(No Model.) 2 Sheets—Sheet 1.

G. H. PATULLO.

FUEL FEEDER FOR BOILER APPARATUS.

No. 364,851. Patented June 14, 1887.

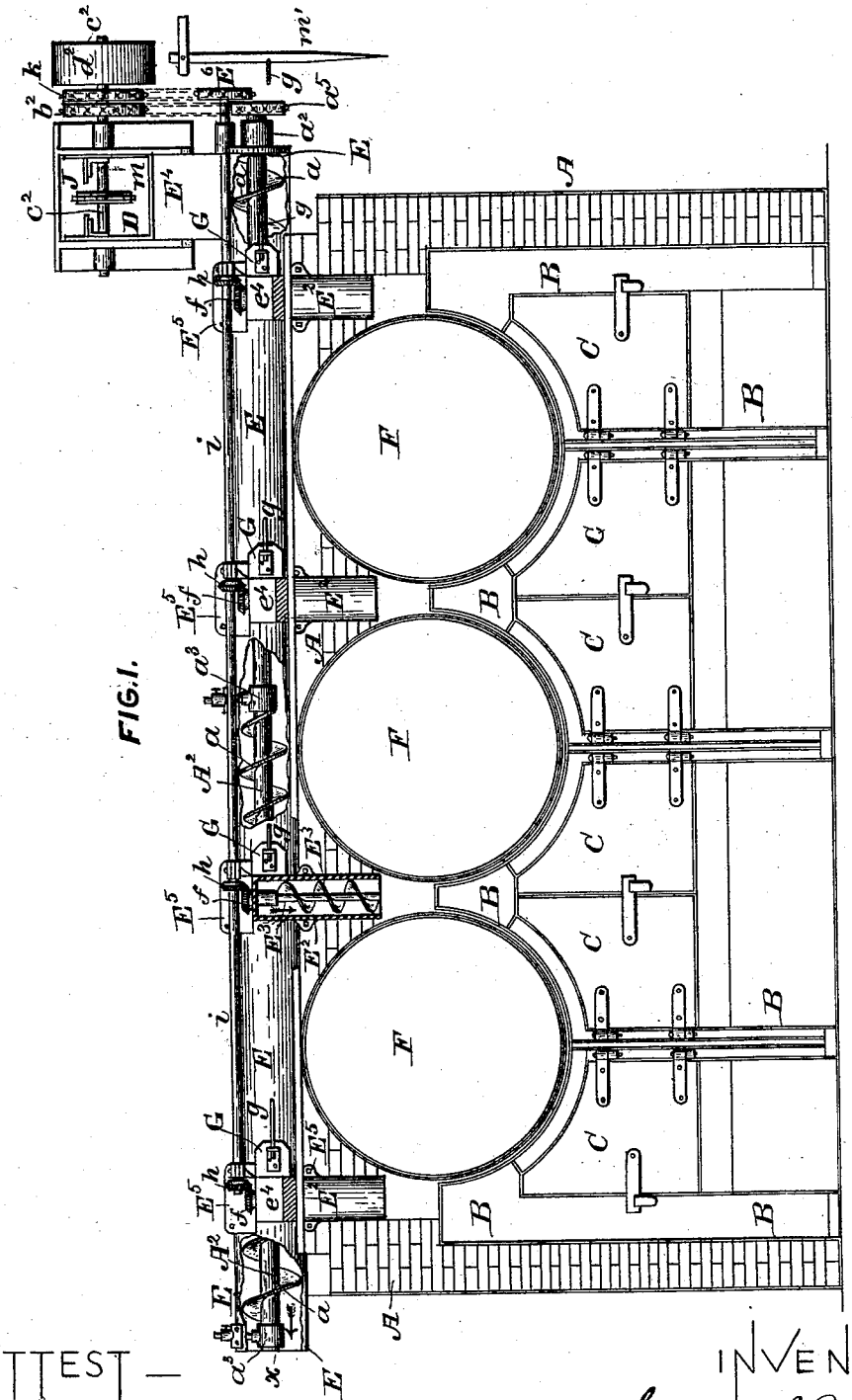

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

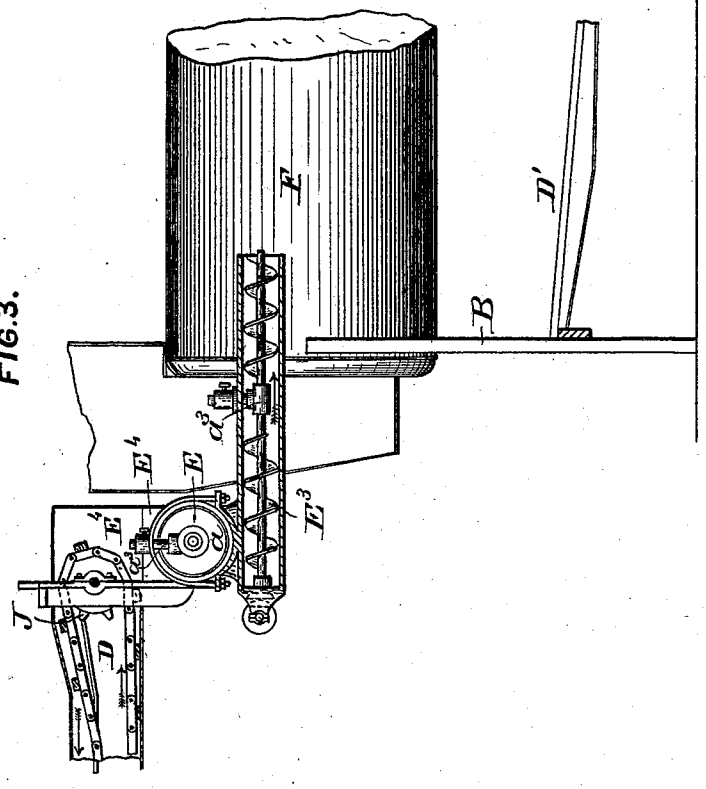
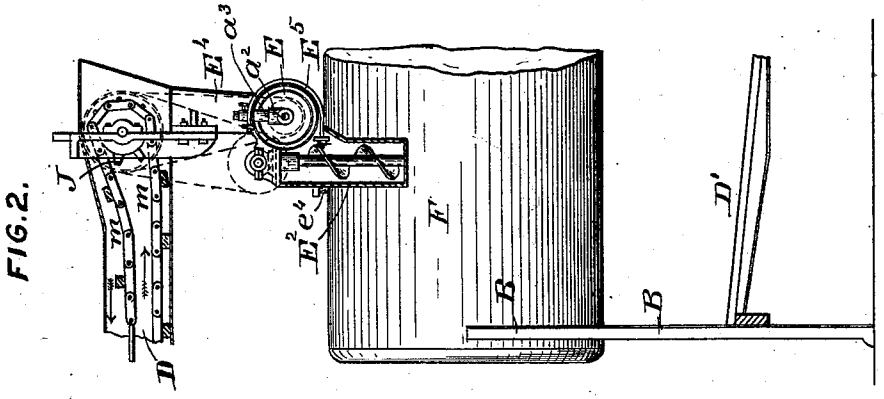


FIG. 2.



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UNITED STATES PATENT OFFICE.

GEORGE H. PATULLO, OF BAY CITY, MICHIGAN, ASSIGNOR OF ONE-HALF TO MICHAEL GARLAND, OF SAME PLACE.

FUEL-FEEDER FOR BOILER APPARATUS.

SPECIFICATION forming part of Letters Patent No. 364,851, dated June 14, 1887.

Application filed January 24, 1887. Serial No. 225,333. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. PATULLO, of Bay City, in the county of Bay and State of Michigan, have invented a new and useful Improvement in Fuel-Feeders for Boiler Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this application.

