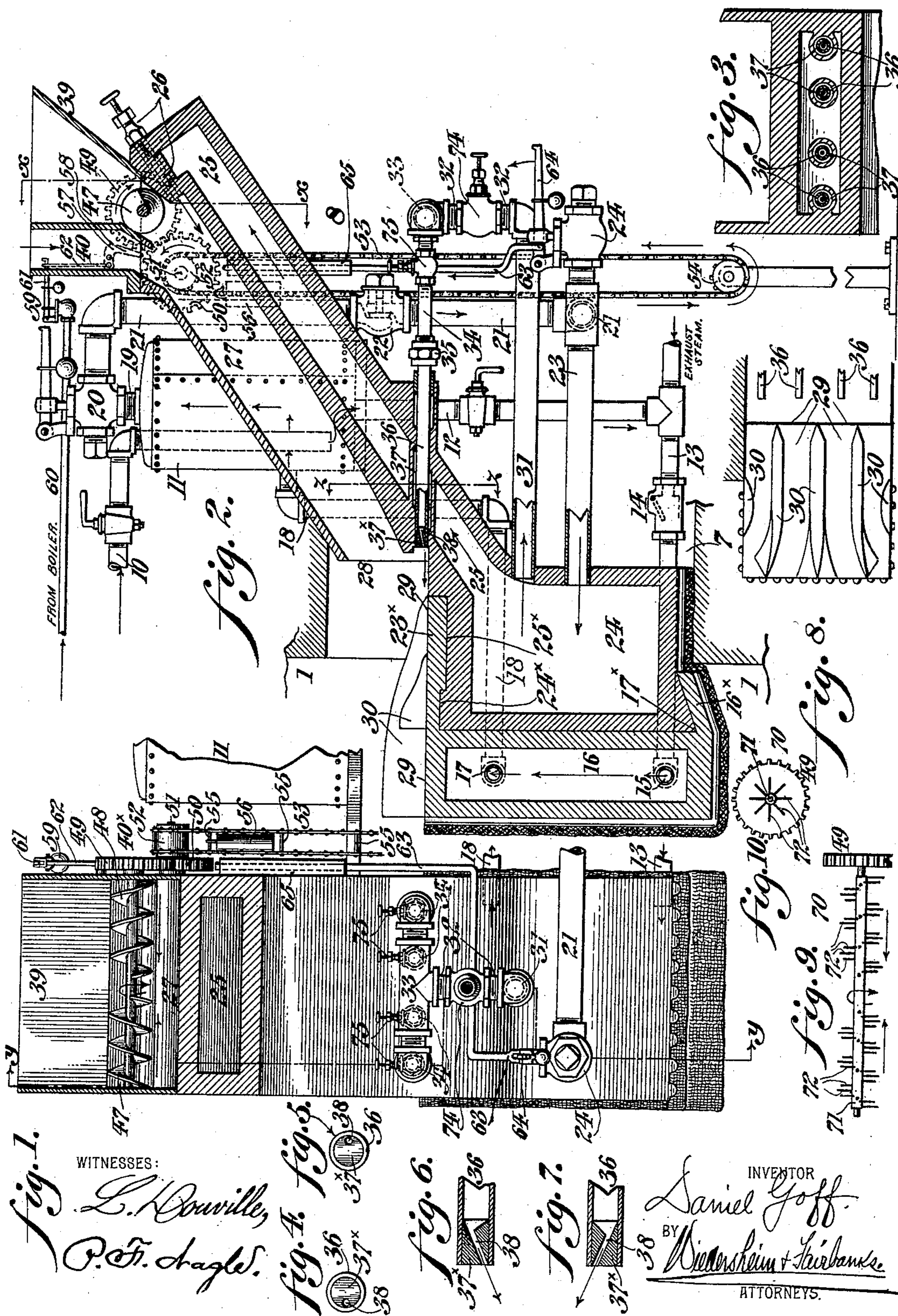


Patented Feb. 7, 1899.

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(No Model.)

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No. 618,862.

