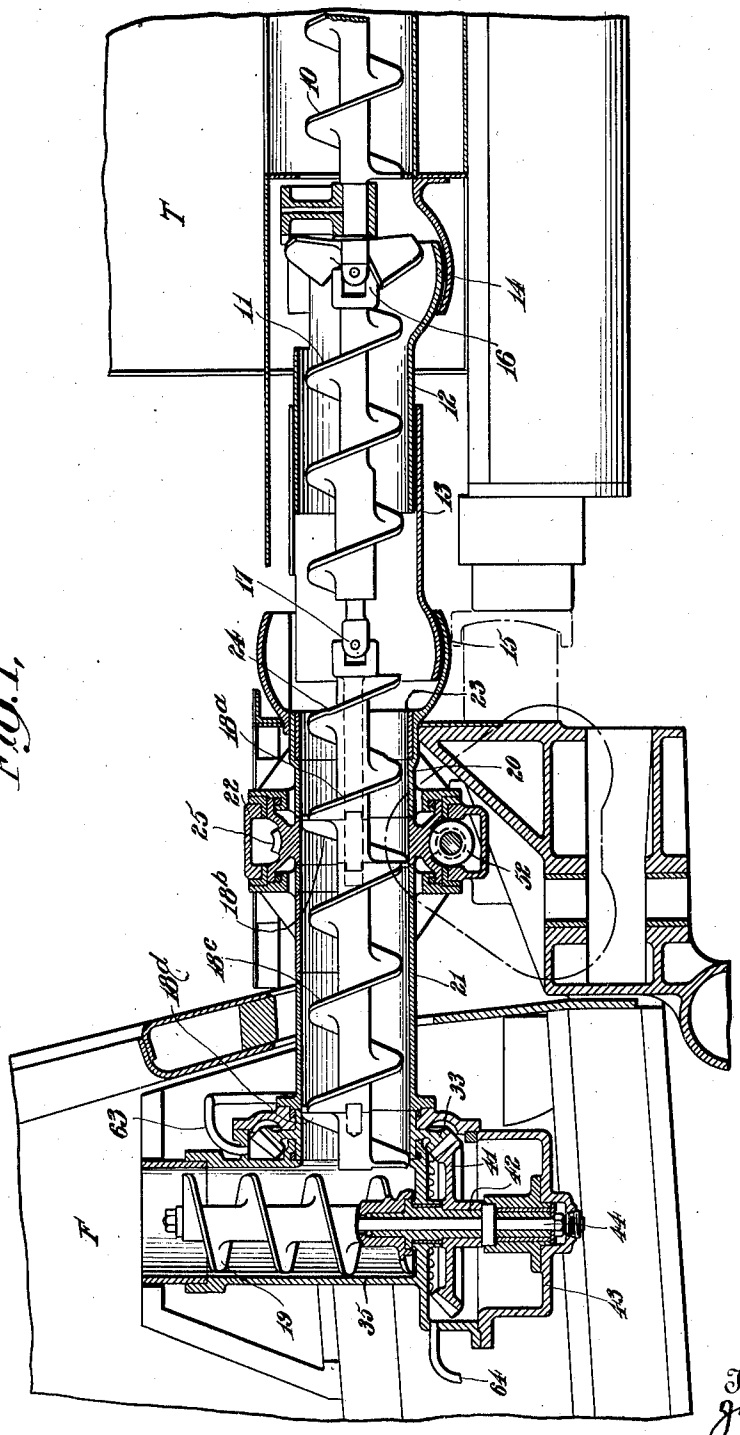


Fig. 1.

