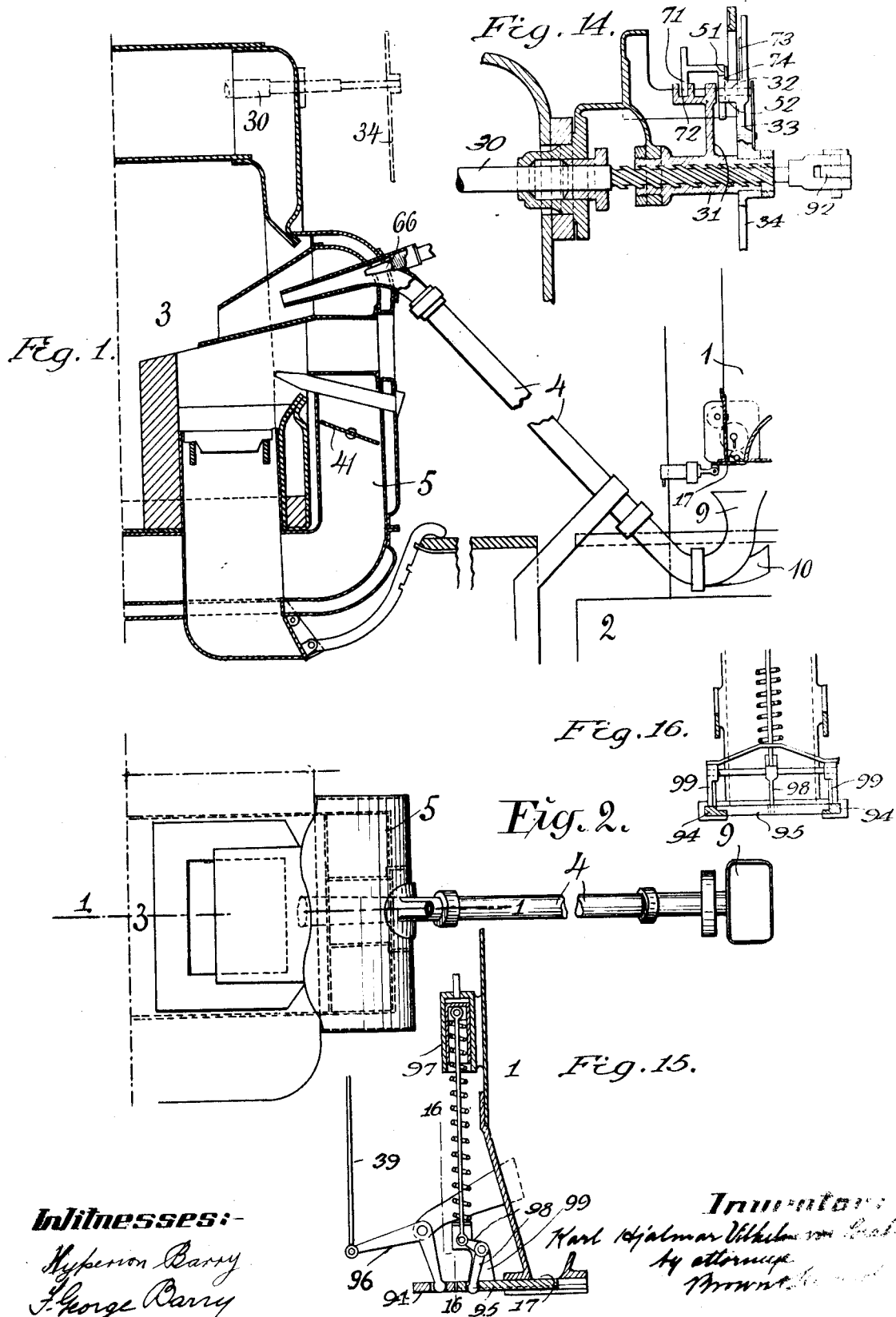


K. H. V. VON PORAT.
STOKING DEVICE FOR PULVEROUS FUEL.
APPLICATION FILED MAY 31, 1913.

Patented Apr. 18, 1916.
6 SHEETS—SHEET 1.

1,179,784.



