

E. F. LITTLEPAGE.

AUTOMATIC FEEDERS FOR FURNACES.

No. 188,647.

Patented March 20, 1877.

Fig. 1.

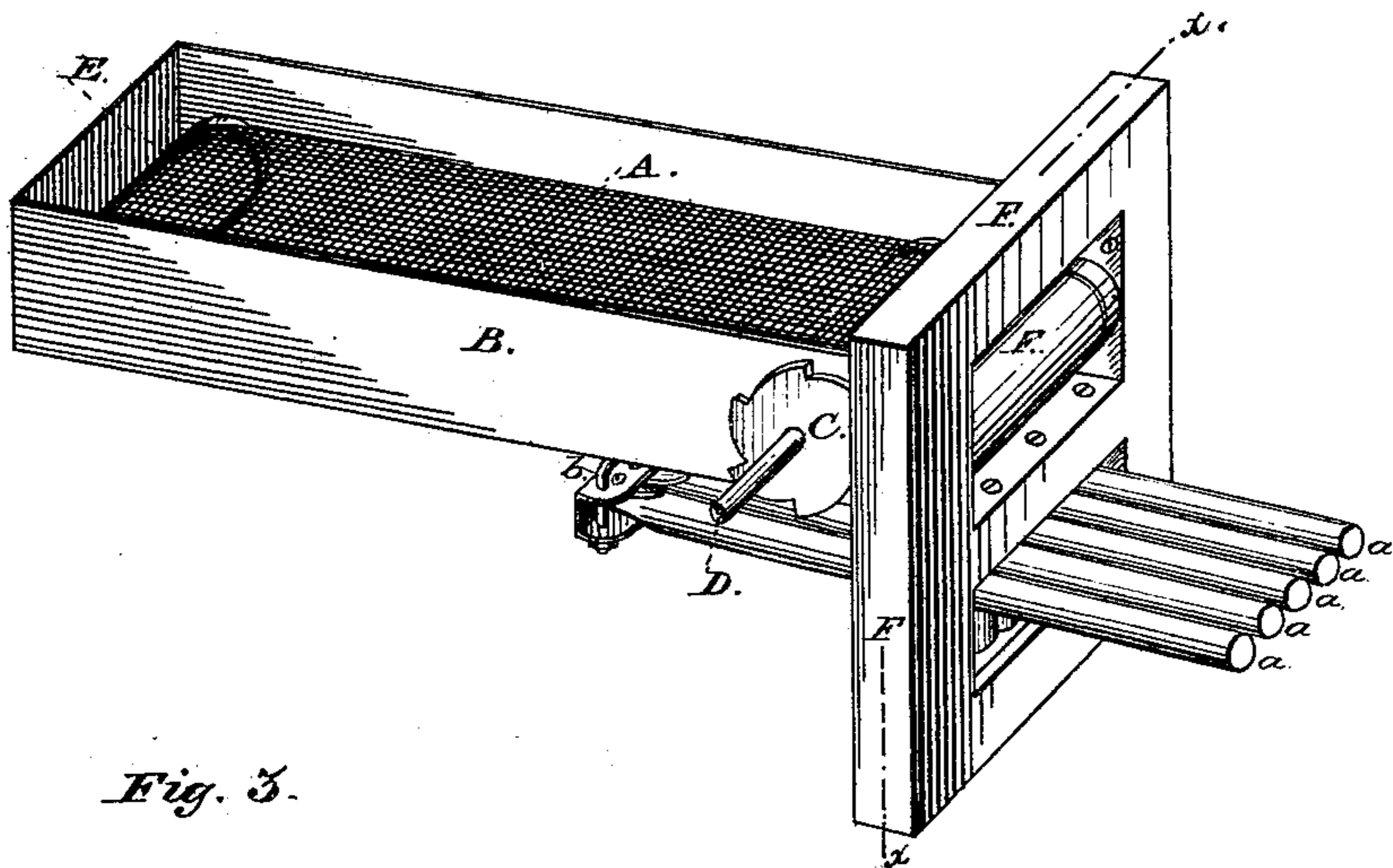


Fig. 3.



