No. 726,664. PATENTED APR. 28, 1903.

C. I. FILSON.

FUEL FEEDING MECHANISM.

APPLICATION FILED NOV. 29, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

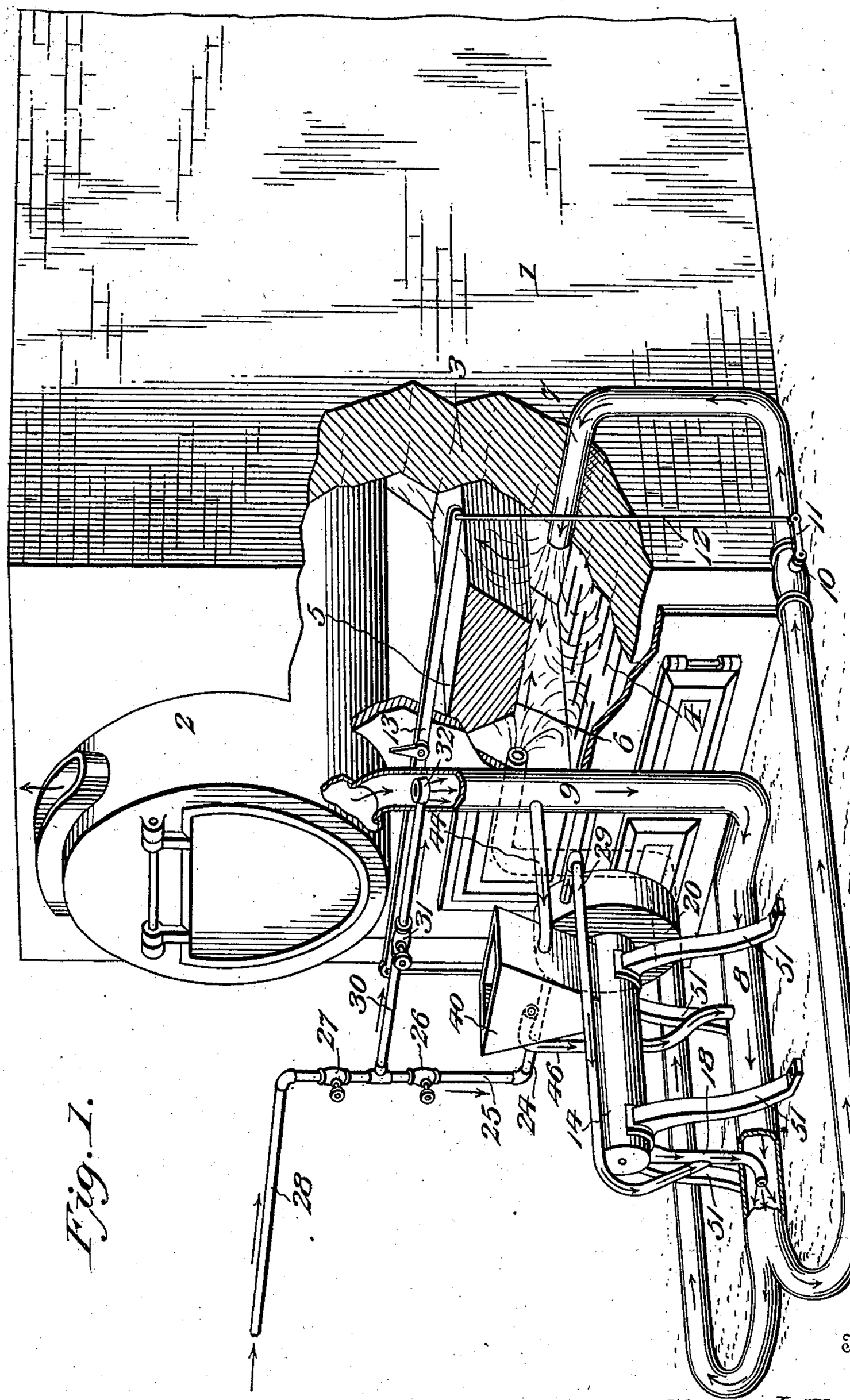

Fig. 1.

