Feb. 16, 1932. W. KELLY, JR 1,845,284

ASH COLLECTOR FOR LOCOMOTIVES

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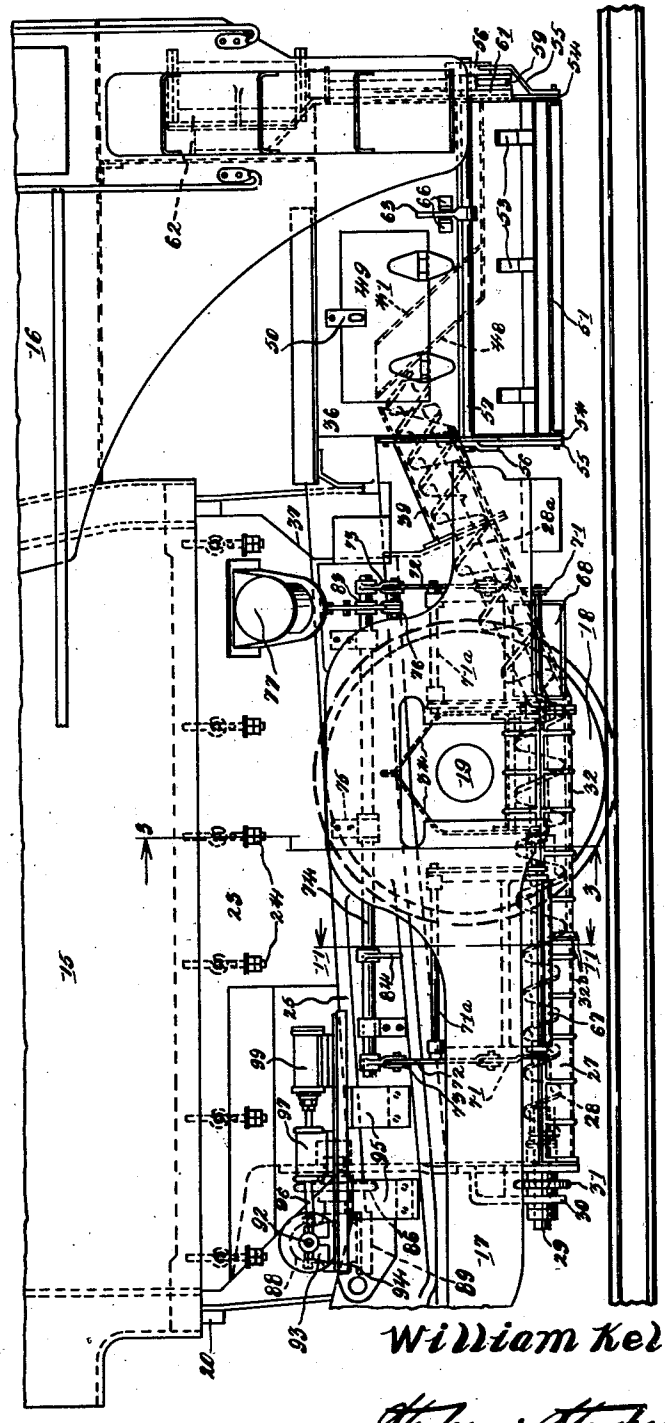


Fig. 1

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ASH COLLECTOR FOR LOCOMOTIVES

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Fig. 2

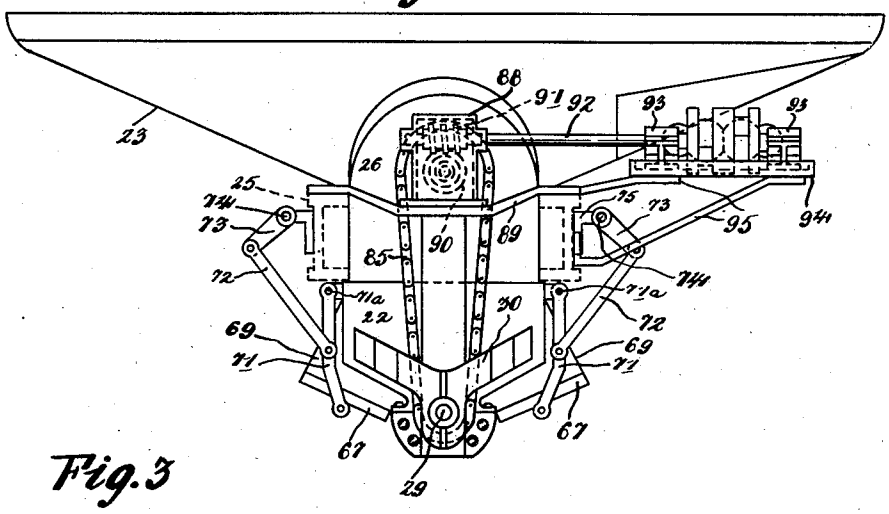
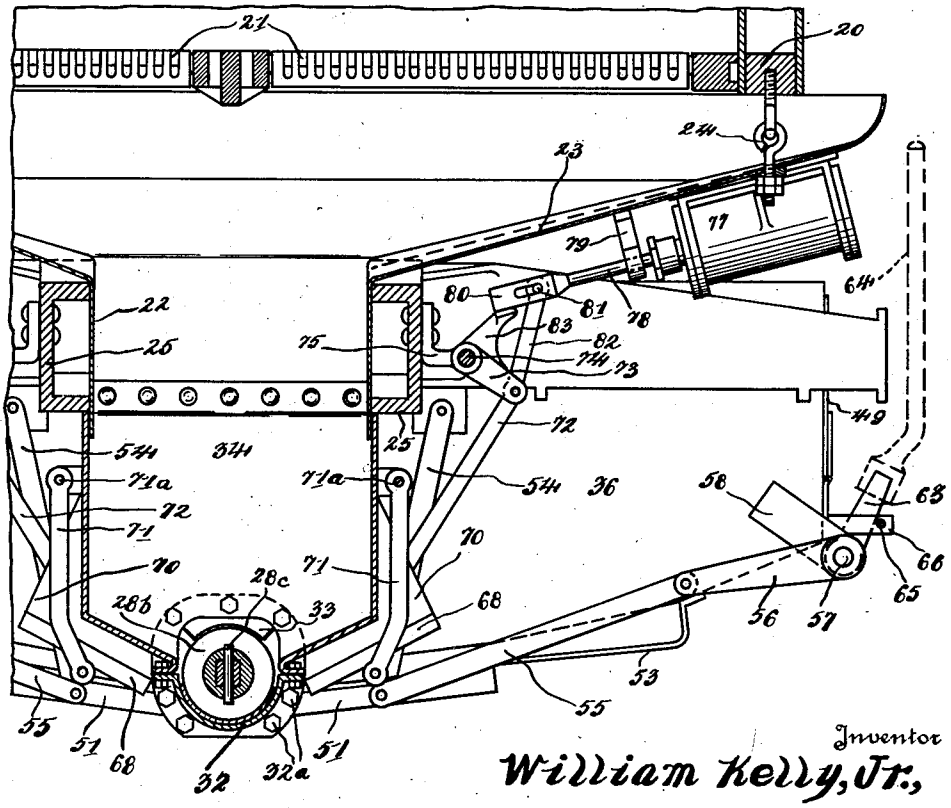