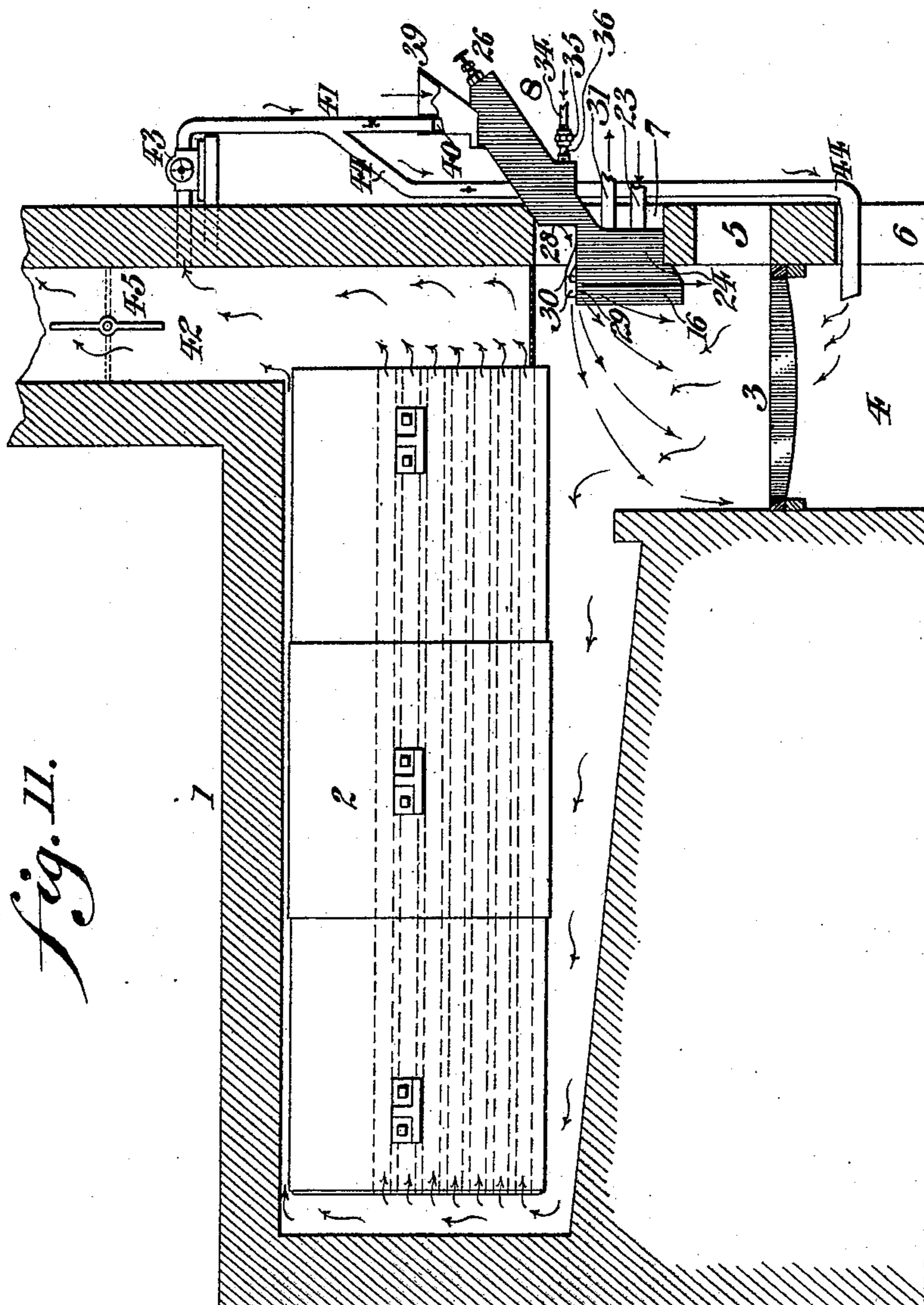
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D. GOFF.
AUTOMATIC STOKER.