My invention relates to apparatuses or contrivances for feeding fuel—such, for instance, as sawdust—automatically to the furnaces of steam-boilers; and it consists in certain novel devices and combinations of devices, which will be hereinafter more fully explained, and which will be more particularly pointed out and clearly defined in the claims of this specification.

To enable those skilled in the art to which my invention relates to understand and practice the same, I will now proceed to more fully describe the several features of my improved fuel-feeder, referring by letters to the accompanying drawings, which form part of this specification, and in which I have shown my invention carried out in those forms of apparatus in which I have so far successfully practiced it.

In the drawings, Figure 1 is a front view or elevation of a nest or set of (three) steel boilers, mounted or set in the usual approved manner, and having combined therewith my improved fuel-feeding contrivance for automatically supplying the sawdust or other conveyable material to the fire-boxes thereof. Fig. 2 is a partial side elevation of the same. Fig. 3 is a view similar to Fig. 2, but showing a modification of the fuel-feeder, in which the material is discharged horizontally instead of vertically into the furnaces.

In the several figures the same parts will be found designated by the same letters of reference.

F F F are three ordinary steam-boilers, suitably mounted or set, as shown, in the masonry or brick-work A, having the usual metallic front plates and supporting frame-work B, in which are arranged the furnace-doors C, all in a well-known manner, and behind which are located the grate-bars D′, on which the fire-bed rests, and beneath which bars are the ash-pits. Immediately over the boilers F, a short distance from their forward ends and (in the case shown) resting upon them, is a transversely-arranged cylindrical trunk or metallic conveyer-tube, E, running entirely across the nest of boilers and projecting slightly at either side of the setting A, as plainly seen by reference to Fig. 1 of the drawings. Within the conveyer-trunk E, which in the case shown is composed of a thirteen-inch lap-welded tube, is mounted, centrally of the tube, a shaft, A^2, which rotates in suitable journal-boxes, (in the case shown three in number,) one of which, a^2, is located, preferably, in the head of the closed end of the tube E, and the other two of which, a^3 a^3, are joined in hangers that depend within the tube E, and are vertically adjustable for the purpose of lining up the shaft A^2, to keep it in a line about coincident with the axial line of the tube E. One of these depending bearing-boxes, a^3, is located, preferably, as shown, near the open end x of the conveyer tube or trunk. The rotatory shaft A^2 carries a helical blade or conveyer-screw, a, by means of which the contents of the tube E is screwed along or fed through said tube in the direction indicated by the arrow at Fig. 1, and the necessary rotatory motion is imparted to the conveyer-shaft A^2 by means, preferably, of a chain-wheel, a^5, driven by a chain belt, as shown, that is banded to a similar wheel, b^2, on the drive-shaft c^2, that carries the main driving-pulley d^2 of the apparatus. Directly over the receiving end of the tube E is located the discharge end of a conveyer trough or tube, D, which is connected with the said receiving end of the tube by means of a short vertical spout or vertical conduit, E^4, through which any material discharged from the conveyer-trough D will descend by gravity into the receiving end of the tube E. This last-mentioned tube has at intervals in one side of it a series of openings that are provided with sliding doors G, each composed of a metal plate curved (in a vertical direction) to correspond to the curvature of the said tube or cylinder E, and the whole series connected, preferably, to a rod, g, by which, through the medium of a lever or pendent handle, m', located, as shown, at one side of the boilers, the attendant can open and close

(either wholly or partially) the said doors. Of course, if deemed preferable under certain circumstances, these doors G may be provided with means for manipulating each one independently of the others. At each one of these openings in tube E the latter communicates with the upper part of a vertically-arranged feeder chute or conduit, E^2, which extends downwardly toward and at its lower end opens into the upper portion of the fire-chamber of the furnace, and, as shown, the arrangement or location of the four devices E^2 is such that two of them communicate with the furnace at either side of the set of boilers and two more are located one between each of the outside boilers and the central one, all as fully illustrated at Fig. 1. It will be understood, of course, that in lieu of having these descending feed-tubes E^2 arranged vertically and at the exact localities shown they may be placed obliquely (or even horizontally) and at different positions from those shown, according to number and arrangement of the furnaces to be fueled, and according to all the circumstances surrounding the particular boiler structure to which it may be desired to apply my improved fuel-feeder.