Witnesses:
Hyperion Barry
George Barry

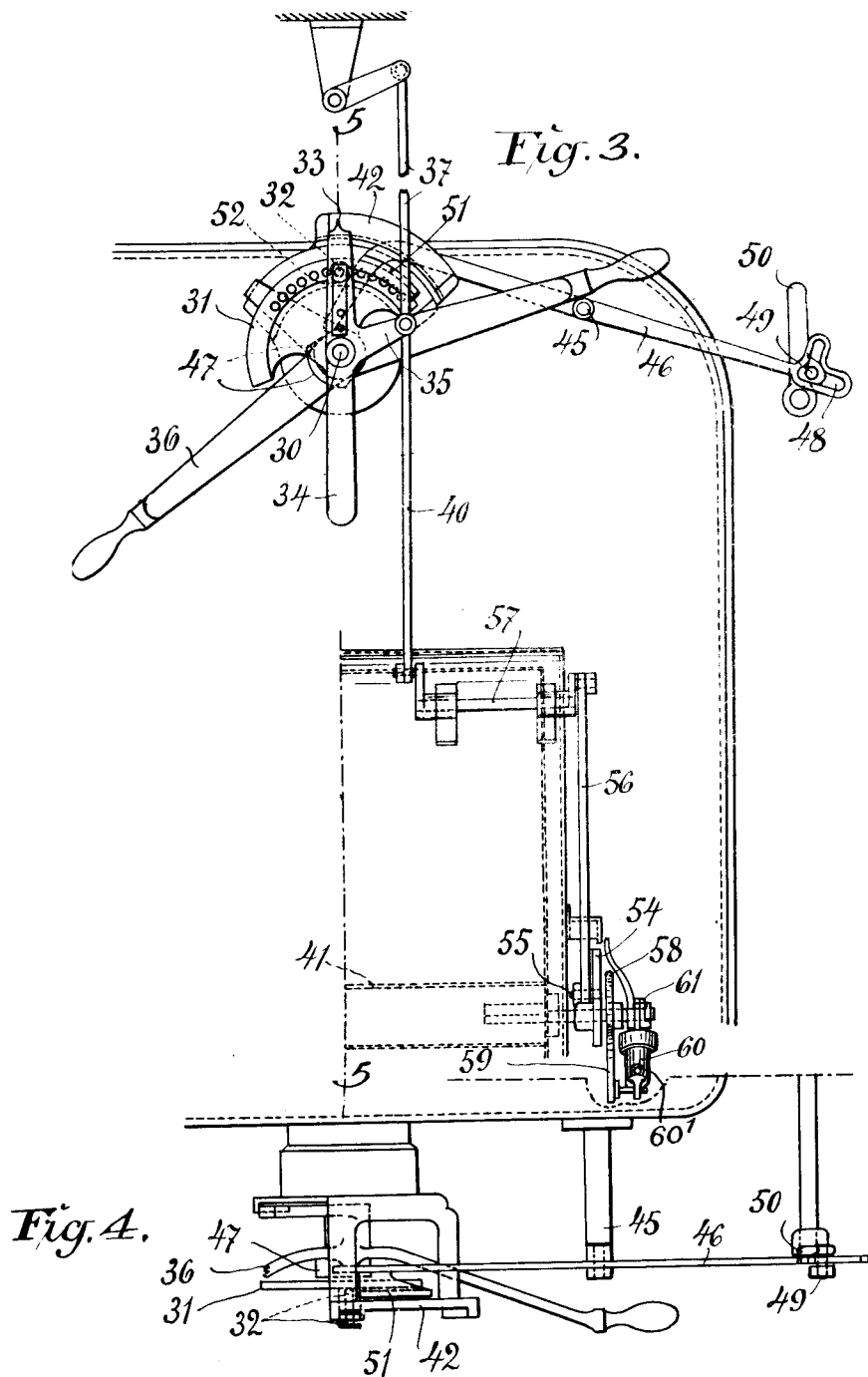
Inventor:
Karl Hjalmar Vilhelm von Porat.
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8 SHEETS—SHEET 2.

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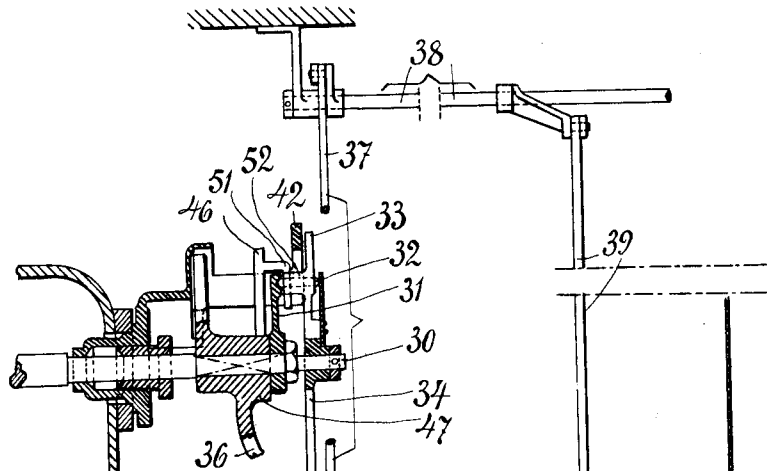


Fig. 5.

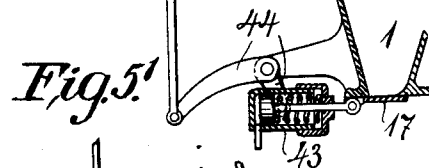
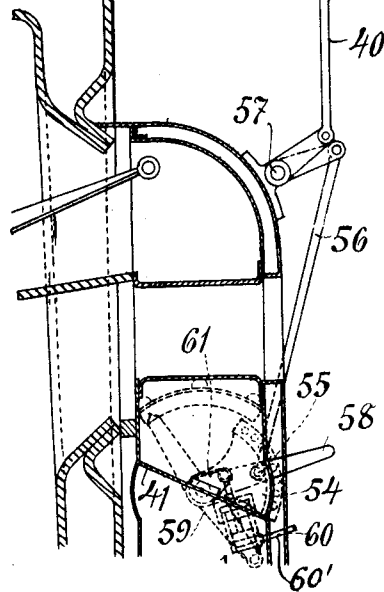


Fig. 6.

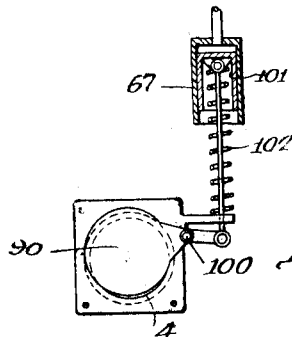
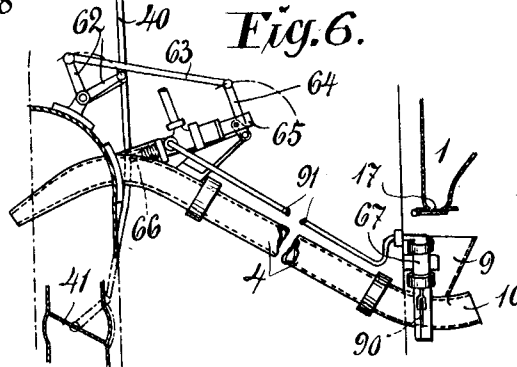


Fig. 6''.