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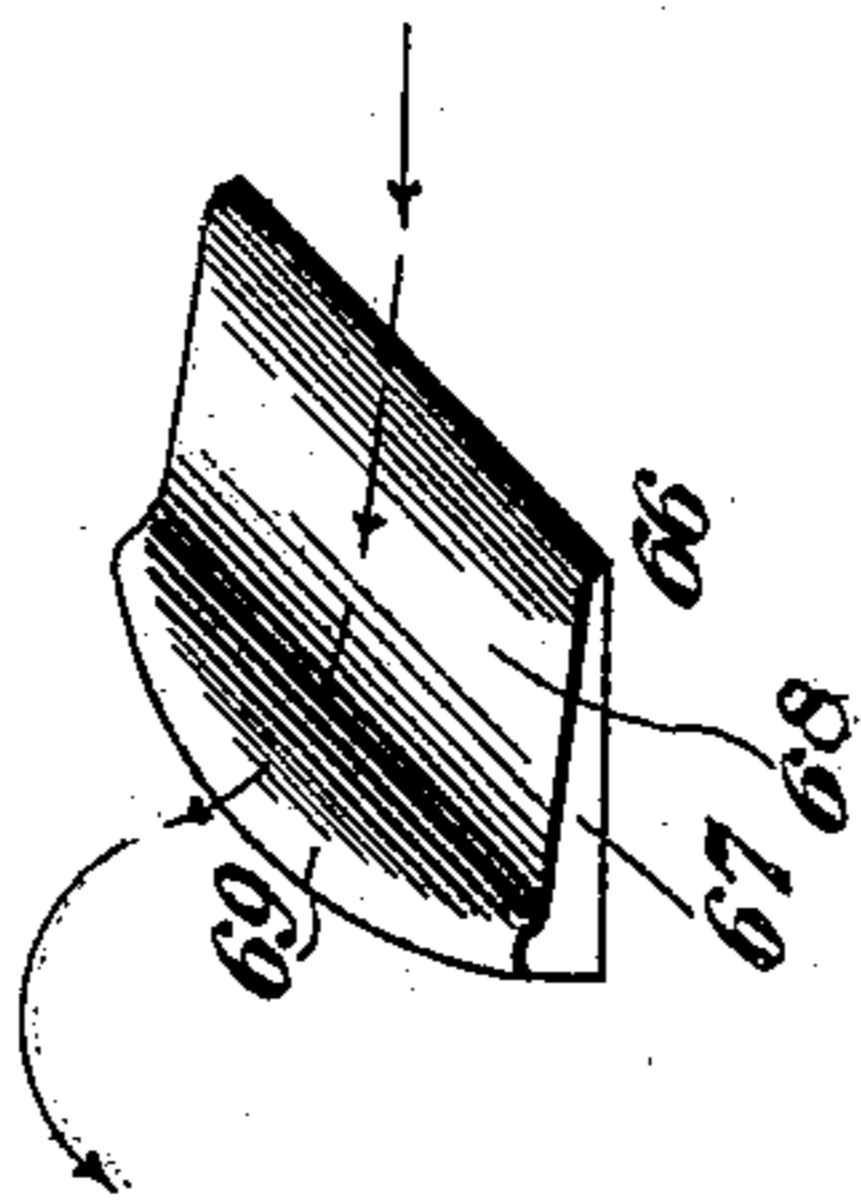
2 Sheets—Sheet 2.



WITNESSES:

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Fig. 12.



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UNITED STATES PATENT OFFICE.

DANIEL GOFF, OF MILLVILLE, NEW JERSEY.

AUTOMATIC STOKER.

SPECIFICATION forming part of Letters Patent No. 618,862, dated February 7, 1899.

Application filed April 15, 1898. Serial No. 677,650. (No model.)

To all whom it may concern:

Be it known that I, DANIEL GOFF, a citizen of the United States, residing at Millville, in the county of Cumberland, State of New Jersey, have invented a new and useful Improvement in Automatic Stokers, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of an improved construction of automatic stoker in which provision is made for automatically feeding the fuel to a boiler according to requirements, the feeding being regulated by the variations of pressure in said boiler.

It also consists of an improved construction of steam generator and superheater adapted to be used in conjunction with the stoker, steam being discharged from the superheater, so as to accelerate and assist the descent of the fuel to the furnace.

It also consists of an improved construction of rotatable or adjustable steam-nozzles employed, which discharge steam into the furnace.

It also consists of an improved construction of deflectors adapted to operate in conjunction with the adjustable nozzles above referred to.

It also consists of an improved construction of fuel-feeding device which is automatically thrown into operation when the boiler-pressure becomes unduly lowered, said device being adapted to feed the fuel toward the center of the chute or passage leading to the furnace.

It further consists of novel details of construction, all as will be hereinafter fully set forth, and particularly pointed out in the claims.