Fig. 3



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ASH COLLECTOR FOR LOCOMOTIVES

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Fig. 4

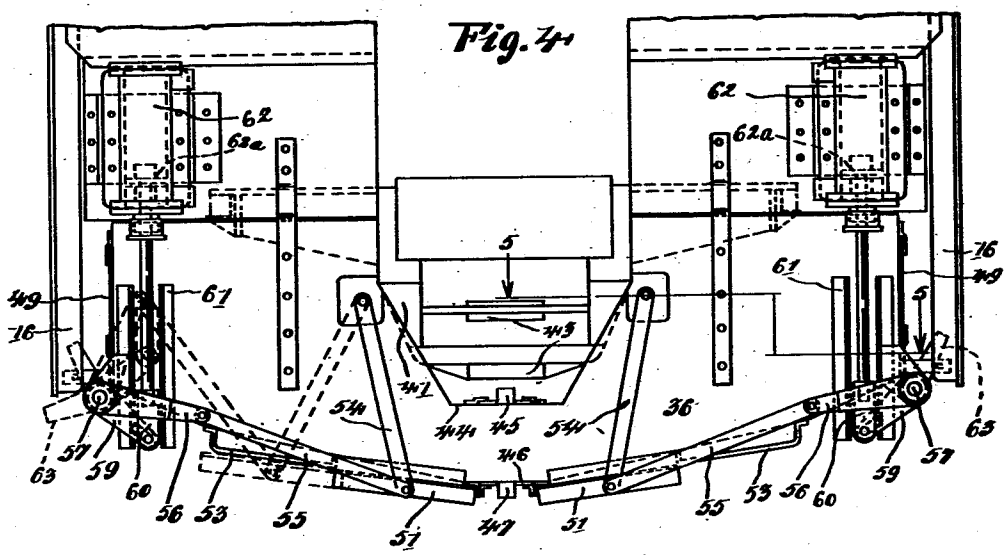


Fig. 5

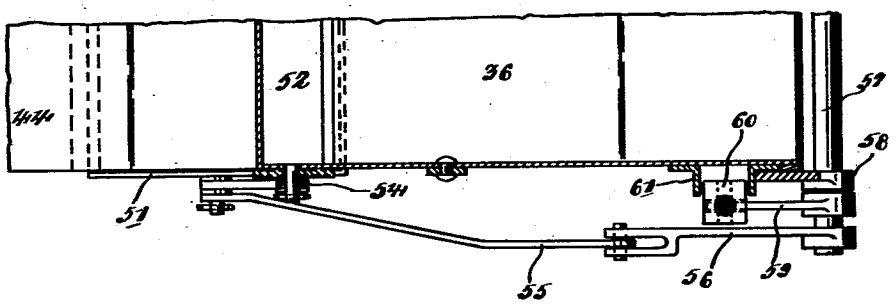
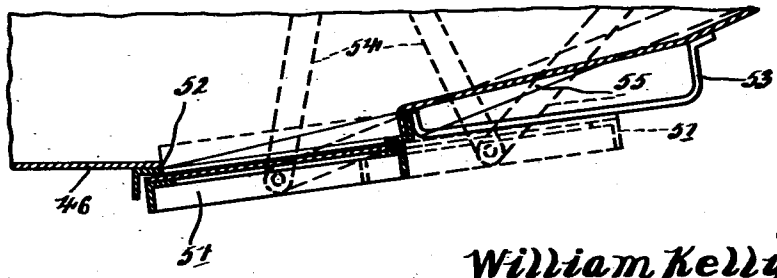


Fig. 6



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Feb. 16, 1932. W. KELLY, JR 1,845,284