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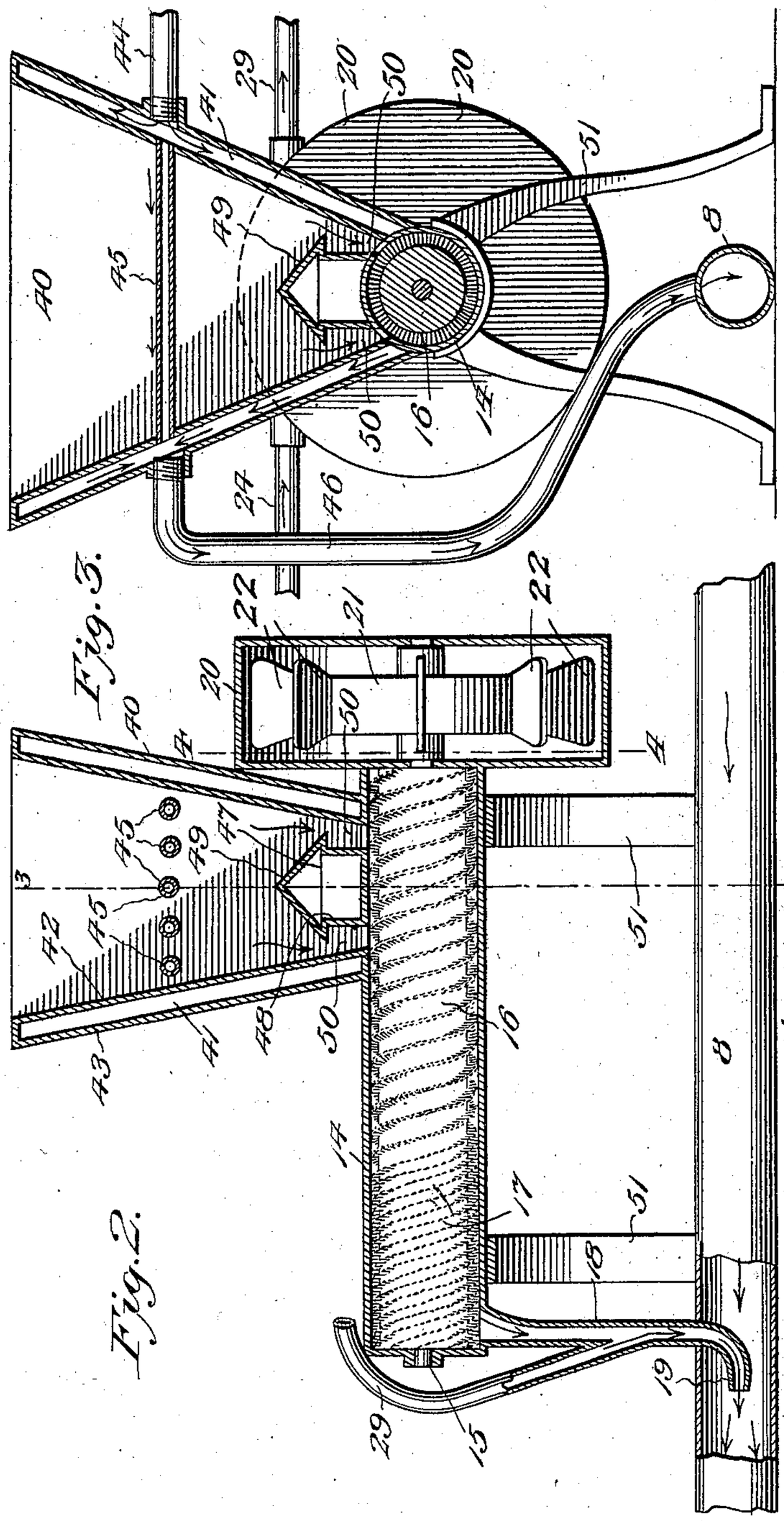

Fig. 3.

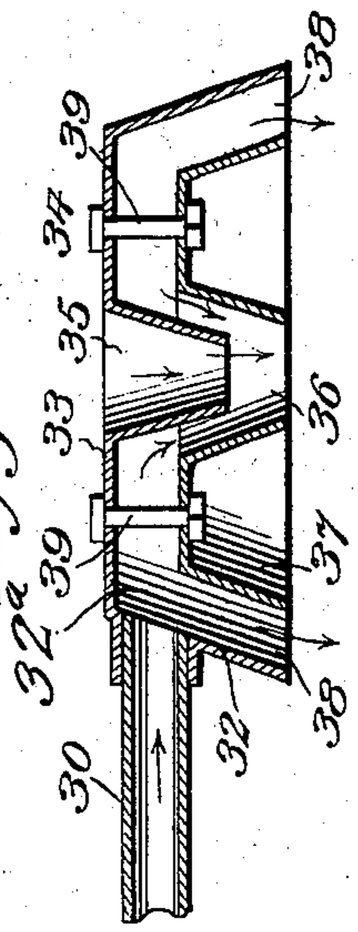

Fig. 5.