Figure 1 represents a front elevation, partly in section, of an improved construction of automatic stoker embodying my invention, the section being taken on line *x x*, Fig. 2. Fig. 2 represents a vertical section on line *y y*; Fig. 1. Fig. 3 represents a section on line *z z*, Fig. 2. Figs. 4 and 5 represent end views of adjustable or rotary steam-nozzles employed. Figs. 6 and 7 represent sectional views of the ends of the nozzles seen in Figs. 4 and 5. Fig. 8 represents a plan view of the deflectors employed, said deflectors being seen in elevation in Fig. 2. Figs. 9 and 10 repre-

sent front or end elevations of a modified construction of a fuel-feeding device. Fig. 11 represents a side elevation of a boiler having my invention applied thereto, the furnace-walls being shown in section. Fig. 12 represents a perspective view of a deflector employed in connection with vertical or upright boilers having stokers embodying my invention applied thereto.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates a boiler-furnace containing a boiler 2, grate 3, ash-pit 4, firing-door 5, ash-pit door 6, and the other usual appurtenances.

7 designates a recess or opening in the front wall of the furnace and having applied thereto my improved automatic stoker 8 and its adjuncts, the detailed construction of which will now be explained.

10 designates a pipe leading from any source of water-supply to the reservoir 11, said pipe being preferably extended to near the bottom of said reservoir.

12 designates a pipe leading from the reservoir 11 to the pipe 13, which is adapted to receive exhaust-steam also and has a check-valve 14 therein and discharges at the point 15 into the chamber 16, which being located directly above the grate rapidly heats to a high degree the water contained therein, which water being now vaporized leaves said chamber at the point 17 and passes through the pipe 18 to the reservoir 11. The incoming water through the pipe 18 being now highly heated or vaporized passes out through the pipe 19 through the safety-valve 20 to the pipe 21 and through the check-valve 22 to the pipe 23, which also has a safety-valve in connection therewith, and thence to the superheating-chamber 24.

25 designates a passage leading from the chamber 24 to the valve or valves 26, which is preferably a needle-valve, although it will be apparent that any other construction may be employed, if desired. The superheated steam after passing through the valve 26 is directed into the fuel passage or chute 27, which discharges at the point 28 upon the bed 29, upon which are located the deflectors 30, the relative position and construction of which will be best understood from Figs. 2 and 8.

A portion of the superheated steam leaves the chamber 24 through the pipe 31 and passes through the valved branch 32 to the laterally-extending branch 33, which has a plurality
5 of pipes 34 leading therefrom, each of which has a swivel or other coupling 35 mounted thereon, in which are mounted rotatable or adjustable pipes 36, which pass through the openings 37, so that they are out of communi-
10 cation with the passage 25, and thus unaffected by the superheated steam.

Each of the pipes 36 has mounted in the extremity thereof the block or plug 37^x, which has the inclined opening 38 leading there-
15 through, through which steam is discharged, whereby it will be apparent that by adjusting or rotating the pipes 36 the steam can be deflected into any desired direction within the furnace.

39 designates a hopper into which the fuel is placed, said hopper being in communication with the chute 27, which latter also communicates with the passage 40, into which leads the pipe 41, which communicates with
25 the uptake 42, said pipe having a blower 43 therein, while the pipe 41 has a branch 44, which leads to the ash-pit 4, wherefrom it will be apparent that upon the proper manipulation of the damper 45 some of the products of combustion can be directed into the
30 passage 27 or into the ash-pit 4 at will.

40^x designates the means for feeding or propelling the fuel into the passage 27, the same consisting of a shaft having mounted thereon
35 the screw or helical members 47 and 48, which, it will be noted, incline in opposite directions, so as to tend to feed the fuel toward the center of the chute 27. The shaft carrying the helical members 47 and 48 has mounted there-
40 on a gear 49, which meshes with the gear 50, the latter being mounted on the shaft 51, which carries the sprocket wheel or drum 52, around which passes the upper portion of the endless sprocket-chain 53, the lower portion
45 of the latter passing around the sprocket-wheel 54, which is journaled in a suitable support.

55 designates cross-pieces joining the chain at intervals, upon which is hung the weight
50 56, the tendency of which normally is to cause the rotation of the gears, and consequently of the feeding device 40^x.