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6 SHEETS—SHEET 4.

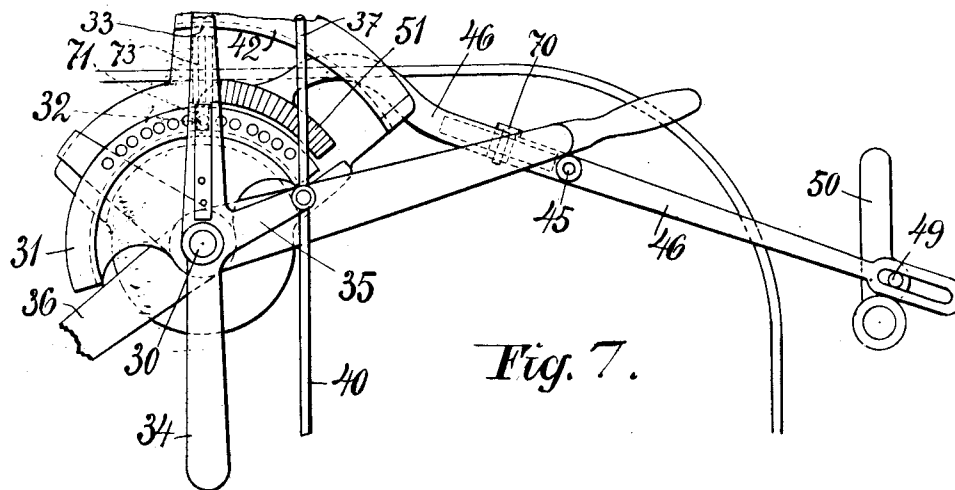


Fig. 7.

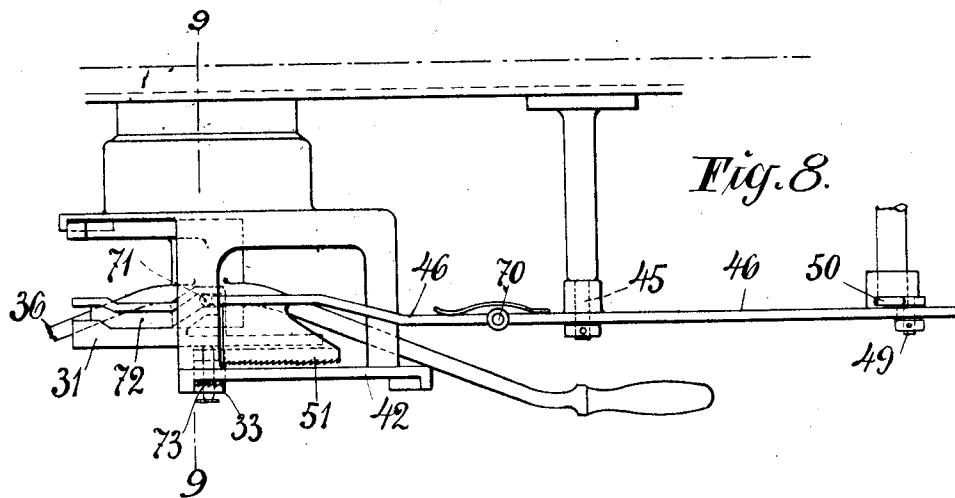


Fig. 8.

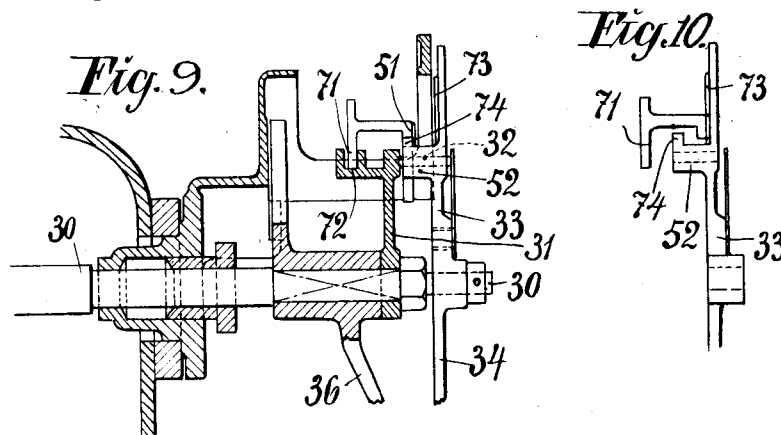


Fig. 9.

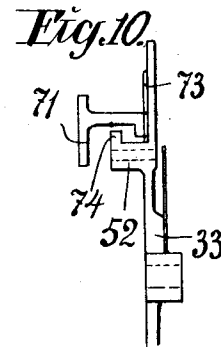


Fig. 10.

Witnesses:

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J. George Barry

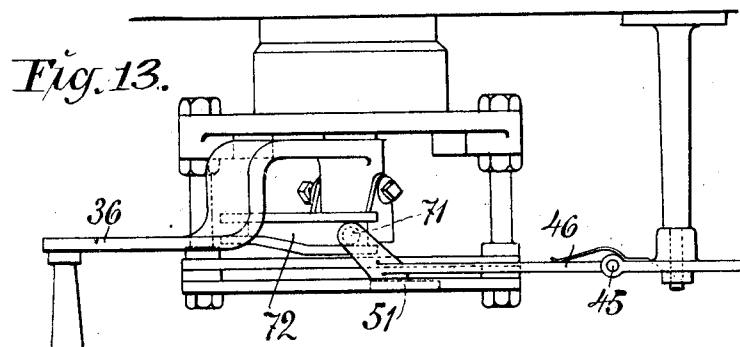
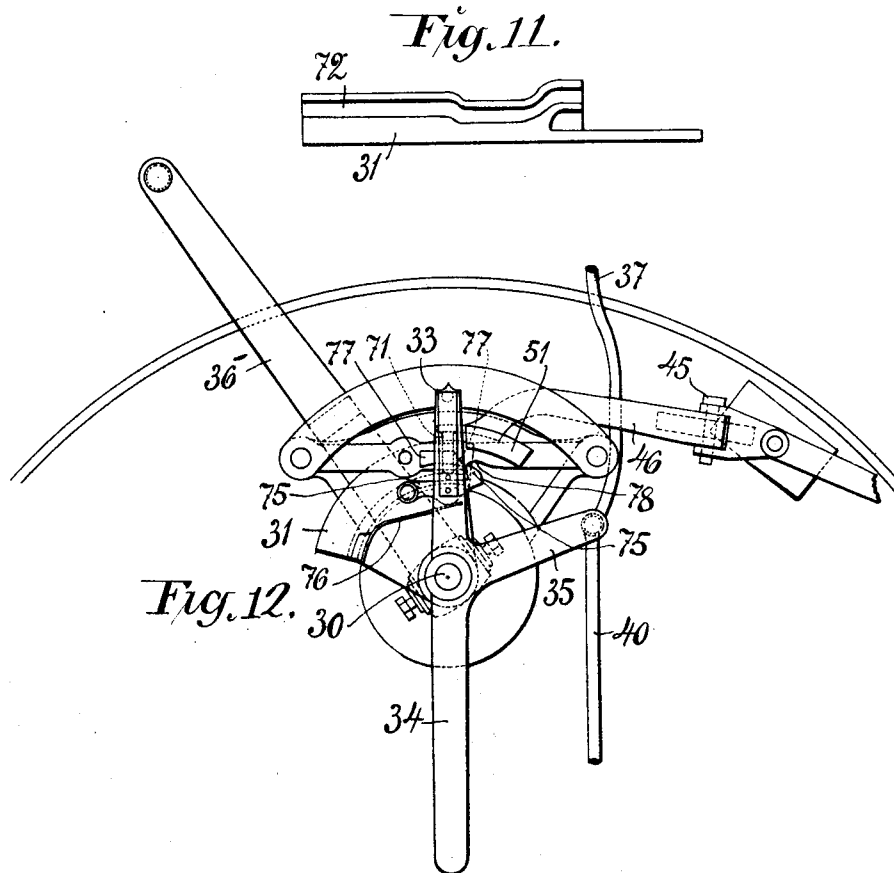
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6 SHEETS—SHEET 5.



Witnesses:-
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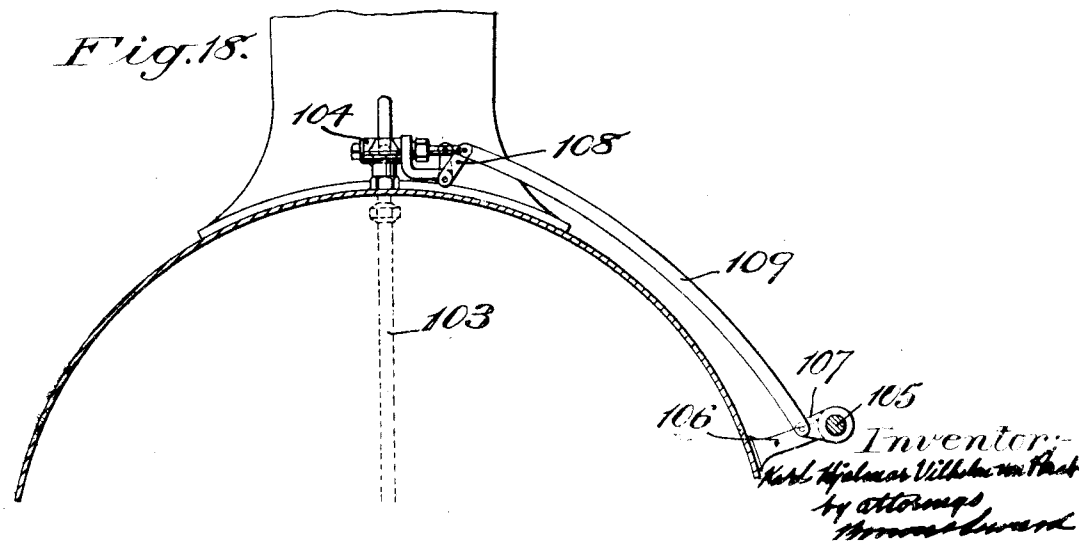
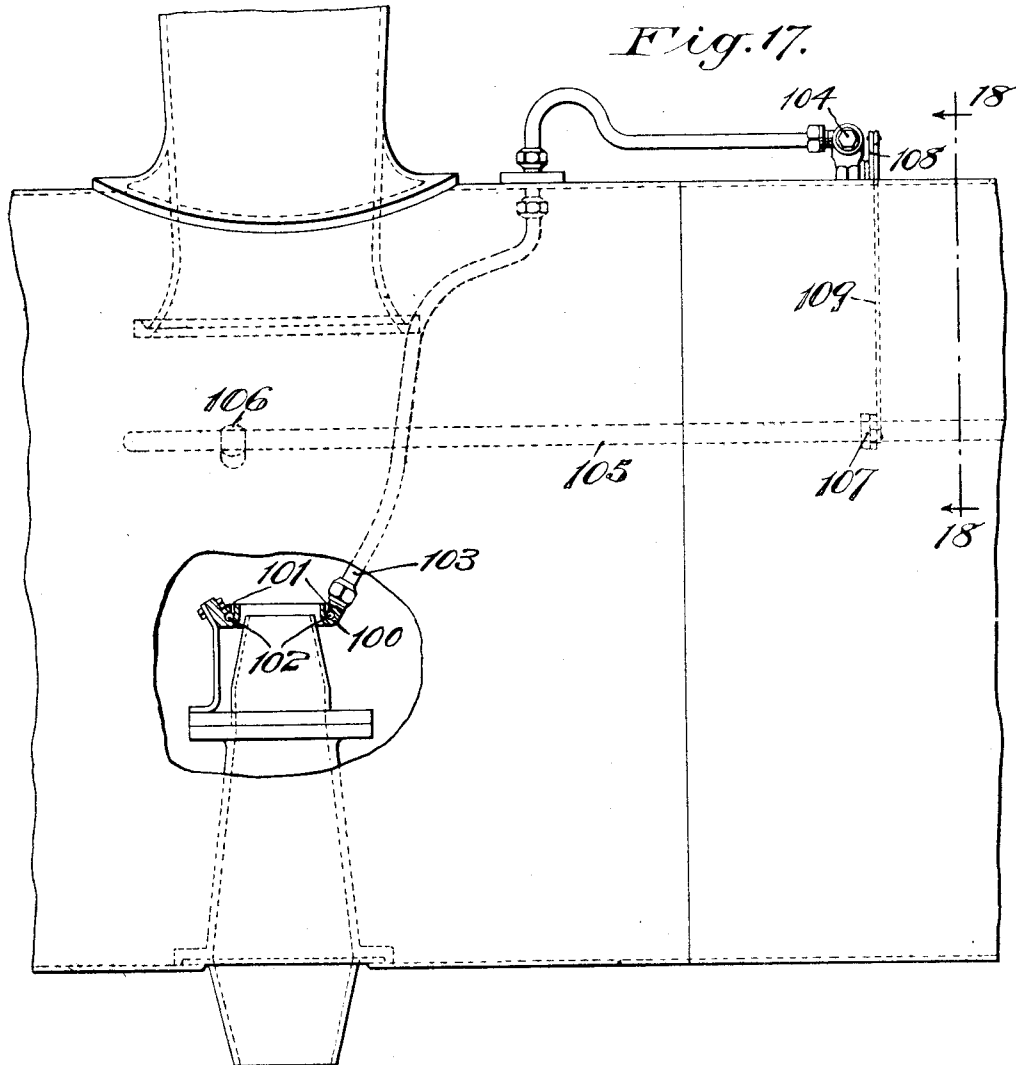
Inventor:-
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Patented Apr. 18, 1916.