Inventor
James A. Carey

By his Attorneys
Kerr Page Cooper & Hayward

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STOKER

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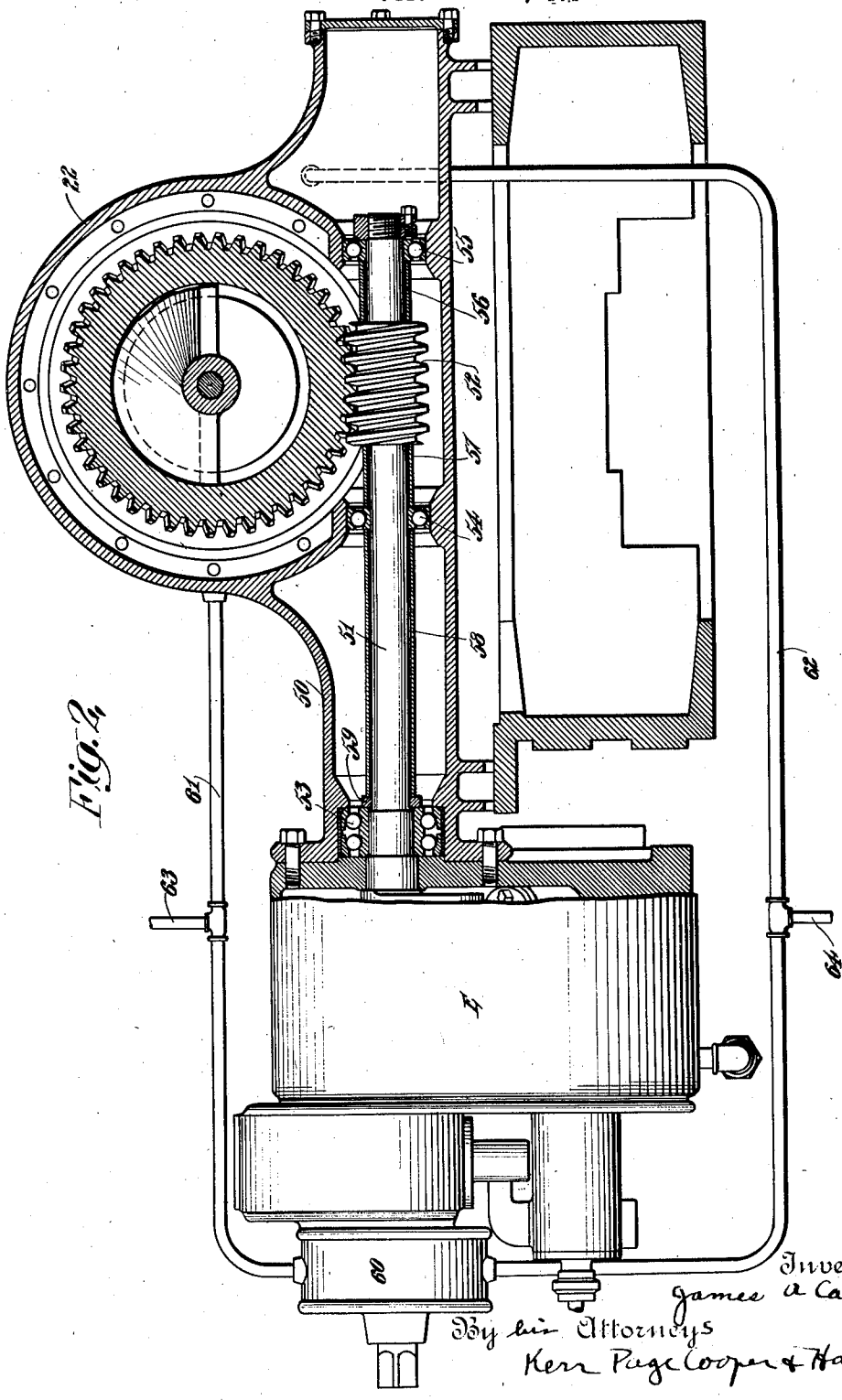


Fig. 2.