57 designates an elbow or other lever, which is fulcrumed above the gears 49 and 50, said
55 lever having a member 58, adapted to be rocked so as to prevent the rotation of said gears, the movement of said lever being effected by the safety-valve 59, which is mounted on the pipe 60, which leads from the boiler,
60 the lever 61 of said valve having a link 62 common thereto and to the lateral member of the lever 57, wherefrom it will be apparent that when the pressure in the boiler increases above a certain point the lever 61 will be
65 raised, and thus cause the member 58 to engage the gear 50 and lock the latter; but when said pressure decreases the lever 61 is low-

ered, and the gears being unlocked can now be revolved by the weight 56, whereby the feeding of the fuel is effected. 70

63 designates a rod connected to the lever 64 of the safety-valve, wherefrom it will be seen that when said lever is raised the rod 63 will be actuated, said rod passing through a guide 65. 75

It will be understood that my improved stoker is equally applicable to vertical or upright boilers, and when the latter are used I employ the deflector 66, (seen in Fig. 12,) said deflector having the body portion 67 and
80 the upper surface 68, upon which the fuel is discharged, said surface terminating in the upwardly-extending lip 69.

70 designates a modified form of feeding device, (seen in Figs. 9 and 10,) the same consisting of a shaft 71, having mounted thereon the gear 49, the same as in Figs. 1 and 2, said shaft having the fingers or projections 72 thereon, by which the feeding of the fuel is effected. 85 90

The operation is as follows: Water having been introduced into the reservoir 11 and steam generated and superheated in the manner described and directed into the chute 27, it will be evident that as the fuel is fed there-
95 into its movement down the chute will be accelerated, and when said fuel has reached the lower portion of the chute and been discharged upon the bed 29 its movement will be further accelerated by the superheated steam
100 rising from the ports 38, and since the pipes 36 can be rotated in any direction it will be evident that the fuel can be directed into any part of the furnace. When the elbow-lever 57 is in the position indicated in Fig. 2, it will be
105 evident that the weight 56 will be acting to operate the feeding device, such action continuing until the pressure in pipe 60 has increased sufficiently to raise the lever 61 till the member 58 interlocks with the gear 50. 110

It will of course be understood that the various pipes or flues above referred to are provided with valves and dampers according to requirements.

It will be apparent that upon operating the
115 fan 43 a portion of the hot gases can be returned to the furnace through the chute 27 or the ash-pit, and, if desired, a pipe may be employed leading from the pipe 44 to the combustion-chamber above the grate. 120

By the manipulation of the valve 74 the flow of superheated steam to all the pipes 36 can be simultaneously checked or each of the pipes 36 can be controlled by its valve 75.

I desire to call special attention to the func-
125 tion of the water back or chamber 16, it being evident that by the same a large number of the heat units ordinarily wasted in furnaces are utilized, said water-back also serving to protect the front part of the stoker and
130 to further prevent the superheating-chamber 24 from burning out.

I desire to call especial attention to the construction of the water-holding chamber 16, it

being apparent that the same can be readily applied to and disconnected from the steam-superheating chamber, said chamber 16 having an extension 16^x, which projects at an angle therefrom and is adapted to engage the flaring or wedge-shaped portion 17^x at the lower portion of the chamber 24, it being also noted that the top of the chamber 24 has a tongue 24^x, which engages the adjacent recess in the extension 23^x of the bed 29, said extension being provided with the tongue 25^x, which engages the adjacent recess in the top of the chamber 24, it thus being apparent that the water-chamber 16 can be readily removed or replaced in case of injury without dismantling the furnace to any extent.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an automatic stoker, a chute leading to a furnace, a steam generating and superheating chamber located in proximity to said furnace, a fuel-feeding device for said chute and means for discharging superheated steam into the upper and lower portions of said chute.

2. In an automatic stoker, a chute leading to a furnace, a steam generating and superheating chamber, located in proximity to said furnace, a fuel-feeding device for said chute, means for discharging superheated steam into the upper portion of said chute, at an angle corresponding to the inclination thereof, and means for returning some of the products of combustion to the furnace through said chute.

3. In an automatic stoker, a chute, a fuel-feeding device located adjacent thereto, a steam generating and superheating chamber, the latter being located adjacent to said chute, a steam-nozzle leading into the upper portion of said chute below said feeding device, said nozzle discharging into said chute at an angle parallel to the inclination thereof, and steam-nozzles located below said chute and discharging laterally into the furnace.