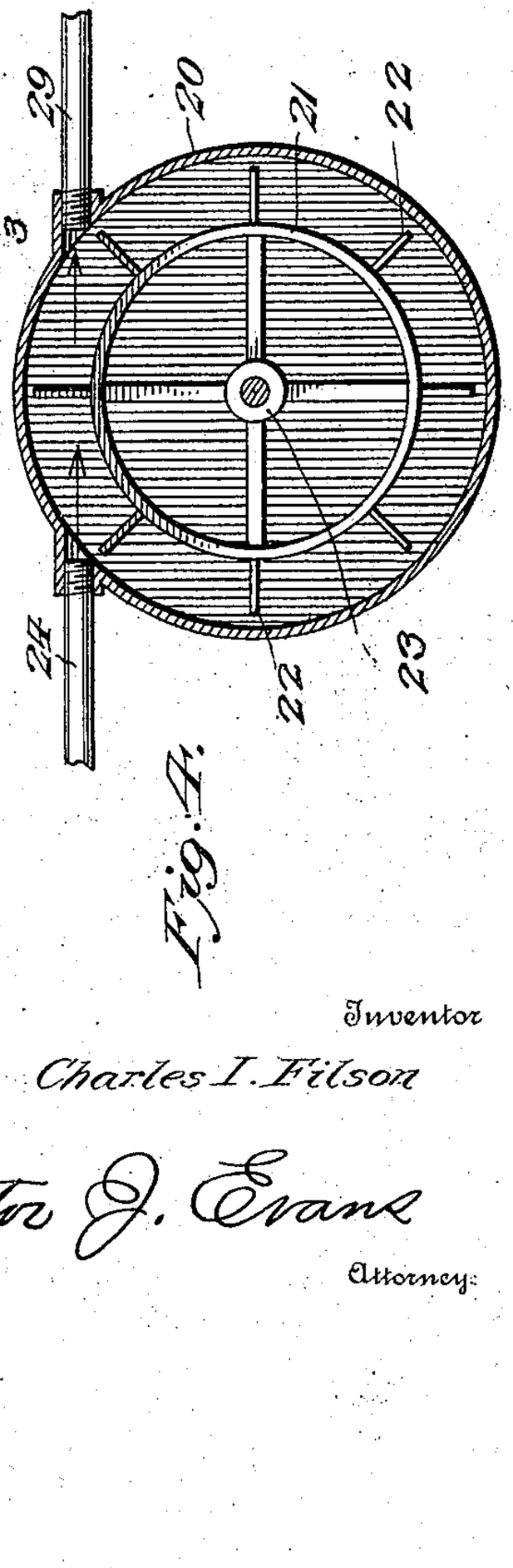

Fig. 4.

Fig. 2.

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FUEL-FEEDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 726,664, dated April 28, 1903.

Application filed November 29, 1902. Serial No. 133,263. (No model.)

To all whom it may concern:

Be it known that I, CHARLES I. FILSON, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have invented new and useful Improvements in Fuel-Feeding Mechanism, of which the following is a specification.

This invention relates to means for feeding furnaces with fuel; and the purpose of the same is to provide a simple and effective organization of elements to overcome numerous disadvantages found to exist in mechanisms of this class as heretofore constructed and to reduce the number of parts and the expenditure of driving power, with a regular feed and more perfect combustion of the fuel.

A further purpose of the improved feeding means is to institute a reliable disposition of the fuel within a fire box or chamber of a furnace under the influence of a blast without loss or partial consumption.

A further purpose of the improvement is to utilize the heated currents under suction from a furnace or boiler to preliminarily temper the fuel before it is delivered into the fire box or chamber of a furnace, with obvious advantages in combustion.

A further purpose of the improvement is to equalize the injection or deposit of the fuel within a fire box or chamber of a furnace from opposite delivery sources.