Fig. 2.

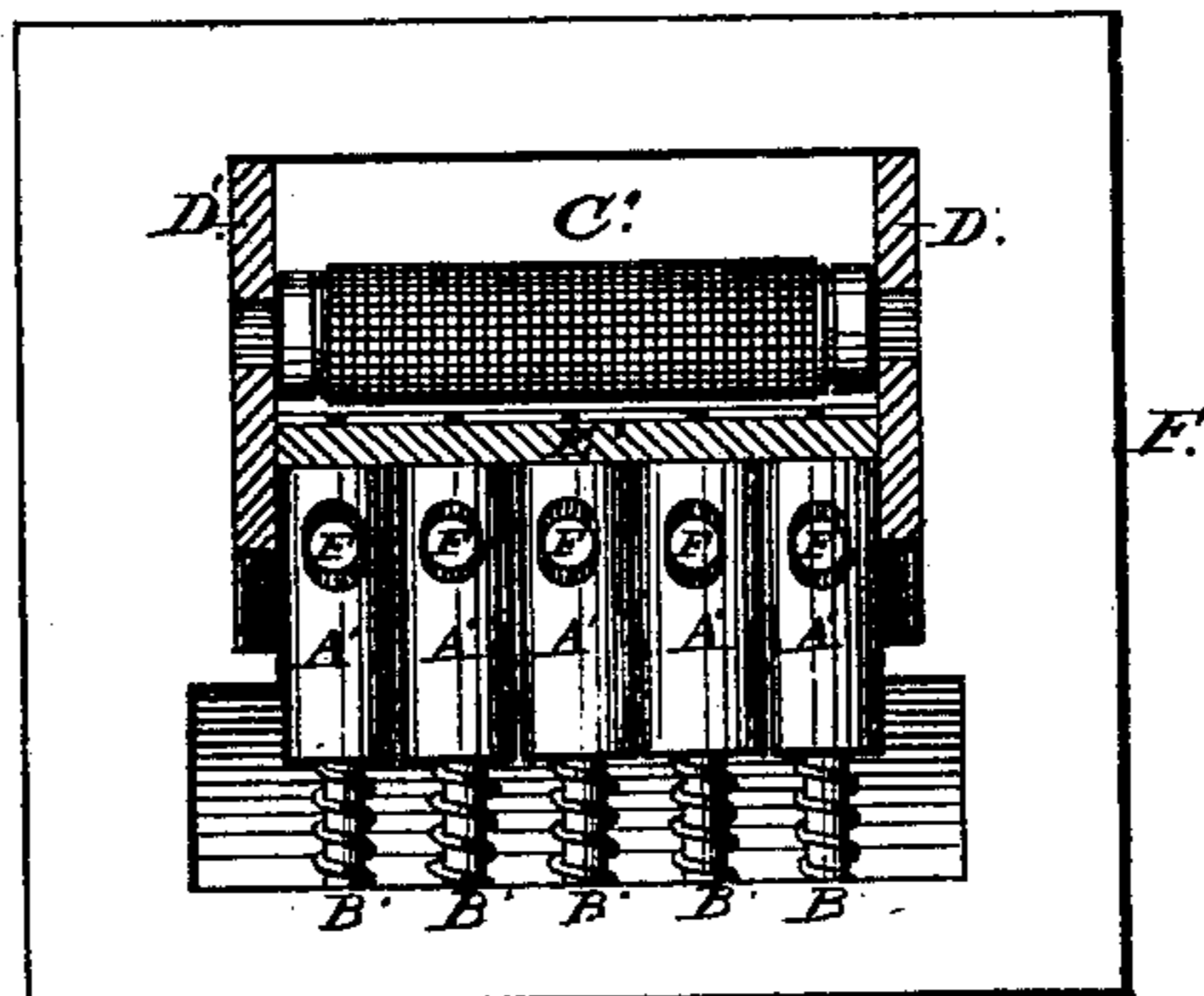