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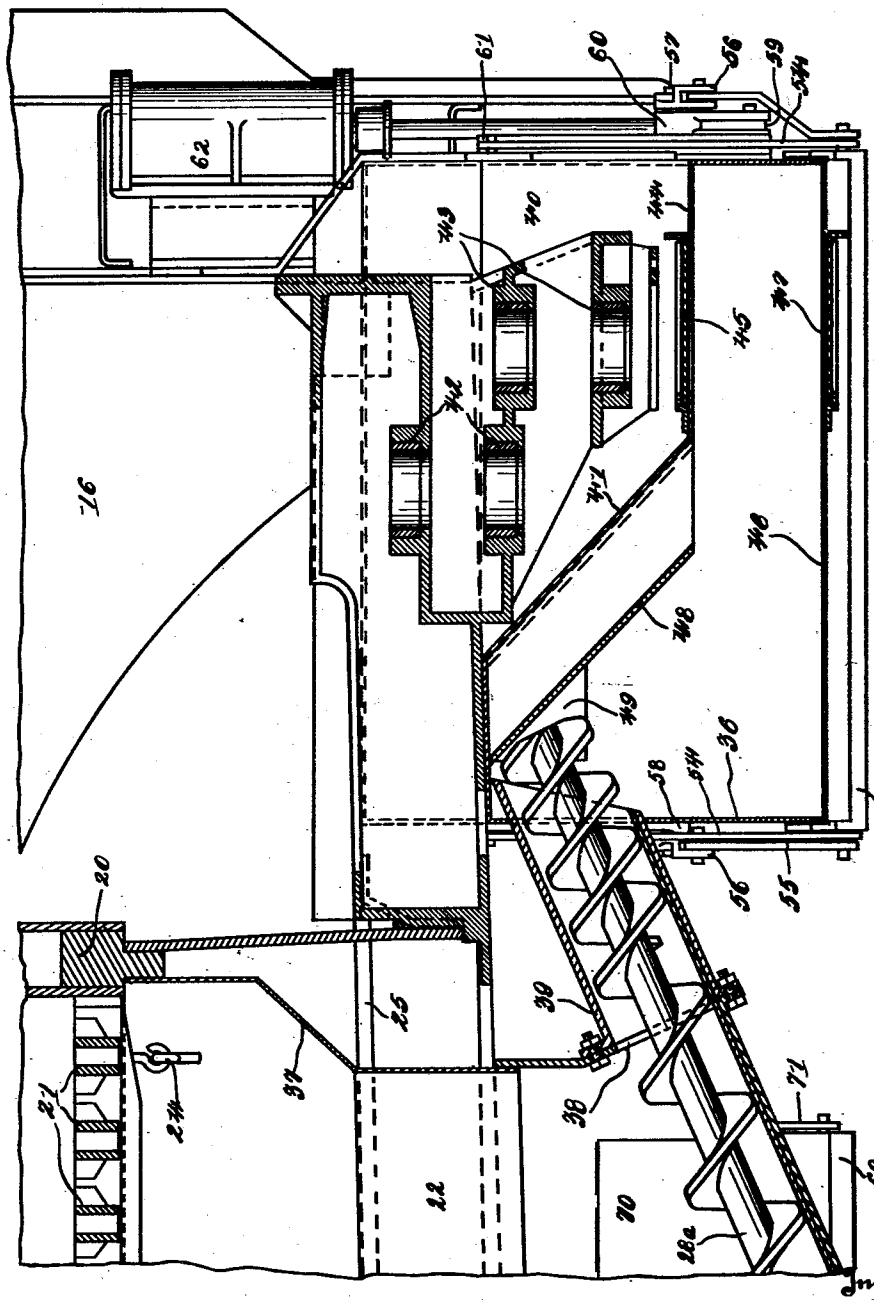


Fig. 1

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ASH COLLECTOR FOR LOCOMOTIVES

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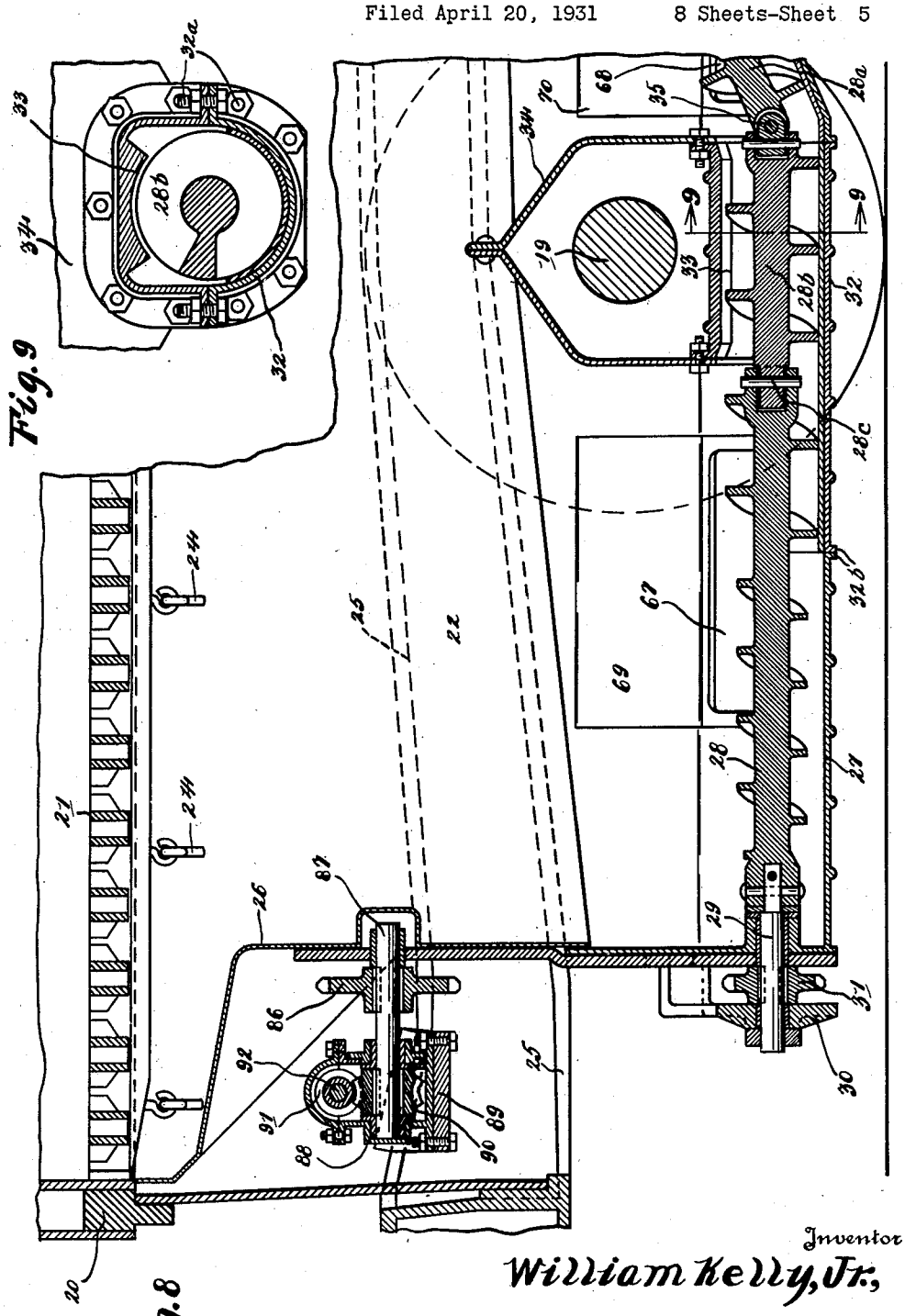