Inventor
James A Carey
By his Attorneys
Kerr Page Cooper & Hayward

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J. A. CAREY

STOKER

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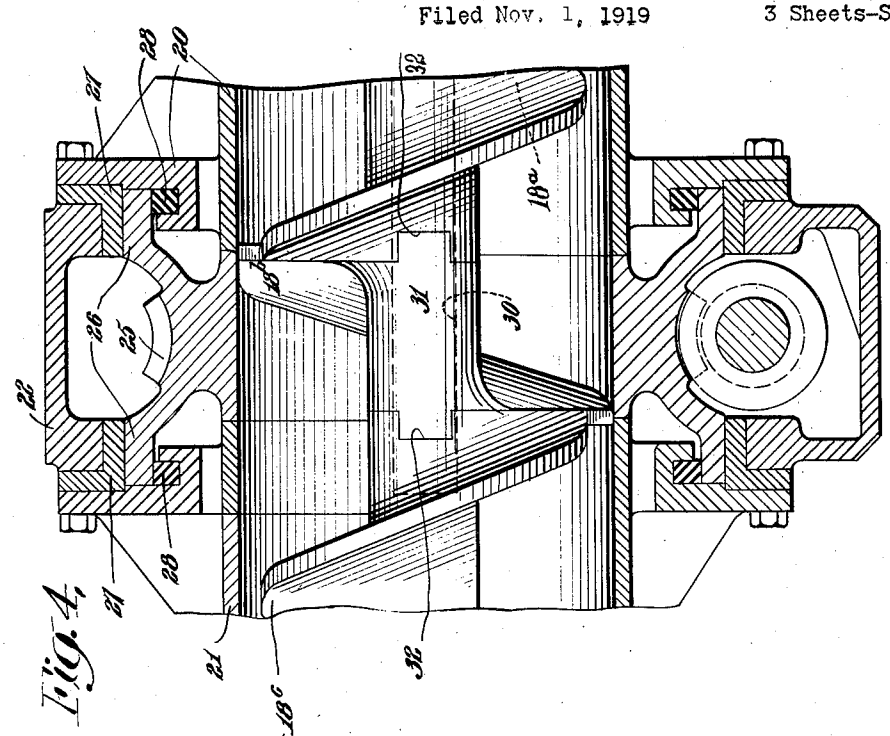


Fig. 4.

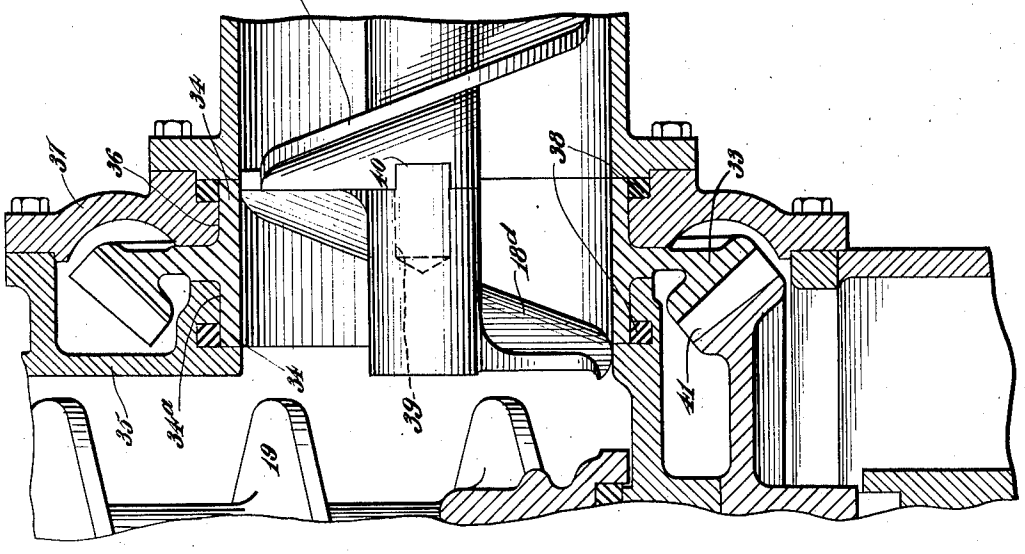


Fig. 3.

Inventor
James A Carey
By Attorneys
Kerr Page Cooper & Hayward

Patented Nov. 3, 1925. 1,560,203

UNITED STATES PATENT OFFICE.

JAMES A. CAREY, OF NEW YORK, N .Y., ASSIGNOR TO THE STANDARD STOKER CO., INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

STOKER.

Application filed November 1, 1919. Serial No. 335,100.

To all whom it may concern:

Be it known that I, JAMES A. CAREY, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Stokers, of which the following is a full, clear, and exact description.