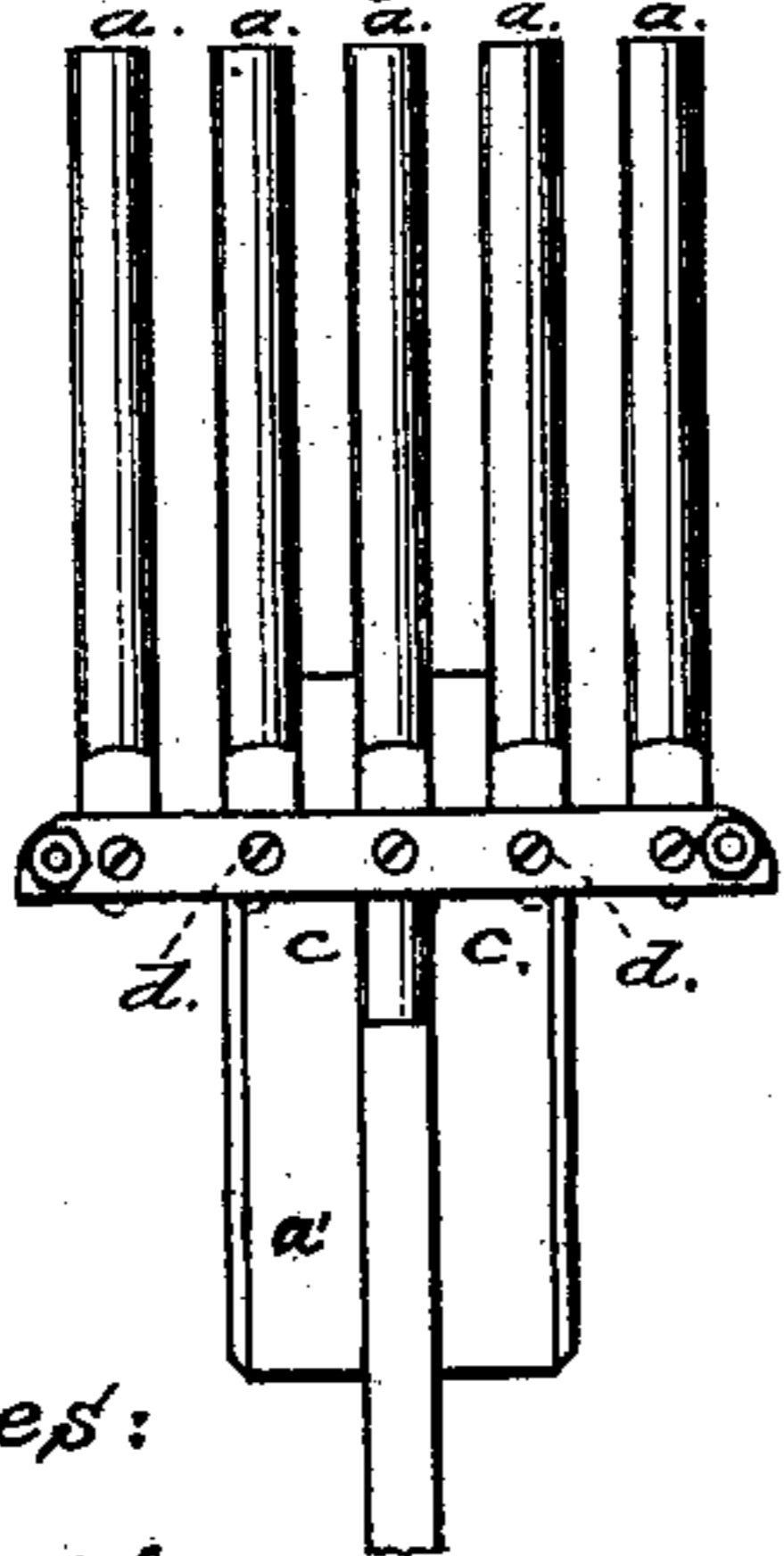