6 SHEETS—SHEET 6.



UNITED STATES PATENT OFFICE.

KARL HJALMAR VILHELM VON PORAT, OF VILLA KARLSRO, STOCKSUND, SWEDEN.

STOKING DEVICE FOR PULVEROUS FUEL.

1,179,784.

Specification of Letters Patent.

Patented Apr. 18, 1916.

Application filed May 31, 1913. Serial No. 770,988.

To all whom it may concern:

Be it known that I, KARL HJALMAR VILHELM VON PORAT, a subject of the King of Sweden, and resident of Villa Karlsro, Stocksund, in the Kingdom of Sweden, have invented certain new and useful Improvements in Stoking Devices for Pulverous Fuel, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improved stoking device for pulverous fuel, especially pulverous peat, the principal object of the same being to make possible the employment of such fuel for the stoking of locomotives.

A characteristic feature of the invention consists in combining the device controlling the feeding of pulverous fuel into the furnace with the device controlling the supply of steam to the working cylinders and with the auxiliary steam jet blower respectively in such manner that no pulverous fuel can be fed into the furnace until a sufficient draft has been effected in the furnace and the supply conduit for the fuel and that the feeding of pulverous fuel must be interrupted before the supply of steam to the cylinders and the said auxiliary steam jet blower has been stopped, in order that the furnace and the fuel conduit may not be stopped up by fuel.

Several forms of the invention are illustrated in the accompanying drawings.

Figure 1 shows diagrammatically and in a side elevation partially in a section on the line 1 to 1 of Fig. 2, the rear end of a furnace for pulverous fuel and a stoking device for said fuel. Fig. 2 is a plan view, partially a horizontal section of the same parts. Fig. 3 is a vertical section on a greater scale of a stirring device and of a damper for controlling the feeding of the fuel from the receptacle containing the same. Fig. 4 is a plan view, and Fig. 5 a side view, partially a section on line 5 to 5 of Fig. 3 of the steam admitting device, in the following called the throttle for the sake of brevity, and the parts by means of which the said auxiliary steam jet blower, the air controlling damper of the furnace and the feeder of the pulverous fuel are controlled. Fig. 5' shows a diaphragm box with diaphragm connected with damper. Fig. 6 shows in a side view the combination between the in-

jector and the fuel feeding device. Fig. 6* shows a swingable damper in detail. Fig. 7 is a side view and Fig. 8 is a plan view of a special form of the connection between the throttle and the auxiliary steam jet blower provided in the chimney. Fig. 9 is a section on the line 9 to 9 of Fig. 8. Fig. 10 shows some of the parts in Fig. 9 but in a different position. Fig. 11 shows a groove disk. Fig. 12 is a front view and Fig. 13 is a plan view of a further form of the said connection. Fig. 14 shows in a longitudinal section the fuel admitting device combined with the shaft of the throttle, the said shaft being movable longitudinally. Fig. 15 shows in a vertical section a special form of the damper controlling the pulverous fuel current. Fig. 16 is a section on line 16 to 16 of Fig. 15. Fig. 17 is a detail side elevation of a locomotive boiler a portion of which is broken away to show the steam jet nozzle within and the means for operating the same, and Fig. 18 is a detail transverse section taken in the plane of the line 18—18 of Fig. 17.