Fig. 9

Fig. 8

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ASH COLLECTOR FOR LOCOMOTIVES

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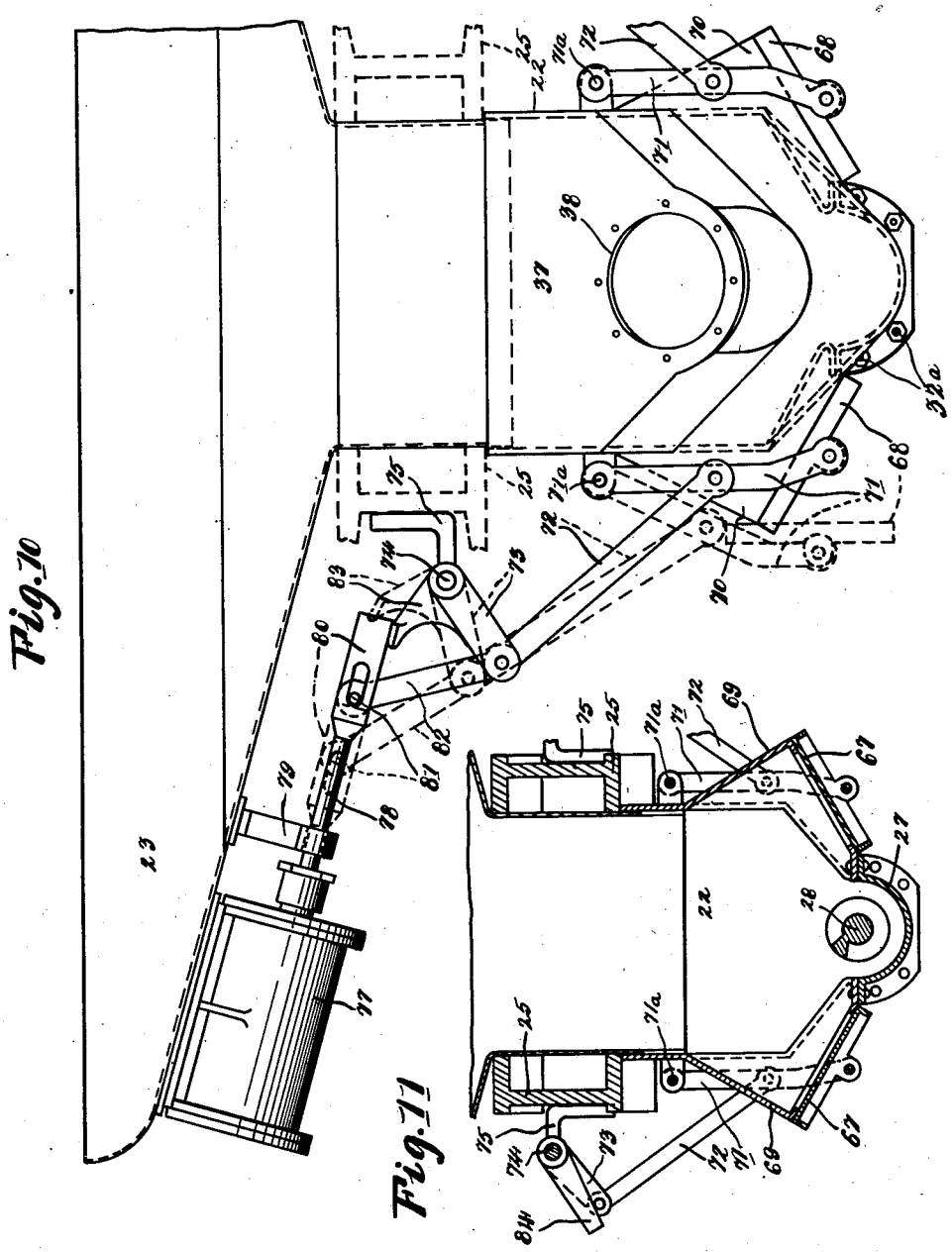


Fig. 10

Fig. 11

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ASH COLLECTOR FOR LOCOMOTIVES