4. In an automatic stoker, a chute, a fuel-feeding device located adjacent thereto, a steam-nozzle leading into the upper portion of said chute below said feeding device, said nozzle discharging into said chute at an angle parallel to the inclination thereof, and steam-nozzles located below said chute and discharging laterally into the furnace, said last-mentioned nozzles being adjustable, relative to said furnace.

5. In an automatic stoker, an inclined chute, means for discharging superheated steam and products of combustion thereinto, and a series of nozzles located below said chute, said nozzles being rotatable, and having plugs in the ends thereof, said plugs having inclined openings therethrough.

6. In an automatic stoker, an inclined chute, a fuel-feeding device located therein, a gear mounted on the shaft carrying said device, a second gear in mesh therewith, a shaft on which said gear is mounted, a sprocket on

said shaft, a lower sprocket-wheel rotatably supported, a chain common to said wheels, means for attaching a weight to said chain, and means for locking said gears when the boiler-pressure becomes unduly increased.

7. In an automatic stoker, a chute, a feeding device therefor, gearing for actuating said device, a pipe communicating with the boiler-pressure and having a safety-valve and connections from the latter for interlocking with said gearing, in combination with a pipe having communication with a superheater, a safety-valve in said pipe, and a rod actuated by said safety-valve and suitably guided, said rod being also adapted to interlock with said gearing.

8. In an automatic stoker, a chute, a fuel-feeding device therefor, means for conducting steam into the upper and lower portions of said chute, and a bed located near the lower extremity of said chute, said bed having deflectors mounted thereon.

9. In an automatic stoker, the combination of a reservoir adapted to receive water from any suitable source, the inlet-pipe of said reservoir projecting nearly to the bottom thereof, outlet-pipes for said reservoir, a water-holding chamber located above the furnace-grate and in communication with said outlet-pipe, a pipe leading from the upper portion of said chamber to said reservoir, a pipe leading from the upper portion of said reservoir to a steam-superheating chamber, a pipe leading from said superheating-chamber to the lower portion of a chute, adapted to discharge fuel into the furnace, means for discharging superheated steam into the upper portion of said chute, and means for regulating the feeding device for said chute.

10. In an automatic stoker, an inclined chute having a hopper located near the upper portion thereof, a feeding device located in said hopper, a superheater located adjacent said chute, a connection from the outlet-flue of the boiler to a passage adjacent said hopper, gearing actuating said feeding device, a sprocket-wheel adapted to rotate in unison with said gearing, a second sprocket-wheel suitably journaled, a sprocket-chain common to said wheels, and means for attaching a weight to said chain, in combination with devices for controlling the action of said weight in proportion to the variation of boiler-pressure.

11. In an automatic stoker, an inclined chute, a hopper located adjacent thereto, a feeding device located in said hopper, said feeding device consisting of a shaft rotatably mounted, said shaft having secured thereto spiral or helical members or wings, the latter being oppositely inclined so as to feed the fuel to the center of said chute, and means for rotating said shaft, in combination with a steam-superheating chamber, located adjacent to said chute and pipes leading to the latter from said chamber.

12. In an automatic stoker, an inclined

chute, a hopper located near the upper portion thereof, a shaft mounted in said hopper and having means thereon for propelling fuel to the furnace, a superheating-chamber having a passage discharging into said chute, openings through said superheating-passage leading to said chute but out of communication with said passage, rotatable pipes mounted in said openings, plugs in the extremity of said pipe said plugs having inclined openings therein, a single pipe leading from said superheater and provided with a laterally-extending branch, a valve in said pipe and connections common to said branch and to each of said rotatable pipes, and valves for each of said pipes, said valves being located intermediate the latter and said branch.

13. The combination of an inclined chute, a feeding device therefor, a bed upon which the fuel is adapted to be discharged, deflectors supported upon said bed and rotatable pipes located in proximity to said bed, said pipes being provided with plugs therein having inclined openings therethrough, through which superheated steam is discharged to the furnace.

14. In an automatic stoker, an inclined chute, a heating or feeding device therefor, a superheater, pipes leading from the latter for discharging superheated steam into the upper and lower portion of said chute, a safety-valve operated by boiler steam-pressure, a safety-valve operated by the pressure in the superheater, gearing for actuating said feeding device and connections from said safety-valve for controlling the automatic operation of said gearing.