This invention relates to improvements in stokers and particularly to improvements in stokers of the type shown in patent to Williams, 1,118,985, and patent to Williams, 1,099,956.

It has been found desirable in locomotive practice to reduce to a minimum all parts requiring attention by firemen, engineers or oilers inasmuch as operating difficulties have been found to be largely due to neglect and inattention by them.

It is among the objects of the present invention to reduce to a minimum all gearing and associated mechanism which connects the conveyors to each other and to the engine and also to provide a self-operating lubricating system which requires no attention other than occasionally filling one compartment with oil.

Other objects reside in the provision of a novel mounting for the horizontal conveyor whereby the use of depending bearings in the conveyor tube is avoided, thereby cutting down the possibility of clogging and permitting a more uniform advance of material therethrough. According to the present invention one of the bevel gears which drives the vertical conveyor is coaxial with and forms a part of the horizontal conveyor screw and also is arranged to form a bearing for one end of the rotary screw of the horizontal conveyor. By reason of the arrangement for driving the vertical conveyor I am enabled to dispense with the rear gearing and shafting which was employed for driving the bevel gearing of this conveyor and thereby eliminate mechanism requiring attention.

For driving the horizontal conveyor I employ a worm wheel coaxial with the rotary screw and mounted within the passaged structure. This wheel is driven by a worm gear mounted directly on the engine shaft.

This worm wheel also has a portion which forms a section of the convolutions of horizontal conveyor screw and has portions thereof which form a bearing to co-operate with the bevel gear in supporting the conveyor screw in the tube. The convolution of the conveyor screw forming a part of the aforesaid bevel and worm gears is uniform in pitch with the screw itself, whereby an even and non-accelerated or non-retarded movement of coal or other material through the device is attained.

Other objects reside in the novel methods of mounting the bevel and worm gears whereby the material being advanced does not have access to the gears with the possible consequence of wearing or injuring them or clogging their action.

Other objects reside in the provision of certain details of construction which simplify and modify the previous constructions to the general end of efficiency of operation and low cost of upkeep.

In the drawings:

Figure 1 shows a longitudinal sectional view of my improved stoker.

Fig. 2 shows a transverse sectional view of the stoker. This view shows the connections to the driving engine.

Fig. 3 is a detail enlarged sectional view of the bevel gear which drives the vertical conveyor.

Fig. 4 is a similar detail view of the worm wheel which drives and is a part of the convolutions of the horizontal conveyor.

In more detail, T is a tender and F a fire box. A conveyor screw 10 is adapted to take coal from the tender T and deliver the same to a conveyor screw 11 which rotates within telescoping troughs 12 and 13. These telescoping troughs at their ends are provided with the usual ball joints 14 and 15 which permit relative movement of the tender and locomotive. The conveyor screw is likewise sectional and is provided with interconnecting universal joints 16 and 17 to permit the conveyor sections to assume varying angles as relative movement of tender and locomotive occurs.

From conveyor screw 11 the coal is delivered to the rotary conveyor screws 18^a, 18^b, 18^c, 18^d and thence to the vertical screw conveyor 19 which delivers the coal to the fire box. The horizontal conveyor screw is made up of four axially aligned sections which will hereafter be described in detail

The horizontal conveyor screw rotates in a horizontal passaged structure made up o

two trough sections 20 and 21 which are interconnected by a gear housing 22. These sections 20 and 21 are preferably bolted to the gear housing by means of cap nuts best shown in Fig. 4. Section 20 also has at the end adjacent the ball joint an annulus 23 of hard metal which co-operates with a raised portion 24 of the periphery of screw 18^a to pick up the coal or other material. The annulus may be replaced when worn and is adapted to form a bearing for one end of the screw section 18^a.

Disposed between the conveyor screws 18^a and 18^c is an intermediate section 18^b having a pitch equal to the pitch of the two screws 18^a and 18^c. As clearly shown in Figs. 1 and 4, the horizontal screw sections 18^a, 18^b and 18^c cooperate to form a continuous conveyor screw having blades or convolutions extending from end to end of the screw and being of uniform pitch throughout. In this respect this construction differs from the constructions heretofore used in which the portion of the screw corresponding to 18^b had an increased pitch. I find it advantageous to have a uniform pitch throughout the length of the screw as the material is advanced uniformly without accelerating or retarding the flow. This mode of operation is particularly advantageous when depending bearings are omitted from the troughs as in the present construction.