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Fig. 12

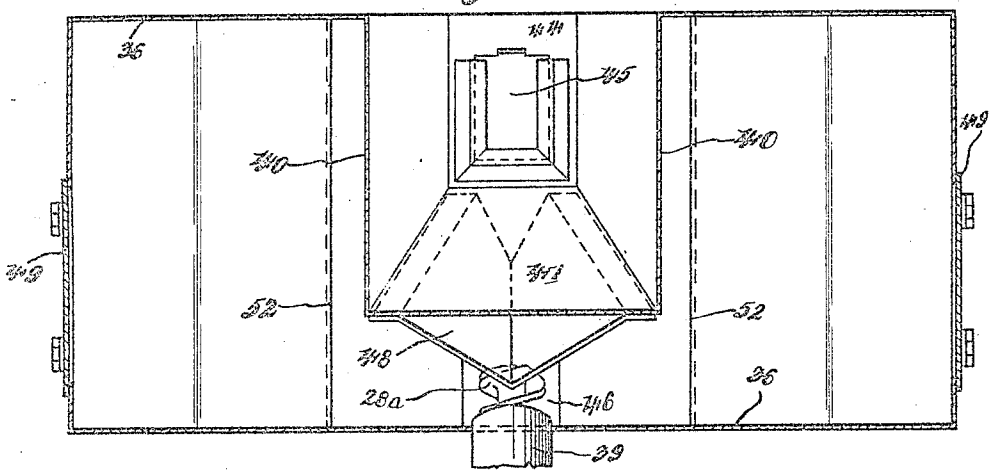
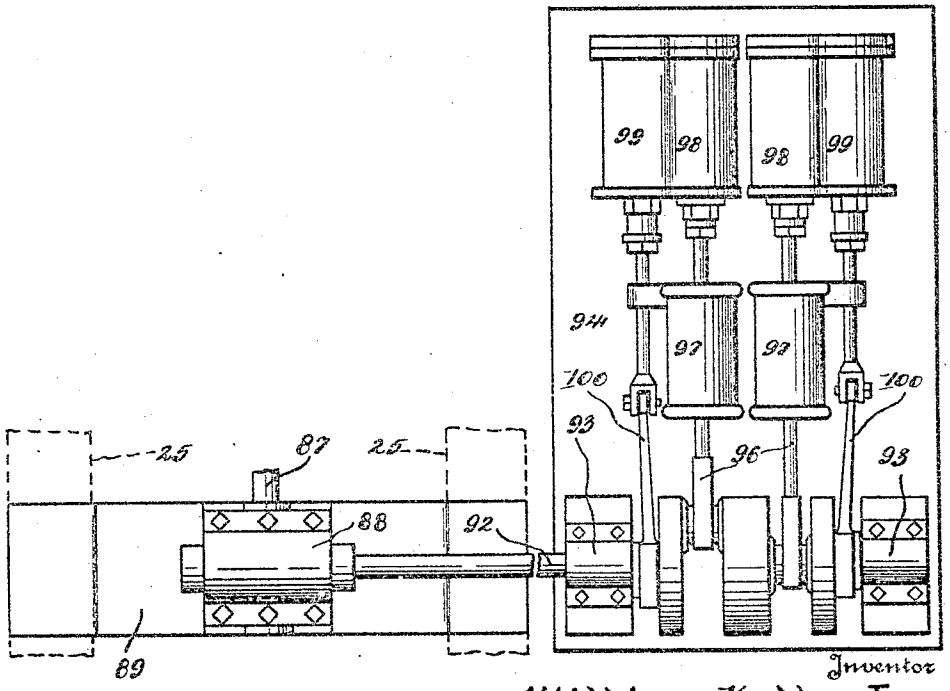


Fig. 13



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ASH COLLECTOR FOR LOCOMOTIVES

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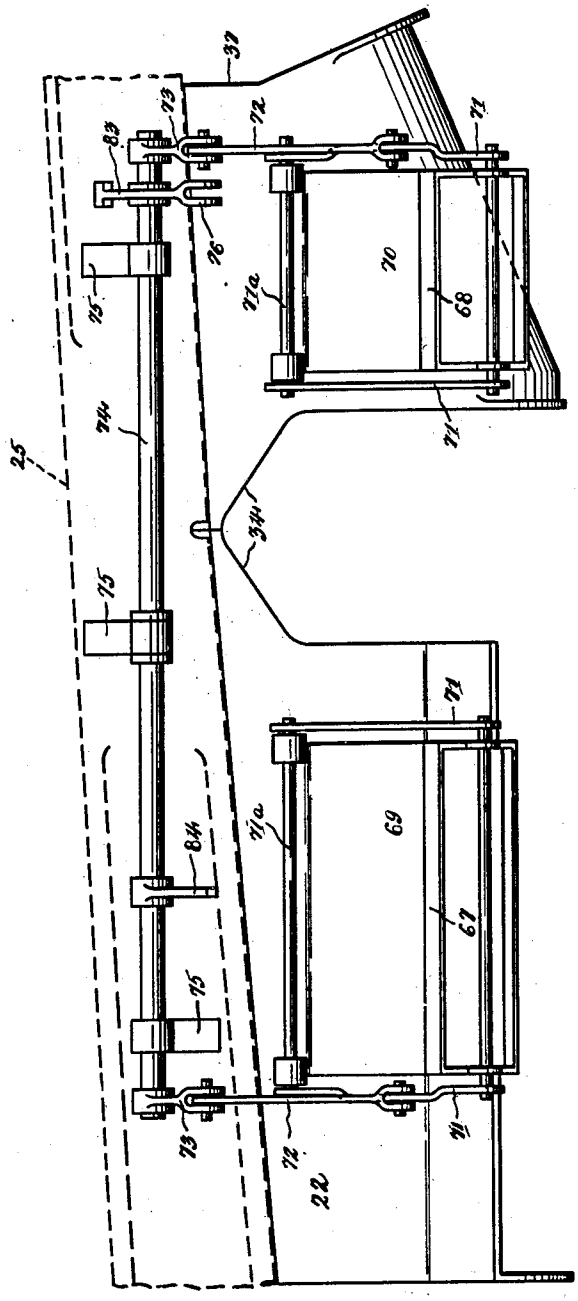


Fig. 14

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UNITED STATES PATENT OFFICE

WILLIAM KELLY, JR., OF SPOKANE, WASHINGTON

ASH COLLECTOR FOR LOCOMOTIVES

Application filed April 20, 1931. Serial No. 531,400.