With these and other objects and advantages in view the invention consists in the construction and arrangement of the several parts which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a sectional perspective view of a portion of a furnace and boiler, showing the improved fuel-feeding means applied thereto in operative position and partially broken away. Fig. 2 is a longitudinal vertical section of the initial fuel receiving and feeding mechanism arranged in connection with a part of one of the conduits or pipes leading to the furnace. Fig. 3 is a transverse vertical section on the line 3 3, Fig. 2. Fig. 4 is a transverse vertical section on the line 4 4, Fig. 2. Fig. 5 is a detail transverse vertical section of a rose, forming a part of the mechanism to set up a suction in one of the conduits or pipes.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a furnace, which in the present instance is shown used in connection with a boiler 2; but it will be understood that the improved feeding mechanism may be employed with either a furnace alone or with a furnace and boiler. In other words, it is intended to apply the improved feeding mechanism in connection with any device with which it is desired to regularly supply fuel, and the organization of the furnace or furnace and boiler is not in the least modified to supply the improved structure, with the exception of a special feed in connection with the fire box or chamber, which will now be set forth.

Extending from the back wall 3 of the furnace forwardly over the grate 4 is a combustion-guard 5, preferably of inverted angular truncated form and having its lower reduced side 6 at an elevation above the grate 4. This combustion-guard 5 will be constructed of hard material to render it durable.

Extending through opposite side walls of the furnace are feeding or supply conduits or pipes 7, having their outlet ends in direct transverse alinement and in a plane coincident with the lower portion of the guard 5. These conduits 7 extend downwardly and forwardly in a horizontal plane and connect with a main supply-pipe 8 of greater diameter and from which they branch in opposite lateral direction. The main supply-pipe 8 continues at its rear extremity into a vertical blast pipe or conduit 9, connecting with the front end of the boiler 2. In each of the conduits or pipes 7 is a suitable valve having an outwardly-projecting stem 10, with a lever 11 secured thereto and also connected to an operating-rod 12, extending upwardly and movably attached to the end of a fulcrumed adjusting-bar 13, secured on the front of the furnace. This adjusting-bar 13 is fulcrumed at its center, so that the opposite extremities thereof may be equally elevated and depressed. The purpose of this attachment is to equalize the injection or deposit of the fuel in the fire box or chamber in the event that one conduit or pipe 7 has more of the fuel forced therethrough than the other, and when the adjusting-bar 13 is in normal horizontal

position, as shown by Fig. 1, the valves in the conduits or pipes 7 will be set to provide passages of equal dimensions, and as long as the fuel is feeding equally through both conduits or pipes 7 when the valves are in this condition the adjusting-bar 13 will be permitted to remain in its horizontal arrangement, as shown. If, however, the one conduit or pipe 7 feeds an amount of fuel in excess of the other similar conduit or pipe, the one extremity of the adjusting-bar 13 is depressed and the opposite extremity correspondingly elevated, thereby reducing the passage controlled by the valve on the side at which the adjusting-bar is depressed and increasing the size of the passage controlled by the valve in the conduit or pipe on the side of the furnace where the said adjusting-bar extremity is elevated. This equalization of feed, through the mechanism just described, can be controlled at will to produce a uniformity of injection or supply of fuel through both conduits or pipes 7, and hence a practical consumption of all the fuel in the fire box or chamber will result.

Disposed in front of the furnace is a fuel-receiving and initial feeding mechanism, which comprises an elongated cylindrical chamber 14, having a shaft 15 extending therethrough, carrying a double spiral brush 16, with the spirals toward the outlet end arranged in close proximity, as at 17. The outer end of the cylindrical chamber 14 is closed, and depending from the under portion thereof, adjacent to said outer end, is an outlet-pipe 18, having a lower outwardly-turned reduced nozzle extremity 19, located within the main supply-pipe 8, as clearly shown by Figs. 1 and 2. On the inner end of the cylindrical chamber 14 a motor-casing 20 is secured and has therein a fan 21, fast on the inner extremity of the shaft 15, the outer edges of the fan-blades being arranged close to the inner periphery of the casing 20. The fan or pneumatic motor 21 comprises blades 22, extending outwardly from a central hub 23, and it is proposed to secure the blades in such manner that they may be uniformly tightened within the hub and capable of being replaced in the event of injury thereto or breakage thereof. Connecting with the upper portion of the motor-casing 21 is a compressed-air-feeding pipe 24, having a vertical member 25 with valves 26 and 27 therein, the said vertical member 25 connecting with a supply-pipe 28, running from a suitable compressor located at a distance from the furnace and which will be of such construction as that ordinarily employed in connection with furnaces. The feeding-pipe 24 delivers the compressed-air blast directly against the blades of the motor or fan 21, and the exhaust of the blast is had through an exhaust-pipe 29, secured to the upper portion of the motor-casing 20 at a point directly opposite to the engagement with said casing of the feed-pipe 24, the said exhaust-pipe 29 continuing outwardly in a horizontal plane and from the outer end of the cylindrical chamber 14 and connecting with the outlet-pipe 18 at a point below the attachment of the latter to the under portion of the outer extremity of said cylindrical chamber.