The periphery of the screw 18^b is extended as shown in Fig. 4 and has cast integrally therewith a worm wheel 25 having annular extensions 26 at the sides thereof. The outer face of the annular extensions 26 bear upon annular members 27 carried by housing 22 to form a bearing for the worm wheel and likewise a bearing support for one portion of the horizontal screw conveyor. The inner faces of these extensions 26 form a bearing surface for felt rings 28 which are retained in grooves in the ends of troughs 20 and 21. The function of these parts is to form a seal and prevent dirt or coal-dust entering the gear case.

In order that the depending bearings in the passaged structure be eliminated I provide means for supporting screw sections 18^a and 18^c from the section of the screw 18^b. An interior shaft shown in dotted lines at 30 in Fig. 4 extends through the center of screw conveyor section 18^a, 18^b and into section 18^c and supports sections 18^a and 18^c from 18^b. I also provide for the driving of sections 18^a and 18^c from section 18^b by means of rectangular projections 31 which extend into rectangular jaws 32 in sections 18^a and 18^c. From the above construction it follows that the worm gear annular flanges 26 form a supporting bearing for the sections 18^a and 18^c of the screw conveyor.

I also propose to drive the conveyor screw sections by means of a square shaft fitting within square socket openings in sections 18^a, 18^b and 18^c.

In order to provide a bearing support for the opposite end of conveyor screw section 18^c and eliminate the previous objectionable depending bearing and at the same time provide a direct drive for the vertical conveyor screw 19, I provide a bevel gear 33 which is cast integral with screw section 18^d and which, like section 18^b, has the same pitch as sections 18^a and 18^c. Gear 33 has integral annular extensions 34, the outer periphery of which cooperate with an annular bearing surface 34^a on the vertical housing or passaged structure 35 and with an annular bearing surface 36 provided by gear case cap 37. In this manner a bearing is provided for the gear 33 and the screw section 18^d which is integral therewith. To prevent the ingress of dirt or coal-dust into the gear housing I provide dust rings 38 which co-operate with a portion of the exterior surface of the extensions 34. Screw section 18^c has a stub shaft 39 which projects into section 18^d whereby the left-hand end of section 18^c is supported by section 18^d without the use of the objectionable dependable bearings. Section 18^a is driven from section 18^c by rectangular projection and a co-operating jaw shown at 40.

Gear 33 meshes with a gear 41 which through a sleeve 42 having jaws at the upper end drives the vertical screw conveyor 19. Sleeve 42 is supported on suitable bearings in the lower end of the housing or passaged structure 35 and in cap 43. A suitable thrust bearing is also provided to support the gear 41. The lower end of screw 19 and upper end of sleeve 42 and housing 35 are provided with co-operating flanges which prevent the ingress of dirt into the gear housing. The entire vertical conveyor assembly is secured together by a through bolt 44. Cap 43, cap 37 and the lower end of housing 35 provide an oil-tight housing for the right-angle bevel gear conveyor drive between the vertical and horizontal conveyors.

Drive to engine.

Referring to Figure 2, the gear housing 22 has an extension 50 at the lower end to which the housing of the engine E is bolted. A drive shaft 51 carries a worm 52 which meshes with worm wheel 25. To support the shaft I provide ball bearings 53, 54 and 55. These bearings are spaced apart by sleeves and collars 56, 57, 58 and 59. The sleeves 57, 58, and collar 59 transmit the thrust of the worm to the bearing 53.

The construction described eliminates external gearing and shafts for driving the vertical conveyor screw. The drive from the engine is direct through shaft 51, worm

52, worm wheel 25, screw sections 18[b], 18[c], 18[d], bevel gears 33 and 41 through sleeve 42 to vertical screw 19.

Oiling system.