It is the object of this invention to effect certain economies in the operation of coal burning locomotives by reducing the number of stops which have heretofore been necessary for the dumping of ashes and by minimizing the work of dumping and cleaning out the ash containers.

A further object is to provide an ash collector of large capacity so located and constructed that it utilizes a maximum of the available space on a locomotive.

Another object is to provide novel and efficient means for conveying ashes and cinders, including clinkers, from the grates or fire box to a receiver removed longitudinally of the locomotive from the grates.

A particular object of the invention is to provide a large receiver for ashes located beneath the engine cab in combination with a hopper for collecting ashes from the grates and a conveyor for transmitting the ashes from the hopper to the receiver.

A still further object is to provide novel and efficient means for emptying the ashes from a collector of this kind. Other objects will appear and be more fully pointed out in the following specification and claims.

Referring to the accompanying drawings:

Figure 1 is a side elevation of my device, together with the adjacent portions of a locomotive of common type;

Fig. 2 is a front elevation of the hopper and drive mechanism for the conveyor;

Fig. 3 is a fragmentary, transverse section taken on the line 3—3 of Fig. 1;

Fig. 4 is a rear elevation of the large storage bin or ash receiver;

Fig. 5 is a fragmentary, horizontal section taken on the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary, vertical section through one of the bottom doors of the receiver;

Fig. 7 is a central, longitudinal section through the rear end of the device and adjacent portions of the locomotive;

Fig. 8 is a similar section through the front end of the device;

Fig. 9 is a transverse section taken on the line 9—9 of Fig. 8;

Fig. 10 is a rear elevation of the hopper showing the door operating mechanism;

Fig. 11 is a fragmentary, transverse section taken on the line 11—11 of Fig. 1;

Fig. 12 is a plan view of the ash storage bin or receiver with the top removed;

Fig. 13 is a plan view of the engine for operating the conveyor; and

Fig. 14 is a side elevation of the hopper.

In the drawings, fragmentary portions of the fire box and cab of a locomotive of common type are indicated by the numerals 15 and 16 respectively. Beneath the fire box is a trailer truck 17 with trailer wheels 18 and axle 19. The fire box 15 has the usual water jacketing at the bottom of which are located frame members forming the "mud ring" 20. The grates are indicated by the numerals 21.

Beneath the grates is mounted a hopper 22 having a large, flaring upper portion 23 which is suspended from the mud ring 20 by bolts 24, as shown in Figs. 1 and 3. The hopper 22 extends longitudinally between the main frame members or cradle 25 of the engine and, as best shown in Fig. 8, the front end of the hopper is closed by a sheet metal wall 26. The bottom of the hopper 22 supports a longitudinally extending trough 27 in which is mounted a conveyor screw 28. At its front end the screw 28 is connected to a drive shaft 29 having bearings in the wall of the hopper and in a bracket 30 secured to the exterior of the wall 26. A sprocket wheel 31 for driving the screw 28 is mounted between the bracket 30 and wall 26.

The conveyor screw passes beneath the axle 19 in a tubular casing 32, the upper periphery of which is provided with a heavy plate 33 adapted to coact with the screw to crush the larger cinders and clinkers. The axle 19 is enclosed at the top, front and rear by casing members 34. To facilitate removal of the trailer wheels and axle, a removable section 28*b* of the screw 28 is located beneath the axle 19, being connected by a pin 28*c* at its front end to the screw 28 and having a similar connection with a universal joint 35 at its rear end. The plate 33 is secured in place by removable bolts and, as shown in Figs. 3, 9 and 10, removable bolts 32*a* retain the casing 32 in

place at its rear end, similar bolts being provided at its front end to connect arcuate flanges 32*b* on the members 27 and 32.

Near the rear end of the tubular casing 32, the universal joint 35 connects the screw 28 to an oblique section 28*a* adapted to transmit ashes from the hopper 22 to a large bin or receiver 36 located beneath the cab 16. As best shown in Figs. 7 and 10, the hopper 22 has a rear wall 37 and an opening 38 therein which communicates with the conduit 39 connecting the hopper to the receiver 36. The section 28*a* of the conveyor screw is revoluble in the conduit 39 and the pitch of said screw is preferably reduced toward its free extremity to aid in forcibly distributing the ashes in the receiver 36.

The receiver 36 extends to substantially the full width of the cab, and to allow access to the draw bar pins, reentrant walls 40, 41 and 44 extend in from the rear end of the receiver 36, as shown in Fig. 12. The usual or suitable bearings 42 and 43 for the draw bar pins are located in the recess in the ash receiver formed by the walls 40, 41 and 44. The wall 41 extends obliquely beneath the bearing 42 and from this wall 41 the horizontal wall 44 extends to the rear. A slidable door 45 in the wall 44 allows access to the bearings 43. The bottom 46 of the receiver is also formed with a sliding door 47 to permit insertion of the draw bar pin in the bearings 43. The pin may be inserted in the bearings 42 through an opening in the cab floor.