Fig. 4.

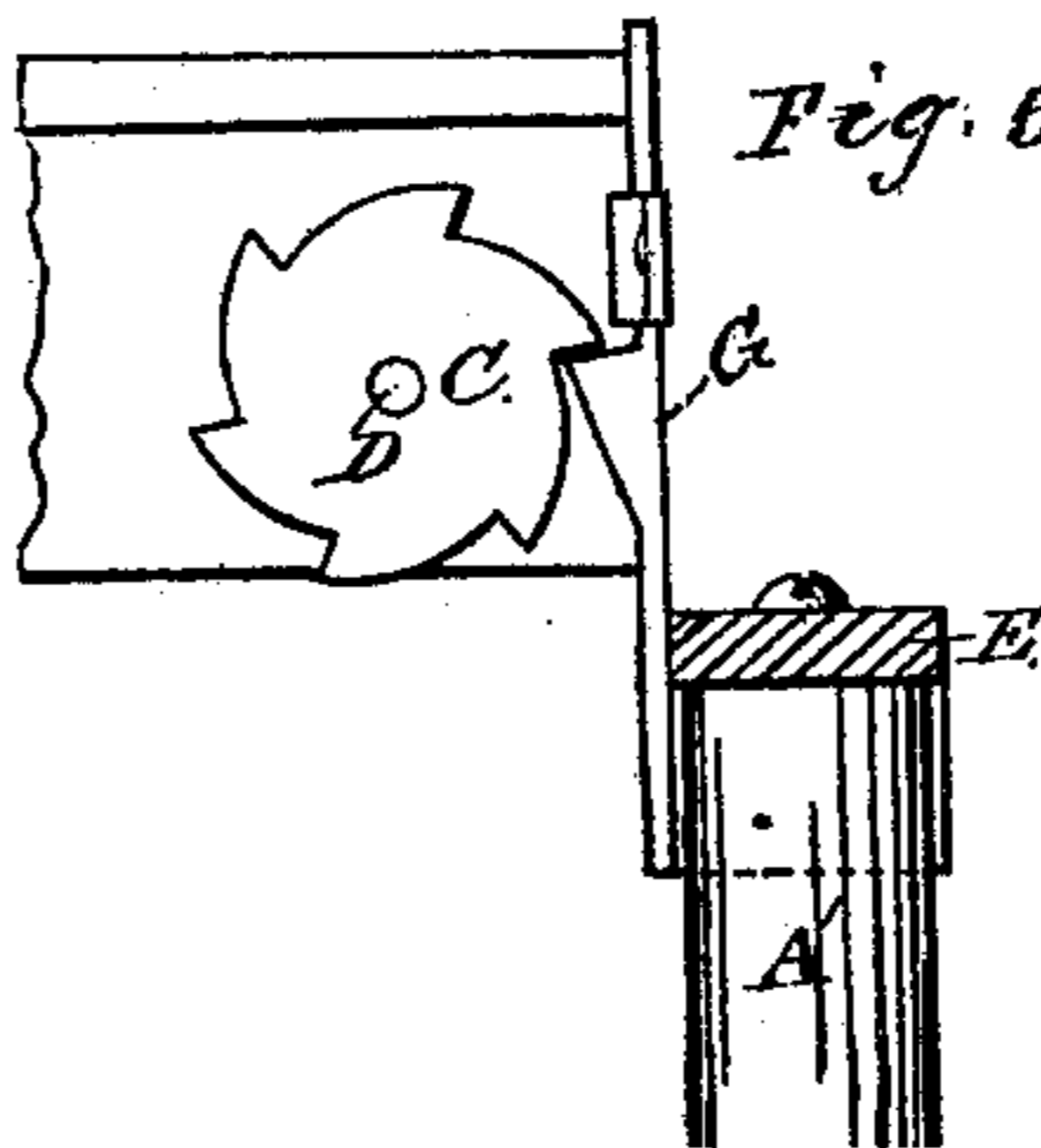


Witnesses:

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Fig. 5



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## IMPROVEMENT IN AUTOMATIC FEEDERS FOR FURNACES.

Specification forming part of Letters Patent No. **188,647**, dated March 20, 1877; application filed January 12, 1877.