In order to provide for automatically oiling the gearing I provide an oil pump 60 on the end of the engine shaft which forces oil through pipe 61 to the interior of the worm gear housing. From this housing a drain pipe 62 leads back to the pump. A branch pipe 63 leads from pipe 61 to the bevel gear housing. A drain back pipe 64 leads excess oil back from the bevel gear housing to the pump.

What I claim is:

1. The combination with a passaged structure, means to advance material therethrough comprising a rotary screw having its axis extending longitudinally of the axis of the structure, a driving gear coaxial with said screw and having the portion which connects the periphery and the axis portion thereof shaped to form a section of the screw, said section having an equal pitch with respect to the other convolutions of the screw whereby material is uniformly advanced through the passaged structure.

2. In a device of the class described, in combination, an advancing means comprising a rotary screw, a passaged structure housing said screw, and also forming a gear housing, a gear having its axis coaxial with that of the screw and within said housing a driving gear enmeshing therewith and within said housing, and means associated with said first mentioned gear and co-operating with the housing to form a bearing support for the gear.

3. The invention set forth in claim 2 in which the coaxial gear is also adapted to form a support for the rotary screw whereby an unobstructed passage may be obtained in said passaged structure.

4. The invention set forth in claim 2 in which the interior portion of the coaxial gear is in the form of a section of the screw said screw adapted to advance the material through a part of the passaged structure.

5. The invention set forth in claim 2 in which the interior portion of the coaxial gear is in the form of the section of a screw and in which said interior portion co-operates with the rotary screw advancing means to support and drive the same.

6. In a device of the class described, in combination, a passaged structure, a rotary screw mounted therein and means for supporting said rotary screw in said passage, said means comprising a pair of gears having supporting bearing portions adjacent their periphery and central portions adapted to co-operate with and support the rotary screw.

7. The invention set forth in claim 6 in which the central portion of the gears is in the form of a section of the screw whereby the material in the passaged structure is advanced thereby in its passage past the gears.

8. The invention set forth in claim 6 in which the central portions of the gears are in the form of sections of the screw each having a pitch uniform with the pitch of the rotary screw.

9. In a device of the character described, a structure having angularly disposed passageways, conveyor screws in each of said passageways, each having a conveyor blade, and means for driving one of said screws from the other, said means including a driving gear mounted coaxially with one of the screws and having a conveyor blade section adapted to cooperate with the blade of the respective conveyor screw.

10. The invention set forth in claim 9, in which the driving gear is provided with a peripheral rim providing an external bearing surface for supporting the gear and the adjacent conveyor screw being detachably supported thereon.

11. The invention set forth in claim 9, in which the passageway wherein said one screw is disposed is continued through said driving gear which provides an unobstructed passageway, and an oil-tight housing is provided for said gear drive.

12. In a stoker, in combination, a horizontal rotary conveyor element, a vertical rotary conveyor element, vertical and horizontal passaged structures therefor, a worm wheel mounted in a section of the horizontal passaged structure between the ends of the horizontal conveyor element and adapted to drive and support for rotation the horizontal conveyor element, a driving engine adapted to drive said conveyor elements through the said worm wheel by means of a single shaft and a worm gear, and a bevel gear drive for the vertical conveyor comprising a bevel gear coaxial with and driven by the horizontal conveyor and an intermeshing bevel gear coaxial with and driving the vertical conveyor.

13. In a device of the class described, in combination, a horizontal and a vertical conveyor screw, means for driving one from the other, said means comprising a pair of bevel gears, one of said bevel gears having extended surfaces adapted to form a bearing support for the gear and the horizontal conveyor.

14. The invention set forth in claim 13 in which the extended surfaces co-operate with a sealing means which prevents the ingress of dirt and dust to said gearing.

15. In a device of the class described, a passaged structure, a worm wheel therein, said wheel having peripheral extensions adapted at their outside diameter to form a bearing support for the worm wheel.

16. In a device of the class described, a passaged structure, a worm wheel therein, said wheel having peripheral extensions co-operating with the passaged structure, the inner surface of said peripheral extension co-operating with a sealing means to prevent the ingress of dirt from the passaged structure.

17. The invention set forth in claim 15 in which the outer surface of the peripheral extensions is adapted to constitute a support for the worm wheel.