To direct the ashes from the conveyor screw to the large side portions of the receiver 36, oblique guide plates 48 are secured to the wall 41. At each side a door 49 is provided for inspection and manual aid in the dumping of the ashes when such aid is needed. The doors 49 have hinges at their lower edges and small pivoted catches 50 engage their upper edges to hold them in closed position.

At each side of the bottom of the receiver 36, is a door 51 through which the ashes may be dumped. These doors cover long openings 52 and are slidable on guides 53 when in open position. Each door 51 is hung from a pair of arms 54, one located on the front of the receiver 36, as shown in Fig. 3, and the other located on the back wall of said receiver, as shown in Fig. 4. The arms 54 are pivotally secured to the receiver at their upper ends and are pivotally connected to the door 51 at their lower ends. Operating links 55 at the front and rear ends of each door 51 are connected to the arms 54 and to cranks 56 fast on a horizontal shaft 57. The mechanism for operating the door 51 is duplicated at each side of the receiver. The shaft 57 is supported in bearings 58 and has a crank 59 connecting it to a cross head 60 mounted between vertical guides 61 on the rear wall of the receiver 36. This cross head is operable by a piston 62*a* in a cylinder 62 having suitable connection therewith. The crank 59 has a slot in which a pivot pin extends to join it to the head 60, said slot being of sufficient length to permit the arcuate movement of the crank in connection with the rectilinear movement of the head 60. The cylinder 62 is preferably connected to the compressed air supply of the locomotive and has air controls of suitable or common type to operate the receiver doors. For emergency use, a crank 63 is secured to the shaft 57 to be operated by a hand lever 64. A grate shaker handle may be employed as the lever 64. When the air cylinder is not in use, the crank 63 and connected mechanism may be locked with the door 51 in closed position by inserting a pin 65 in perforations in a pair of bracket arms 66 (see Fig. 3). The air cylinder 62 is mounted beneath the cab floor on brackets secured to the engine frame.

When the doors 51 are to be opened compressed air or other fluid under pressure is admitted to the cylinders 62 beneath the pistons 62*a* so that the heads 60 are raised together with the free ends of the cranks 59. Each crank 59 is thus actuated to turn a shaft 57 and raise a pair of the cranks 56 at their ends connected to the links 55. These links draw the doors 51 to open position on the guides 53 while moving the suspension arms 54 as indicated in dotted lines in Fig. 6. To close the doors compressed air is admitted to the upper ends of the cylinders 62 to reverse the operation.

It will be evident that the hopper 22 has a large capacity for ashes and constitutes a storage compartment which must be emptied periodically. To facilitate the emptying operation, I provide doors 67 and 68 at each side of the bottom of the hopper, these doors being located at the bottom of enlarged portions 69 and 70, as shown in Figs. 1, 2, 3, 8 and 14. Each door is suspended from a pair of arms 71, fixed on a horizontal shaft 71*a*, and one arm of each pair is connected by a link 72 to a crank 73 fixed on a horizontal shaft 74. This shaft is supported in bearing brackets 75 and extends longitudinally of the hopper with connections for operating a door 67 and a door 68, as best shown in Fig. 14. Another crank 76 is fixed on the shaft 74 to be actuated by connections with the piston in air air cylinder 77. An air cylinder 77 is secured to the bottom surface of the upper portion 23 of the hopper at each side. Each cylinder has a piston rod 78 guided in a bracket 79 and a slotted end 80 of the piston rod is connected by a pin 81 to a link 82 joined to the crank 76. An arm 83, integral with the crank 76, is arranged to engage the end 80 of the piston rod to lock the doors 67 and 68 in closed position. The cylinder 77 has connections with the compressed air supply and controls whereby the hopper doors may be opened and

closed, as will be readily understood by those skilled in this art.

In operation, assuming that the doors 67 and 68 are in the closed position shown in Figs. 2, 3 and 10, they are locked in this position by engagement of the arm 83 with the end 80 of the piston rod 78. To open the doors air is admitted to an end of the cylinder 77 so as to retract the piston rod 78. As movement of the rod starts the end 80 is withdrawn from the path of the arm 83 while the pin 81 merely remains stationary in its slot. When the outer end of the slot engages the pin 81, the arm 83 is free to move toward dotted line position shown in Fig. 10 and further movement of the piston raises the cranks 76 and 73 and actuates the link 72 to open a door by outward movement of the arms 71, as indicated in dotted lines in Fig. 10. Manual operation of the hopper doors is made possible by providing a crank 84 on the shaft 74 adapted to be engaged by a lever, such as the grate shaker handle 64 (Fig. 3).

To drive the conveyor screw 28, a chain 85 is applied to the sprocket wheel 31 and is arranged to be driven by a sprocket wheel 86 fixed on a shaft 87 (Figs. 2, 8 and 13). The shaft 87 has a bearing in the front end of the hopper and another bearing in a gear housing 88. A supporting bar 89 for the gear housing 88 extends transversely between the main cradle members 25. Within the gear housing, a worm wheel 90 is fixed on the shaft 87 and a worm 91, in mesh with the worm wheel, is fixed on a transverse shaft 92. This transverse shaft has additional bearings 93 on an engine base 94 supported on bracket arms 95.

A suitable steam engine is supported on the base 94 to operate the shaft 92, said shaft having cranks joined to connecting rods 96. Cylindrical guides 97 are provided for cross heads to which the connecting rods are joined. Steam cylinders 98 contain suitable pistons and piston rods for operating the connecting rods 96. The engine valves in the valve chambers 99 are operated in well known manner from eccentric rods 100 in connection with eccentrics on the shaft 92. The steam engine illustrated is of the reversible type to permit operation of the conveyor screw 28 in either direction. Thus in case of clogging or jamming of the larger clinkers in the conveyor the direction of rotation of the screw may be reversed momentarily to free the obstruction.