Within each of the vertical tubes E^2 is arranged axially of said tube a shaft provided with a helical sheet-metal vane or blade running nearly or quite the whole length of the tube and forming a screw-conveyer or feeding blade, as clearly seen at E^3. Each of these screw or propeller shafts is mounted to turn freely in suitable bearing-boxes at either end, and is provided at its upper projecting end with a bevel-pinion, *f*, that gears with a similar wheel, *h*, keyed fast on the shaft *i*, so that all the screw-feeders E^3 are driven simultaneously (by the series of sets of gears *f h*) from the one shaft *i*. If deemed expedient, however, in the use of a series of such feeders, they may be each separately or independently driven. The shaft *i* is mounted, in the case shown, in suitable journal-boxes, four of which are formed in or secured to the metallic stands E^5, projecting upwardly from the four feeder-tubes E^2, a fifth being formed in or attached to the head of the closed end of the cylinder E, all as plainly shown at Fig. 1 of the drawings. Preferably, this shaft *i* is rotated in the proper direction to make the screw-feeders E^3 feed downwardly, as indicated by the arrows at Fig. 1, by means of a chain-wheel, E^6, on one end of it, banded by a chain-belt, *k*, to a similar wheel on the same shaft that carries the main drive-pulley d^2. On this same shaft is mounted (within the conveyer box or trough D) one of the wheels J, over which passes (and by which is driven) a conveyer-chain, *m*, of ordinary construction, the flights of which convey the sawdust (or other material to be burned) from any provided source of supply, along within D, and effect its discharge into the descending chute or tube E^1.

In the particular detail construction of my improved fuel-feeder (shown in the drawings) each of the vertical feeder devices E^2 is formed or provided with a lateral projection or shoulder-like device at e^4 that rests upon a supporting bar running crosswise of and on top of the boiler structure, and the said devices E^2 and the main feed-cylinder E are secured together by curved tie-rods or bolt-rods E^5, which partially encircle the cylinder E and have their upper and lower ends made fast, as clearly shown, (see Fig. 2,) to the top stands of E^2 and the inner middle portions of the latter. But of course these details of the structure may be more or less varied without changing in substance the principle of construction or the mode of operation of my improved fuel-feeder contrivance.

In the modification of my invention shown at Fig. 3 the main tube E instead of being located over the boilers is placed in front of them in a line some distance from but parallel with their front ends or heads and at a level about coincident with the topmost portions of the boilers; and in this case the feeder devices E^3 are arranged horizontally (instead of vertically, as in Figs. 1 and 2) and enter the fire-boxes in lines parallel with the axes of the cylindrical boilers F, all as clearly shown.

In the general operation of my improved contrivance, the moving parts of the machinery being set in motion with the proper speed, the sawdust or other fuel material to be supplied to the furnace or furnaces will be conveyed along (in a well-known manner) from the source of supply and within the conveyer-trough D to the chute E^1, within which it will descend by gravity into the receiving end of the tube or cylinder E. Here the material is acted upon by the screw-conveyer device *a*, which carries it along within the tube E as fast as supplied thereto and continuously, and when the doors or slides G are closed the fuel will be discharged at the opposite end of the tube E, as illustrated at Fig. 1; but whenever the sliding doors G are either partially or wholly open, so that there will be open communications between the interior of the tube E and the interiors of the depending or vertical tubes E^2, then the material being conveyed along in the tube E will be taken therefrom in greater or less quantities by each and all of the feeder devices E^3, and will be by the latter fed downwardly within the tubes E^2 and discharged into the fire-boxes of the furnaces. It will be observed that the peripheral edges of the helical feeder devices E^3 are arranged to run close up to the periphery of the screw-conveyer *a*, (see Fig. 2,) so that when the slides G are open these feeder devices E^3 will easily receive and remove the material being fed along within E.