Connecting with the vertical member 25 of the feed-pipe 24 at a point between the valves 26 and 27 is a primary blast-pipe 30, having a valve 31 therein and extending to and through the blast-pipe 9 at a point adjacent the attachment of the latter to the boiler 2, as clearly shown by Fig. 1. On the end of the pipe 30, within the blast-pipe 9, is a horizontally-disposed rose 32, which is shown in enlarged sectional detail by Fig. 5 and comprises a downwardly-flaring outer shell 32^a, with a practically-closed top 33, having a depending inverted truncated conical injector member 34 at the center thereof. This injector member 34 has its upper enlarged extremity coinciding with an opening 35 in the top 33, and the lower reduced end of said member extends into the upper extremity of a central passage 36, open at top and bottom and of a form similar to that of said member 34. The passage 36 is constructed in an interior partition-shell 37, similar in general contour to the shell 32^a, but of less diameter than the latter to provide flaring passages 38. The shell 37 is held in operative relation to the shell 32^a by depending bolt-rods 39, which preserve a uniformity of distance or space between the coöperating parts of the two shells. The rose as an entirety is of slightly less diameter than the interior of the blast-pipe 9, and the pipe 30 connects with the shell 32^a at a point below the top thereof, so that as the air is forced into the rose it passes downwardly through the passages 36 and 37 and creates a suction through the injector member 34, to thereby draw the heated currents and unconsumed products of combustion carried thereby from the boiler downwardly through the rose and drive the same with a blast effect into the pipe 9 below the rose.

The cylindrical chamber 14, adjacent to the motor-casing 20, has a feed-hopper 40 rising therefrom and formed with a surrounding hot-air passage or chamber 41, the said hopper having inner and outer walls 42 and 43, closed at their upper ends, and connecting with the hopper is a hot-air-supply pipe 44, attached to the blast-pipe 9 below the rose 32. Extending transversely across the hopper and attached to diametrically opposite portions of the inner wall 42 are a series of horizontal hot-air-feeding pipes 45 to provide a tubular heating-grate at about a central point in the hopper. Connecting with the end of the hopper opposite that to which the pipe 44 is attached is an outlet-pipe 46, which extends down to the main pipe 8, and thus preserves the circulation of the heated air in the hopper without waste by permitting it to pass into the said pipe 8. In the bottom of the hopper is a deflector 47, consisting of an upright body 48, having an inverted conical cap

49, the maximum diameter of the cap being less than the width of the interior of the hopper at the bottom of the latter to form opposite feeding-passages 50, which communicate with the inner extremity of the cylindrical chamber 14 and permit the coal or other fuel to pass downwardly directly in contact with the brush-spirals under the hopper. It will be obvious that the deflector 47 is intended to prevent choking of the fuel at the base of the hopper and also to more equally feed the coal or other fuel therefrom into the cylindrical chamber, so that different portions of the brush-spirals will act upon the coal or fuel and continuously convey or force the same toward the outer end of the said cylindrical chamber. The cylindrical chamber 14 and the parts carried thereby are supported at a suitable elevation by legs 51, which will be attached to the flooring or other base-rest in front of the furnace.