*To all whom it may concern:*

Be it known that I, EUROPE F. LITTLEPAGE, of the city and county of Los Angeles, and State of California, have invented certain new and useful Improvements in the Method of Feeding Furnaces, and in certain means of shaking and operating the grates; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention is applicable to a variety of boiler-furnaces, and may be applied to all coal-furnaces, but preferably to the locomotive type, to which the description will in this case be mainly confined; and the objects are, first, to provide an automatic feeder or stoker, by which the fuel is fed evenly and regularly over the grate-surface at the option of the engineer; second, to produce a nearly perfect combustion by the introduction of the proper supply of fuel and atmospheric air; third, to provide means for shaking, elevating, and locating the feed or fire bars, either longitudinally or laterally, in a horizontal position; and, fourth, to dispose of the fuel in such a manner that nearly all the combustible gases will be consumed, thereby preventing smoke, and securing an economy of fuel.

In the drawings, Figure 1 represents a top view, and a front and side elevation in perspective, showing the fuel-carrying device inside the case in position, the top of the case being removed; also the feeders or fire-bars projecting from the front piece F, said piece forming the front of the furnace, the remaining portion of the furnace not being shown. The operating ratchet cam-wheel C is also shown on the side of the case in position. Fig. 2 illustrates a vertical cross-section on the line *x x*, Fig. 1, showing the lifters and spiral springs, the lifters being provided with apertures for the reception of the feed or fire bars, with the ends of said bars in location. Fig. 3 is a detached end view of the slide, which works longitudinally under the feeder, also showing the common cross-head, to which

the ends of all the feeders or fire-bars are pivoted, and also the laterally-sliding link attached to the longitudinal slide, so that the bars and head may be moved horizontally right and left, and forward and back, as desired. Fig. 4 represents a detached view of the feed or fire bars pivoted to the cross-head, with the operating lever and slide attached; and Fig. 5 shows one of the tripping-toes by which the toothed cam-wheel operates the lifters vertically against the resistance of the springs by which the bars or feeders are vertically moved.

It is well known that in feeding furnaces in the old way, the fuel is thrown into the furnace by shovelfuls, and very often in the same place, thus leaving large spaces without any fuel on the grate-surface, through which the cold air rushes, and which produces a cooling or chilling effect upon the plate-surface of the boiler, and also on the gases evolved from the fuel, and by reason of this chilling effect they are carried off unconsumed. To avoid and remedy this defect is the object of the first feature of my invention, which consists in automatically feeding coal or any other short or pulverized fuel over an endless sheet of iron plate sufficiently ductile or flexible to pass over and under rollers, whereby the fuel is carried from the tender or place of supply to within the front of the furnace, and there delivered on the bars or feeders, by which it is evenly spread on any portion of the grate-surface desired. This endless sheet may or may not be perforated.

The thickness of the layer of fuel upon the grate may be regulated according to the kind used, and may be introduced by my device through the ordinary doorway of the furnace; or an opening may be provided below, and in such a manner that the requisite quantity of atmospheric air is admitted, so as to unite and mingle with the gases evolved from the fuel, such as carbonic-oxide, carbureted-hydrogen, and other gases, whereby a high and regular degree of temperature is maintained. Also, the great danger of sudden contraction and expansion of the boiler-sheets is avoided, thereby preserving the boiler seams, rivets, and joints from the sudden contraction and

expansion caused by the frequent opening of the furnace-door.

The second feature of my invention consists in the arrangement of my feeders or fire-bars. These bars receive the coal from the feeding-plate, and may be turned to feed any part in the combustion-chamber or fire-box, and may project to the inner end of the same, or may be withdrawn to the front, and are capable of shaking the fuel rapidly on the grate, and continually or at intervals, without opening the doors of the furnace, and may be operated by the running-gear of the engine. These bars may be used as grate-bars, or used only for the purpose of feeding.

As before stated, the fuel is evenly distributed upon the grate-surface, but may be a little thicker toward the bridge-wall. Ignition then takes place, and a volume of coal-gas arises. In the combustion of coal-gas, flames are caused by the union of the hydrogen with the oxygen of the atmosphere, and the heat produced is intense, raising the carbon to a state of incandescence and luminosity. Without the carbon there would be no light, and this luminosity and incandescence are the result of that high temperature which is essential to its own combustion or chemical union with oxygen.