By opening the doors G more or less (by a manipulation of the rod *g* through the medium of the hand-lever *m'*) the attendant of the boilers or furnaces can at pleasure regulate the supply of fuel to the fires, and if cir-

cumstances require that the supply to the furnaces be cut off while the supply apparatus continues running no harm will be done and not the slightest impediment offered to or undue strain brought on any of the operative parts of the machinery, the only effect of closing the slides G while the machinery is running being the discharge of the fuel material at the open end *x* of the tube E onto the floor, or into a receptacle for its reception, or into a conveyer for reconveying it to the original source of supply for reuse.

By having the supply-conveyer D separated from the receiving end of the screw-conveyer E and combining with said two devices the drop-tube or vertical conduit E^4, in the manner shown, an efficient break is made between the two devices D and E, (in each of which particles or a layer of the sawdust or other inflammable material may remain,) and thus the dangerous liability of fire running along from those parts of the feed which communicate with the fire-boxes to the fuel-supply source is practically obviated.

Of course many variations in the details of construction of my improved apparatus may be made without materially changing its novel mode of operation, and all such modifications may be made without departing from my invention. As the screw-conveyer *a* in tube E acts continuously and positively, and since the feeder devices E^3 act positively to force the material supplied to them down through and out of the lower ends of the tubes E^2, it follows that there can never be any clogging of the feed and that the fuel will be positively and regularly discharged into the fire-boxes in whatever quantities or at whatever rate may be predetermined by the adjustment of the supply-doors G, which are under the control of the engineer or fireman, and which, as before remarked, may be either all set or adjusted simultaneously by the means shown or may be separately manipulated.

Having now so fully explained the construction and operation of my improved fuel-feeder that those familiar with this class of contrivances can practice my invention, either in one or the other of the two forms of apparatus which I have shown or in some other form of contrivance, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with one or more boilers and the furnaces or fire-boxes thereof, a screw-conveyer device operating to carry along in the vicinity of the furnaces a supply-column of fuel, and one or more auxiliary or branch screw-feeder devices which operate, as specified, to take the fuel from the aforesaid screw-conveyer device and positively discharge it thence into the fire, and the communication between which and said conveyer device may be regulated at pleasure, all substantially as hereinbefore set forth.

2. In combination with an ordinary conveyer for bringing the fuel from the source of supply to the vicinity of the fuel-feeding mechanism that is connected with the furnace and the screw-conveyer tube E, to which the fuel is supplied by the said ordinary conveyer and from which it is fed to the fire, a vertically-arranged safety chute or conduit, E^4, through which the material discharged from the said ordinary conveyer falls into the receiving end of the tube E, and which acts as a fire cut-off, substantially as described.

3. The combination, in a fuel-feeder, of the screw-conveyer *a*, arranged and working within the tube E, and one or more laterally-arranged feed-tubes communicating with said tube E and provided with screw-feeders E^3, which coact tangentially with the screw-conveyer *a* and take material from the moving fuel-column of the latter and discharge it onto the surface of the fire, all substantially as hereinbefore set forth.

4. In a fuel-feeding contrivance, the combination of a supplying-conveyer, D, a screw-conveyer arranged contiguously to the boiler and furnace and open at its tail end, one or more branch screw-feeder devices, one or more valvular slides, G, and a suitable system of driving-gearing for imparting the proper continuous rotatory movements to the screws of both the main and auxiliary feeding devices, all substantially as hereinbefore set forth.

In witness whereof I have hereunto set my hand this 13th day of January, 1887.

GEO. H. PATULLO.

In presence of—
HEZEKIAH M. GILLETT,
MORRIS L. COURTRIGHT.