15. In an automatic stoker, the combination of a boiler-furnace, a steam-superheating device, the same comprising a water-holding chamber located above the furnace, a superheater adjacent to said chamber, an inclined chute, means for conducting superheated steam thereinto, and fuel-feeding devices located in said chute, the top of said water-holding chamber and superheater acting as a bed for the reception of the incoming fuel, and deflecting devices located in proximity to said bed.

16. In an automatic stoker, the combination of a fuel-feeding device, an inclined chute, a water-holding chamber and a superheater suitably supported above a furnace, the upper portion of said chamber and superheater forming a bed upon which the fuel is discharged from said chute, means for conducting superheated steam into said furnace, through said chute, and in proximity to said bed, a hopper located above said chute, a passage adjacent to said hopper leading into said chute, a pipe common to said passage and the outlet-flue of the furnace, a blower located in said pipe and means for conducting the products of combustion simultaneously to the upper and lower portions of the furnace.

17. In an automatic stoker, the combina-

tion of a furnace, an inclined chute, a water-holding chamber and a superheater, located above the furnace-grate, the top of said chamber and superheater forming a bed upon which fuel is discharged, said bed being provided with deflectors, means for discharging superheated steam into said furnace, over the top of said bed, means for rotating the nozzles discharging said steam, means for discharging steam into the upper portion of said chute, and means for conducting products of combustion into said chute and into the lower portion of the furnace.

18. In an automatic stoker, the combination of a water-holding chamber, a superheater located in proximity thereto, the top of said chamber and superheater forming a bed, an inclined chute discharging upon said bed, a feeding device located above said chute, gearing for actuating said feeding device, safety-valves operated by pressure from the boiler and from said superheater and gearing for operating said feeding device, said safety-valves for controlling the rotation of said gearing, in combination with means for returning a portion of the products of combustion to the furnace above the grate through said chute, and means for conducting products of combustion also to a point below said grate.

19. In an automatic stoker, the combination of a reservoir, and a valved water-inlet pipe leading thereto, a connection from said reservoir to a water-holding chamber located above a furnace-grate, a return-pipe leading from the upper portion of said chamber to said reservoir, a pipe provided with a safety-valve and a check-valve leading from said reservoir to a superheating-chamber located above said grate, and in proximity to said water-holding chamber, a pipe leading from said superheating-chamber and having a valve therein to a laterally-extending branch, a plurality of pipes leading from said branch to the bed formed by the upper portion of said water-holding chamber and superheater, valves for controlling the flow of steam in said last-mentioned pipes, means for adjusting the discharge-outlets of the latter, a valved passage leading from said superheater into the upper portion of said chute, a fuel-feeding device located in proximity to the latter, gearing for actuating said device, sprocket-wheels having a chain common thereto and adapted to be actuated in unison with said gearing, means for attaching a weight to said sprocket-chain, safety-valves operated by boiler-pressure, and by the pressure from said superheater, and connections from said safety-valves for controlling the rotation of said gearing.

20. The combination of a boiler-furnace having a boiler therein, an inclined chute, a hopper discharging into said chute, a passage leading into the latter from the outlet-flue of the furnace, a blower located in said passage, means for discharging superheated steam into

the upper and lower portion of said chute, a water-holding chamber and a superheater located at the lower portion of said chute, the top of said chamber and superheater serving
5 as a bed upon which the fuel is initially discharged, deflectors located in said bed, and means for varying the angle at which steam is discharged into the furnace in proximity to said bed.

10 21. In an automatic stoker, a superheater located above the grate, a water-holding chamber mounted on said superheater in front thereof, and interlocking devices common to said chamber and superheater.

15 22. In an automatic stoker, a superheater located above the grate, a water-holding chamber removably mounted on said superheater, so as to protect the same, interlocking devices

common to said superheater and chamber, the top of the latter serving as a bed for the reception of the incoming fuel, and said bed having deflectors thereupon. 20

23. In an automatic stoker, a chute leading to a furnace, a steam generating and superheating chamber, located in proximity to said 25 furnace, a fuel-feeding device for said chute, means for discharging superheated steam into the upper and lower portions of said chute, and means for returning a portion of the products of combustion to the furnace through 30 said chute.

DANIEL GOFF.

Witnesses:

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