In the operation of the device coal or other fuel of a kindred nature is placed in the hopper 40, and the blast is turned on through the pipe 24 to the motor or fan at the inner end of the cylindrical chamber 14 to set the shaft 15 in motion and operate the brush-spirals to feed the coal or other fuel in the hopper toward the outer end of the cylindrical chamber 14. To start the improved mechanism, the valve 27 is first partially opened and then the valves 26 and 31, and after the fuel and blast enter the furnace in proper proportions and more fuel and a greater blast are required the valve 27 is fully opened or operated to increase the pressure of the blast and a proportionate increase in the feed of the coal or other fuel. If it is desired to decrease the blast and fuel-feed, the valve 27 will be operated to regulate such decreased feed, and after the valves have been properly adjusted to equalize both the blast and fuel-feed the improved mechanism will operate with but little attention. When it is desired to stop the feed of the fuel, the valve 27 is shut off or closed, and in starting it is only necessary to reopen the said valve. The blast of air feeding through the pipe 24 to the motor-casing 20 passes from the said casing through the pipe 29 to the outlet-pipe 18 and establishes more or less suction in the said pipe 18, which affects the cylindrical chamber 14 to a certain extent; but the brush-spirals 16 lead the coal or other fuel delivered thereto through the hopper 40 and convey the latter gradually toward the said outlet-pipe, the spirals 17 bringing the coal or fuel into close feeding arrangement and practically creating a continuous run of the coal or fuel from the outer end of the cylindrical chamber into the outlet-pipe 18. From the pipe 18 the coal or other fuel is thrown into the pipe 8 with considerable force and passes forward and then rearward through the pipes or conduits 7 and delivered against the opposite upwardly and outwardly inclined sides of the guard 5 and under the said guard. The guard prevents the fuel from being drawn upwardly before combustion is effected and wasted, and the hottest part of the fire by such arrangement being always maintained at the center of the fire box or chamber will institute a thorough consumption of the coal or other fuel. The heated air-currents carrying the unconsumed products of combustion and gases are drawn outwardly through the blast-pipe 9 and fed into the main pipe 8, the valve 31 of the air-pipe 30 being opened at the same time that the valves 26 and 27 are opened to at once arrange the apparatus in condition for operation throughout all parts of the same. A portion of the hot air under pressure is taken from the pipe 9 through the pipe 44 and delivered to the chamber 41 of the hopper 40, and from said chamber the heated air and gases pass through the pipes 45, and by this means the coal or other fuel deposited in the hopper 40 will be primarily heated before reaching the cylindrical chamber 14, and the heated air or gases after thoroughly circulating through the hopper 40 are conveyed by the pipe 46 to the lower main pipe 8, and thus the circulation is unimpaired and the pressure of the air-blast is not deteriorated. The coal or other fuel delivered through the pipe 18 to the main pipe 8 is materially heated, and the hot-air currents and gases coming through the said pipe 8 and thrown into contact with the coal or other fuel in said pipe further heat the latter, so that when it is delivered in the fire box or chamber it will be in such condition as to facilitate its thorough combustion. After the improved feeding mechanism is arranged for operation the blast in the pipe 9 can be regulated at will through the medium of the valve 31 in the pipe 30, and it is preferred that the pipe 30 be of smaller diameter than the main feed-pipe 24 and its branch 25 and supply connection 28 to intensify the air-pressure in the blast-pipe 9 without detracting materially from the necessary pressure in the pipe 24 in order to regularly rotate the fan or motor 21 within the casing 20. The coal passing between the pipes 45 is thoroughly heated, and by this means the interior of the charge of coal or other fuel will be regularly tempered or raised in temperature, as well as the outer portion of said charge in contact with the inner wall 42 of the hopper. After the improved fuel-feeding mechanism starts to operate it will not be necessary that close attention be given the same, as there are no movable parts liable to become disarranged, and after starting the operation of feeding is practically automatic. From time to time the fireman or other attendant will inspect the fire to see that the fuel is being regularly injected under the guard and also to maintain the hopper 40 in full condition. When it is desired that the improved feeding mechanism shall cease operation, the valves 26 and 27 are closed, and thereby cut off the air-blast from the fan or motor 21, as well as from the

pipe 9, and by cutting off the blast from the said motor the shaft 15 will become inactive, and hence the feed of the fuel will stop.

One of the most important advantages of the present construction is the arrangement of the brush-spirals on the outer extremity of the shaft to set up a continuous feed of the fuel into the pipe 18 in contradistinction to an intermittent feed, and a further important feature is the utilization of the heated air-currents from the boiler to preliminarily heat the fuel before reaching the fire box or chamber.

In using the device with a furnace alone the pipe 9 may be connected to the smoke-flue in a manner similar to the attachment thereof to the boiler, as shown by Fig. 1.