In operation the ashes, including cinders and clinkers of all sizes, are caught in the hopper 22 and are directed thereby to the conveyor trough 27. When a quantity of the ashes has accumulated in the hopper, the conveyor screw 28 is operated by admitting steam to the cylinders 98. The conveyor screw feeds the ashes from the trough 27 through the tubular casing 32 where the larger clinkers are crushed against the plate 33. The ashes are then advanced through the conduit 39 to the receiver 36 and are directed from the delivery end of the screw to the sides of the receiver by the plates 48. The screw may be driven continuously or intermittently. It will be evident that a large quantity of ashes is stored in the hopper and storage bin or receiver so that the number of stops for dumping ashes are greatly reduced. When it becomes necessary to empty the hopper and receiver, air is admitted to the cylinders 62 and 77 so that the doors 67 and 68 of the hoppers and doors 51 of the receiver are opened through the connections hereinbefore described. If the ashes are allowed to become firmly packed in the receiver 36, it is sometimes necessary for the operator to open the doors 49 and manually loosen the ashes with a suitable tool and to move them to the door openings 52.

My device effects particularly important economies where coal of high ash content is used and where long, uninterrupted runs are desirable. For example, it has been found with certain engines using coal having an ash content as high as 30%, without my device, stops for dumping ashes were necessary about every twenty miles and by the use of my device, burning the same coal in the same locomotives, uninterrupted runs of seventy-five miles are common.

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

1. In combination with a locomotive, a fire box, a receiver for ashes, removed longitudinally of the locomotive from said fire box and means for conveying ashes from said fire box to said receiver.

2. In combination with a locomotive, a fire box, a receiver for ashes, a conveyor for carrying ashes from said fire box to said receiver and power-driven means for actuating said conveyor.

3. In combination with a locomotive, a grate, a hopper for collecting ashes located beneath said grate, a receiver for ashes and a power-driven conveyor for carrying ashes from said hopper to said receiver.

4. In combination with a locomotive, a grate, a hopper for collecting ashes located beneath said grate, a receiver for ashes removed longitudinally of the locomotive from said hopper and means for conveying ashes from said hopper to said receiver.

5. In a locomotive, a fire box, a cab extending rearwardly of said fire box, a receiver for ashes located beneath said cab, a hopper beneath said fire box to collect ashes therefrom and means for conveying ashes from said hopper to said receiver.

6. In a locomotive, a fire box, a cab extending rearwardly of said fire box, a large receiver for ashes located beneath said cab, a hopper

beneath said fire box to collect ashes therefrom, means for conveying ashes from said hopper to said receiver, a closure for said receiver and means for opening said closure to empty the receiver.

7. In a locomotive, a fire box, a hopper beneath said fire box to collect ashes therefrom, a conveyor in the bottom of said hopper, a separate receiver for ashes at the delivery end of said conveyor and bottom closures for said hopper and receiver to permit emptying the same.

8. In a locomotive, a fire box, a hopper beneath said fire box to collect ashes therefrom, a conveyor extending longitudinally of the locomotive and located centrally in the bottom of said hopper, a receiver for ashes at the delivery end of said conveyor, said receiver being removed longitudinally of the locomotive from said hopper and closures for said hopper and receiver to permit emptying the same.

9. In a locomotive, a fire box, a hopper beneath said fire box to collect ashes therefrom, a screw conveyor extending longitudinally of the locomotive in the bottom of said hopper, a receiver for ashes at the delivery end of said conveyor and closures for said hopper and receiver to permit emptying the same.

10. In combination with a locomotive having a fire box, an ash collector comprising, a conveyor extending longitudinally beneath said fire box, means for feeding said conveyor with ashes from said fire box, a receiver for accumulating a quantity of ashes at the delivery end of said conveyor and a closure for said receiver to permit emptying of the ashes therefrom.

11. In combination with a locomotive having a fire box, an ash collector comprising, a conveyor extending longitudinally beneath said fire box, means for feeding said conveyor with ashes from said fire box, a receiver for accumulating a quantity of ashes at the delivery end of said conveyor, means for distributing ashes in said receiver and a closure for said receiver to permit emptying of the ashes therefrom.

12. In combination with a locomotive having a fire box, an ash collector comprising, a conveyor extending longitudinally beneath said fire box, means for feeding said conveyor with ashes from said fire box, a receiver for accumulating a quantity of ashes at the delivery end of said conveyor, a closure for said receiver to permit emptying of the ashes therefrom and power-driven means for actuating said closure and conveyor respectively.

13. In combination with a locomotive having a fire box, an ash collector comprising, a hopper to collect the ashes from said fire box, a receiver for ashes removed longitudinally of the locomotive from said hopper, a conduit for conveying the ashes from said hopper to said receiver, power-driven means operable in said conduit to transmit ashes therein and closures for said hopper and receiver.

14. In combination with a locomotive having a fire box, an ash collector comprising, a hopper to collect the ashes from said fire box, a receiver for ashes removed longitudinally of the locomotive from said hopper, a conduit for conveying the ashes from said hopper to said receiver, a power-driven screw operable in said conduit to transmit ashes therein and a closure for said hopper.

15. In combination with a locomotive having a fire box, an ash collector comprising, a hopper to collect the ashes from said fire box, a receiver for ashes removed longitudinally of the locomotive from said hopper, a conduit for conveying the ashes from said hopper to said receiver, power-driven means operable in said conduit to transmit ashes therein, bottom closures for said hopper and receiver and power-driven means for actuating said closures.

In testimony whereof, I have hereunto signed my name to this specification.

WILLIAM KELLY, JR.