The pulverous fuel is fed from the funnel shaped receptacle 1, located on the tender 2, to the furnace 3 of the locomotive through the tube 4. The latter is attached to the locomotive and passed into the furnace through the exterior mantle 5 which extends forward under the furnace and upward behind the same and forms a channel for the introducing of air into the furnace in such a manner that it is preheated when being introduced into the same. A damper 41 is provided in the said channel. In the fore end of the tube 4 an injector 66 is provided and the rear free end of the tube 4 is bent upward and enlarged to form a funnel 9 into which the fuel can fall from the receptacle 1. Behind the funnel air can be supplied to the tube 4 through an opening 10. The receptacle 1 is provided with a stirrer shown diagrammatically and, beneath the latter, with a damper 17 for controlling the feeding of the fuel into the tube 4. The stirrer is not described, as it forms no part of this invention.

The above mentioned throttle generally consists, as is well known, of a shaft by means of which the steam valve, the proper throttle, is opened and shut. The said shaft extends along the steam boiler, and outside

the rear end of the furnace said shaft is provided with a handle for rotating the same. The auxiliary steam jet blower consists of a nozzle 100, having a series of holes 101, opening into an annular passage 102, located in close proximity to the chimney and is connected with the steam chamber of the boiler by a pipe 103. A steam valve 104 is located in the pipe 103, intermediate of the nozzle and chamber, in position to be operated by a lever 50 fast on a rock shaft 105, supported in brackets 106 on the boiler. An arm 107 fixed on the rock shaft 105 is connected to the valve lever 108 by a link 109, so that motion imparted to the rock shaft 105 will be transmitted to the valve stem and thus control the passage of the steam to the nozzle 100, and thence to the chimney, as shown in Fig. 17. On the shaft 30 of the throttle, Figs. 3-5 inclusive, there is located a disk 31 provided with small recesses, slots or the like, into which catches a pawl-like member 32 provided on the arm 33 the hub of which is also common to other arms 34, 35, all these arms being by means of said hub freely located on the shaft 30. The arm 33 also forms an index pointer co-operating with a graduated dial 42. The handle for rotating the shaft 30 is designated by 36. The pawl 32 only catches so loosely into the recesses of the disk 31 that the lever can be swung by hand relatively to the disk 31, but otherwise it acts as a driver connecting the lever arm 33-35 with the disk 31 and, consequently, with the shaft 30. The arm 35 is by means of a link and shaft connecting device 37, 38, 39, connected with the damper 17 controlling the feeding of pulverous fuel and by means of another link 40 with the damper 41 controlling the air inlet, which is further described below. The shaft 38 is journaled on the roof of the engine driver's cabin and on the screen of the tender. The damper 17 is connected with the piston of a cylinder 43 which is attached to one end of a bell crank lever 44 journaled in the receptacle 1, and to the other end of said lever the link 39 is attached. Thus, the damper 17 can be opened or shut by means of the combined lever arm 33-35, and the opening and shutting can also be effected by actuating the handle 36 of the throttle. Furthermore, the damper 17 is controlled by the steam pressure in the boiler acting in the cylinder 43. In a cylinder 43 carried by the joint-lever 44, there is a diaphragm 44' connected with the damper 17 by means of a bar 44''. The diaphragm 44' is acted upon by the steam pressure in the boiler acting in the cylinder 43 against the action of a spring 44*. A lever 46 is journaled on a pivot 45, and bears with its fore end which is bent downward, against an eccentric 47 provided on the shaft 30. The opposite end of said lever is provided

with a slot 48, into which enters a pin 49 on the lever arm 50. By actuating said lever arm the auxiliary steam jet blower can be opened or shut. The end of the lever 46, facing the shaft of the throttle, is provided with an arc shaped head 51 forming a pawl for holding the lever 33-35 when the throttle and the auxiliary steam jet blower are shut. On opening the throttle, which is effected by swinging the handle 36 upward, the inner end of the lever 46 is raised and the lever 33-35 is released. After the steam has thus been admitted and draft prevails in the furnace the damper 17 can be opened and stoking of pulverous fuel started by means of the lever arm 33-35 or by the handle 36, actuating the said lever arm by means of the disk 31 and pawl 32. As the handle 36 is swung in opposite direction, it will first bring the lever arm 33-35 into the position shown in Fig. 3 and consequently shut the damper 17, before the handle 36 reaches its initial position, and consequently the stoking of pulverous fuel is interrupted, before the throttle is stopped and the draft in the furnace ceases. On starting the auxiliary steam jet blower by swinging the handle 50 to the right, Fig. 3, the lever 46 is also actuated by the pin 49 running in the slot 48 and pressing the end of said lever downward. Consequently, the lever 33-35 will also be released. As the damper 17 is opened by swinging the lever 33-35 a shoulder 52 on the arm 33 will be placed beneath the head 51 whereby the lever 46 and thereby also the handle 50 are locked. Thus, the auxiliary steam jet blower cannot be shut off until the damper 17 has been shut.

On the shaft of the damper 41 there is loosely located a disk 54 provided with a pin 55 to which the link 56 is connected. The latter is by means of the crank shaft 57 connected with the link 40. On the shaft of the damper 41 there is loosely located a handle 58 provided with an arm 59 to which the cylinder 60 is secured. Another arm 61 fixed to the shaft of said damper is connected with the rod of a piston located in said cylinder. The said cylinder 60 is in communication with the steam boiler through a suitable conduit connected with a pipe stud 60' for actuating the piston which is acted upon by a spring or the like. The disk 54 is also provided with a slot or the like, which is engaged by a yielding pin provided on the handle 58. This arrangement forms a driver similar to the driver 32 mentioned above. Thus, the damper 41 can be controlled together with the damper 17 by means of the lever 33-35, or it may be controlled independently of the damper 17 by means of the handle 58. If, after the starting of the stoking device, the pressure in the steam boiler is reduced or increased,

for instance by starting the water injector or by altering the admission of steam to the working cylinders of the locomotive, the dampers 17 and 41 will be opened or closed for a corresponding extent automatically by the steam pressure in the cylinders 43 and 60 respectively.