To accommodate application of the improved fuel-feeding mechanism to furnaces and boilers varying in size, changes in the proportions, dimensions, and minor details of construction may be resorted to without departing from the spirit of the invention.

Having thus fully described the invention, what is claimed as new is—

1. In a fuel-feeding mechanism, the combination of a furnace having a fire-box or combustion-chamber, a guard disposed in the said fire box or chamber above the grate in the latter, feeding-conduits extending through the opposite sides of the furnace in transverse alinement with each other and with the lower portion of the said guard, and means for forcing fuel through the said feeding-conduits.

2. In a fuel-feeding mechanism, the combination of a furnace having a fire box or chamber, a guard disposed in the fire box or chamber above the grate in the latter and formed with upwardly and outwardly inclined sides, fuel-feeding conduits extending through opposite sides of the furnace in transverse alinement with each other and with the lower portions of the opposite sides of the guard, and means for forcing the fuel through the said conduits.

3. In a fuel-feeding mechanism, the combination with a furnace, of fuel-feeding conduits entering the opposite sides of said furnace and continuing into a main pipe, and an initial feeding device having a hopper, said device including a shaft having spiral brushes thereon and an outlet communicating with the said main pipe, a motor connected to the said shaft, and air-blast-conveying means in operative relation to the said motor.

4. In a fuel-feeding mechanism, the combination with a furnace, of an initial feeding device consisting of a chamber having a shaft therein provided with spiral brushes arranged in close relation adjacent to the outlet end of the said chamber, the chamber having a hopper thereon, a motor connected to the said shaft, air-blast-conveying means operatively connected to the motor, a main pipe into which the outlet-pipe of the chamber extends, the said main pipe being provided with a hot-air-blast pipe merging thereinto, and fuel-feeding conduits continuing from the main pipe in opposite directions and extending to opposite sides of the furnace.

5. In a fuel-feeding mechanism, the combination with a furnace, of fuel-feeding pipes passing through opposite sides of the furnace in transverse alinement and continuing from a main pipe having a hot-air-blast branch connected in such manner as to receive the heated currents and gases passing out from the furnace, an initial fuel-feeding device having an outlet at one extremity connecting with the main pipe and a motor at the opposite extremity, means for conveying air under pressure to the said motor, an exhaust-pipe for the motor connected to the outlet of the initial fuel-feeding device, and an auxiliary feeding-pipe connected to the means for conveying the air under pressure to the motor and extending into the hot-air-blast branch and having a device thereon for creating a suction in the upper portion of the said branch.

6. In mechanism for feeding fuel, the combination with a furnace, of fuel-feeding pipes passing through opposite sides of the furnace and connecting with the main pipe having a hot-air branch attached in such manner as to receive heated currents and gases passing off from the furnace, means in said branch for creating a suction to draw the heated air-currents and gases off from the furnace passing thereinto, an initial fuel-feeding device having an outlet extending into the main pipe, a motor for operating the initial feeding device, means for conveying an air-blast to the said motor, and an exhaust-pipe attached to the motor and to the outlet of the initial fuel-feeding device.

7. In a fuel-feeding mechanism, the combination with a furnace, of an initial fuel-feeding device having a chambered hopper at one extremity and an outlet at the opposite extremity, means entering the furnace for conveying the fuel to the latter connecting with the said outlet, a hot-air-conveying pipe attached to the said hopper and the means for conveying the fuel to the furnace, and air-blast-conveying pipes connected to the said conveying means and the hot-air pipe.

8. In a fuel-feeding mechanism, the combination with a furnace, of an initial fuel-feeding device having a chambered hopper at one extremity and an outlet at the opposite extremity, a fuel-conveying means connected to said outlet and entering opposite sides of the furnace, a series of pipes extending across the interior of the hopper and communicating with opposite portions of the chamber in the latter, a hot-air pipe attached to the hopper and with the means for conveying the fuel into the furnace, and air-pressure-conveying pipes connected to the hot-air pipe and the said fuel-conveying means.

9. In a fuel-feeding mechanism, the combination with a furnace, of fuel-feeding pipes

entering opposite sides of the furnace and having valves therein, one in each pipe, an adjusting-bar connected to said valves to simultaneously increase the feed in one pipe and decrease it in the other pipe, and means for delivering the fuel into and forcing it through the said pipes.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES I. FILSON.

Witnesses:
ADAM K. WOLF,
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