18. In a device of the class described, a passaged structure, a bevel gear therein, said gear having extended portions adapted to co-operate at their outer surfaces with the passaged structure to form a support for the said gear.

19. In a device of the class described, a passaged structure, a bevel gear therein, said gear having extended portions adapted to co-operate at their outer surfaces with sealing means associated with the passaged structure to seal off the interior of the passaged structure from the exterior, said extended portions having a portion thereof cooperating with parts of the passaged structure to form a bearing for the bevel gear.

20. In a device of the class described in combination, a passaged structure, a rotary screw mounted therein and means for supporting said rotary screw in said passage, said means comprising a gear having a supporting bearing portion at its periphery and a central portion adapted to cooperate with and support the rotary screw, and a bearing in said passaged structure adapted to cooperate with the periphery of a portion of the screw.

21. In a stoker, a structure having a passageway therein, a conveyor screw disposed within said passageway, and a rotary driving member for said screw providing a section of said structure and being formed to provide an unobstructed continuation of the passageway and providing a rotary support for said conveyor screw.

22. The invention as set forth in claim 21, in which the driving member is provided with hub and peripheral parts and a supporting part extends between said hub and peripheral parts providing a section of the conveyor screw.

23. The invention as set forth in claim 21, in which the driving member is provided with hub and peripheral parts and a supporting part extends between said hub and peripheral parts providing a section of the conveyor screw, the adjacent sections of said conveyor screw being supported on said hub part.

24. In a stoker, in combination, a conveyor having a sectional screw disposed in a conduit or passageway, a plurality of rotary bearing members for said screw for rotatably supporting said screw sections, said bearing members having openings therethrough providing unobstructed continuations of said passageway.

25. The invention set forth in claim 24, in which the rotary bearing members are provided with screw blade sections cooperating with the blades of said screw for advancement of the conveyed material.

26. The invention set forth in claim 24, in which a screw driving means cooperates with one of said bearing members for rotation of the screw.

27. In a device of the class described, in combination, a conveyor having a sectional screw disposed in a conduit or passageway, a plurality of rotary bearing members for said screw for rotatably supporting said screw sections, said bearing members having openings therethrough providing unobstructed continuation of said passageway, and a peripherally disposed bearing plate within said passageway and adapted to contact directly with the blade of said screw for rotatably supporting the latter.

28. In a device of the class described, in combination, a structure having a passageway, a conveyor screw disposed within said passageway, and a peripherally disposed removable bearing plate within said passageway and adapted to contact directly with the blade of said screw for rotatably supporting the latter.

29. In a stoker, in combination, a structure having a passageway, a conveyor screw disposed within said passageway and including a plurality of sections, and a rotary bearing member having bearing surfaces disposed exteriorly of said passageway and rotatably supporting adjacent sections of said conveyor screw.

30. In a conveyor, in combination, a structure having a passageway, a conveyor screw disposed within said passageway and including a plurality of sections, and rotary bearing members having bearing surfaces disposed exteriorly of said passageway and rotatably supporting adjacent sections of said conveyor screw, the blades of adjacent screw sections cooperating to form a substantially continuous conveyor blade.

31. In a conveyor, in combination, a structure having a passageway, a conveyor screw disposed within said passageway and including a plurality of sections, and a rotary bearing member having bearing surfaces disposed exteriorly of said passageway and rotatably supporting adjacent sections of said conveyor screw, the blades of the adjacent screw sections cooperating to form a conveyor blade continuing substantially uninterruptedly past said bearing member.

32. In a device of the character described,

a structure having angularly disposed passageways, conveyor screws in each of said passageways each having a conveyor blade, means for driving one of said screws from the other including a driving gear mounted coaxially with one of the screws and having a conveyor blade section adapted to cooperate with the blade of the respective conveyor screw, a peripheral rim for said driving gear providing an external bearing surface for supporting the gear and the adjacent conveyor screw which is detachably supported thereon, the passageway wherein said driving conveyor screw is disposed being continued through said driving gear which provides an unobstructed passageway, and an oil tight housing for said driving gear.

In testimony whereof I hereunto affix my signature.

JAMES A. CAREY.