According to Fig. 6, the lever 33—35 is by means of a link 40, a bell crank lever 62, a link 63 and a lever 64 connected with the valve 65 of the injector 66. When the pulverous fuel is admitted from the receptacle 1, the injector 66 will also act. The latter operates by means of steam, compressed air or the like or liquid fuel. Preferably steam is used, generated in the boiler. In order to prevent the steam from being condensed in the tube 4, the said injector is located in the fore end of the tube, which is heated by the furnace. Owing to the said arrangement also the powder is spread in a more effective manner in the furnace. The atmospheric air can enter the tube at its rear end, as shown in Fig. 1.

Figs. 6 and 6* illustrate the tube 4 provided with a damper 90, the object of which is to prevent air from entering the tube 4 and cooling the furnace as no fuel is fed into the same. The damper 90 is located in a slot, provided in the tube 4 and is swingable around the pin 100. On the opposite side of the said pin the damper is connected with the piston 101 of a cylinder 67. On opening the valve 65, steam passes through the tube 91 into the cylinder 67 whereby the damper 90 is opened against the action of a spring 102, which closes the damper 90, as the valve 65 is closed.

In order that it may be possible to shut the steam jet blower when the throttle has been opened, the lever 46 is provided with a transverse joint and the parts 31 and 33 to 35 inclusive modified as shown in Figs. 8 to 12 inclusive. The lever 46 is provided with a transverse joint at 70, so that the end facing the shaft of the throttle can be moved transversely to the longitudinal direction of said lever. Furthermore, the arc shaped part 51 of the lever 46 is provided with teeth on its front side and the end of the same, instead of being bent downward, has a pin or projection 71 which extends into a groove 72 provided in the disk 31, said slot having such a shape that on rotating the disk 31 the end of the lever 46 is caused to swing around the joint 70. The arm 33 is fork shaped and one shank 73 of the same is provided with teeth which the teeth of the part 51 can engage. Thus, when the throttle is opened by raising the arm 36 the part 51 is by the action of the groove 72 caused to cooperate with the part 73 whereby the lever 33—35 is maintained in its position. Thereafter the part 51 is brought out of engagement with the part 73

owing to the shape of the slot 72, whereby the lever 33—35 is released and can be shifted manually or participate in the movement of the shaft of the throttle, so that the dampers 17, 41 are opened, or opened still more if they had been somewhat opened before. Consequently, the charging of the fuel can be started, only when the steam has been turned on. If the auxiliary steam jet blower be started by swinging the handle 50, the part 51 is raised, as above mentioned, so that the arm 33, which is locked by a projection 74 on the same engaging the part 51, is released. The dampers 17, 41, can now be opened by swinging the lever 33—35. By said swinging the projection 74 will come beneath the part 51, thereby preventing the shutting of the auxiliary steam jet blower until the dampers have been shut.

The valve of the throttle (the proper throttle) consists, as well known, generally of a great slide and a small slide. As the steam is turned on, the small slide is first opened for the unloading of the great slide when the locomotive is started. Owing to the fact that the lever 33—35 is held by the lever 46 (by the teeth of the part 51 engaging the part 73), the lever 33—35 is prevented from swinging, as the handle 36 is actuated, until the opening of the great slide has been started. This is the case also in Fig. 4. One may also arrange the lever 33—35 in such a manner that it does not partake in the movement of the shaft of the throttle on opening the throttle, but the dampers may be shut automatically when shutting the throttle. This is illustrated in Figs. 12 and 13. The disk 31 is provided with a hook 75 supported by a spring 76. On shutting the throttle, whereby the disk 31 is also rotated, said hook catches a shoulder 77 on the arm 33, whereby the dampers are shut. At the end of the movement the hook 75 is forced downward by the action of the inclined surface 78 on the throttle box, whereby the lever 33—35 is released from the hook. The throttle can now be opened without opening the dampers, but the latter can be opened by means of the lever 33—35.

In the described controlling device the throttle is opened and closed by rotating the shaft 30. There are, however, throttles, which are opened and closed by the shaft 30 being moved longitudinally. In order that it may be possible to use the controlling device also in this case, the disk 31 must be combined with the shaft in such manner that the disk will be rotated as the shaft is moved longitudinally. Such a combination is shown in Fig. 14. The disk 31 is in screw-threaded engagement with the shaft 30 and the pitch of the screw-threads is so great that the disk is easily rotated, as the

shaft is moved longitudinally. The shaft is moved by means of a lever 92 or the like. Instead of the disk being mounted on the shaft 30, it may be mounted on a special pin or shaft and connected with the throttle by means of a suitable link mechanism, motion transmitting device or the like, so that the disk is rotated as the throttle is opened or closed.

Figs. 15 and 16 show a modified form of the damper 17. The damper is made in two parts 94 and 95. The part 94 is movable in the frame and the inner part 95 is movable independently of the part 94. The part 94 is connected with the link 39 by the bell crank lever 96 journaled in uprights 99, so that the damper can be opened and closed by means of the lever 33—35, as stated above. The inner part 95 of the damper is connected with the piston of the steam cylinder 97 by the bell crank lever 98, journaled in uprights 99 fixed to the part 94 and, consequently, the adjusting of the damper is effected in a manner analogous to the first one stated with reference to the cylinder 43, Fig. 6.