Let this fact, then, be borne in mind, as it indicates the cardinal point of the whole process in my furnaces—viz., that it is not the combustion of the gas, but the combustion of the gas mixed with air, that produces the heat, and this mixture must be maintained in the requisite quantities and at a high temperature, which cannot be done if the furnace-door is open at intervals, thereby admitting cold air, reducing the temperature, and destroying the flame. By my contrivance the door is rarely opened, the air is admitted in equal and requisite quantities, causing a chemical union of the elements necessary to support combustion, by which nearly a perfect combustion ensues. The interstices between the lifters may be made to allow the proper supply of air over the fire to mix with the gases evolved without admitting a large volume of cold air to pass immediately between the flame and crown-sheet of the boiler, as is the case when the furnace-door is opened.

Referring to the annexed drawings, B represents the case in which the carrying-feed apparatus is located. A denotes the metallic flexible endless plate, which, in this case, is perforated, but may be made of strips or an endless chain, laid in close contact side by side, or of coarse wire-netting. This metallic sheet or plate runs upon rollers E, by which it is moved forward with its load of fuel and dumped upon the feeders or fire-bars. Between this sheet is also placed, near the furnace end, another roller, the axis of which projects some distance outside of each side of the case, and is denoted by the letter D. Upon each of these projections or spindles is

placed a toothed cam-wheel, C, the teeth, as they revolve, coming in contact with a tripping-toe, G, which is rigidly fastened to the lifter-head E', to which the lifters are also attached. When the cam-wheel C revolves, each cam-tooth clutches onto the tripping-toe G, and bears down the head E', (see Fig. 5,) and the lifters with it, and also the fire-bars, which work through oblong holes made in said lifters against the tension of the springs B', so that, upon the escape of the cam-tooth from the trip-toe, the head, lifters, and bars fly back with a quick movement, thus shaking or pitching the coal or fuel on the fire-bars forward or sidewise, as the bars may be directed.

At the outer end of these bars *a* is located a head, *b*, (see Fig. 4,) into which the end of each bar is pivoted. This head *b* is suspended from the bottom of case B by means of a swivel or link, *f*, running through two eyebolts, (see Fig. 3,) by which it is capable of movement one side or the other, and by which the front ends of the bars are directed to either side, or any point in the furnace, and thereby deliver the fuel at that point. This head is also capable of sliding longitudinally, and, of course, taking the bars with it, as before stated. These bars run through holes in the lifters. Said lifters turn vertically on pivots, thus allowing or accommodating said bars to point to any desirable direction, or to be raised and lowered simultaneously with right or left motion, as may be desired.

While I am aware that automatic stokers have been heretofore used, I am not aware that any have been constructed like mine, embodying the same function. I do not, therefore, desire to confine myself to the exact construction presented, as many other forms may be used without departing from the spirit of my invention.

Having now fully described my invention, and the mode of operating the same, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the flexible endless feeding apparatus with the pivoted feeders or fire-bars, arranged and operating substantially as herein described.
2. The combination of the pivoted bars, the head *b*, and the lifters A', substantially as described, and for the purpose set forth.
3. The combination of the cam-wheel having one or more cams, the tripping-toe G, and the spring-lifters with the pivoted bars *a*, as set forth.
4. The combination of the head *b*, pivoted bars *a*, and links *f*, by which said bars are given a right-and-left motion, as and for the purpose specified.
5. The combination of the head *b*, pivoted bars *a*, and links *f*, with the lifters and cam-wheel, by which the bars are given an oscillating motion and a vertical motion, either independently or together, substantially as described, and for the purpose set forth.

6. The combination of the longitudinal slide  $a'$ , cross-links  $f$ , pivoted bars  $a$ , and head  $b$ , with a furnace-feeding apparatus, in the manner shown and described.

7. The case B, metallic flexible plate A, rollers E, cam-wheel C, and bars  $a$ , with intermediate mechanism, constructed and ar-

ranged to automatically feed a furnace, substantially as described, and for the purpose specified.

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Witnesses:

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