In operation: To open the throttle, the handle 36 is swung upwardly, rotating the shaft 30 with the eccentric 47 thereon into position to engage the arc-shaped head 51 of the lever 46, which will be rocked on its pivot 45, and so move the arm 50 through the pin 49, to rock the shaft 105 so as to open the valve 104 and allow steam to pass from the boiler through the pipe 103 to the auxiliary steam jet nozzle 100, thereby creating a draft in the chimney. Simultaneously with the opening of the nozzle in the furnace, the damper 17 will be opened and the stoking of the pulverous fuel started, since the lever 33, 35 is held in interlocked engagement with the handle 36, by the disk 31 and pawl 32, and the lever is connected with the damper 17 by the link and shaft connecting devices 37, 38, 39. To control the air inlet, a link 40 connects the damper 41 with the arm 35, thereby operating the fuel feeding damper 17 and air damper simultaneously. When the handle 36 is swung in the opposite direction, it will first bring the lever arm 33—35 into the position shown in Fig. 3, closing the damper 17 and damper 41 before the throttle and nozzle are closed. The damper 41 may be independently operated by hand through the handle 58, or automatically operated by the piston and cylinder 60, which is in communication with the steam boiler by the conduit connected thereto. The damper 17 may also be automatically operated by the steam pressure in the boiler through the piston and cylinder 43.

In Fig. 6 the lever 33—35 is also connected to the valve 65 of the injector 66 for controlling the spreading of the powdered fuel in an effective manner in the furnace. The

steam passes from the boiler through the valve 65 and also enters the cylinder 67 by means of the tube 91, which cylinder controls the damper 90 which admits air to the tube 4.

In the form shown in Figs. 7 to 13, the lever 46 is provided with a transverse joint at 70, so that the throttle can be moved transversely to the longitudinal direction of the lever. The lever 46 is also provided at the arc shaped end 51, with teeth on its front side and has a pin 71 which extends into a groove 72 provided in the disk 31, the groove being of such shape that the rotating of the disk will cause the end of the lever 46 to swing around the joint 70. The arm 33, in this form, is fork-shaped, the shank 73 of which has teeth which are adapted to engage the teeth on the end 51 of the lever 46. Thus, when the throttle is opened by the handle 36, the part 51 is, by the action of the groove 72, caused to cooperate with the shank 73, whereby the lever is maintained in its position. When the part 51 is brought out of engagement with the shank 73, through the groove 72, the lever 33—35, is released and can be shifted manually or participate in the movement of the shaft 30 of the throttle, so that the dampers 17, 41, may be independently controlled without affecting the steam jet nozzle, whereas the charging of the fuel can only be started when the nozzle is in operation. When the steam jet nozzle is started by swinging the handle 50, the part 51 is raised so that the arm 33, which is locked by the projection 74 engaging the part 51, is released. By swinging the projection under the part 51, the auxiliary steam jet nozzle cannot be closed until the dampers 17, 41 are closed.

In Fig. 14, the disk 31 is arranged to be rotated by longitudinal movement of the shaft 30. The screw-threaded engagement of the disk 31 with the shaft 30 is such that as the shaft is moved longitudinally by means of the lever 92, the disk is easily rotated.

What I claim is:

1. In steam boilers with furnace for burning pulverous fuel especially steam boilers for locomotives the combination of the throttle, the auxiliary steam jet blower, means for feeding the fuel into the furnace, means for locking the said feeding means in inoperative position, and means actuated by the said throttle and by the auxiliary steam jet blower, when being brought into operative position, for unlocking the said feeding means, substantially as described and for the purpose set forth.

2. In steam boilers with furnace for burning pulverous fuel especially steam boilers for locomotives the combination of the throttle, the auxiliary steam jet blower, means for feeding the fuel into the furnace,

means for locking the said feeding means in inoperative position, means actuated by the said throttle and by the auxiliary steam jet blower, when being brought into operative position, for unlocking the said feeding means, and means for locking the said steam jet blower in operative position, as long as the feeding means are in operative position, substantially as described and for the purpose set forth.

3. In steam boilers with furnace for burning pulverous fuel especially steam boilers for locomotives the combination of the throttle, the auxiliary steam jet blower, means for feeding the fuel into the furnace, means for controlling the supply of air to the furnace, means for locking the said feeding means and controlling means in their initial positions, and means actuated by the said throttle and by the auxiliary steam jet blower, when being brought into operative position, for unlocking the said feeding means and controlling means, substantially as described and for the purpose set forth.

4. In steam boilers with furnace for burning pulverous fuel especially steam boilers for locomotives the combination of the throttle, the auxiliary steam jet blower, means for feeding the fuel into the furnace, means for locking the said feeding means in inoperative position, means actuated by the said throttle and by the auxiliary steam jet blower, when being brought into operative position, for unlocking the said feeding means, means for locking the said steam jet

blower in operative position as long as the feeding means are in operative position and means bringing automatically the feeding means in inoperative position, as the throttle is brought into its inoperative position, substantially as described and for the purpose set forth.

5. In steam boilers with furnace for burning pulverous fuel especially steam boilers for locomotives the combination of the throttle, the auxiliary steam jet blower, means for feeding the fuel into the furnace, means for controlling the supply of air to the furnace, means for locking the said feeding means and controlling means in their initial positions, means actuated by the said throttle and by the steam jet blower, when being brought into operative position, for unlocking the said feeding means and controlling means, means for locking the said steam jet blower in operative position as long as the feeding means are in operative position, and means bringing automatically the feeding means and controlling means in inoperative position, as the throttle is brought into its inoperative position, substantially as described and for the purpose set forth.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

KARL HJALMAR VILHELM VON PORAT.

Witnesses:

GUSTAF ISFALL,
ROBERT YSELGREN.