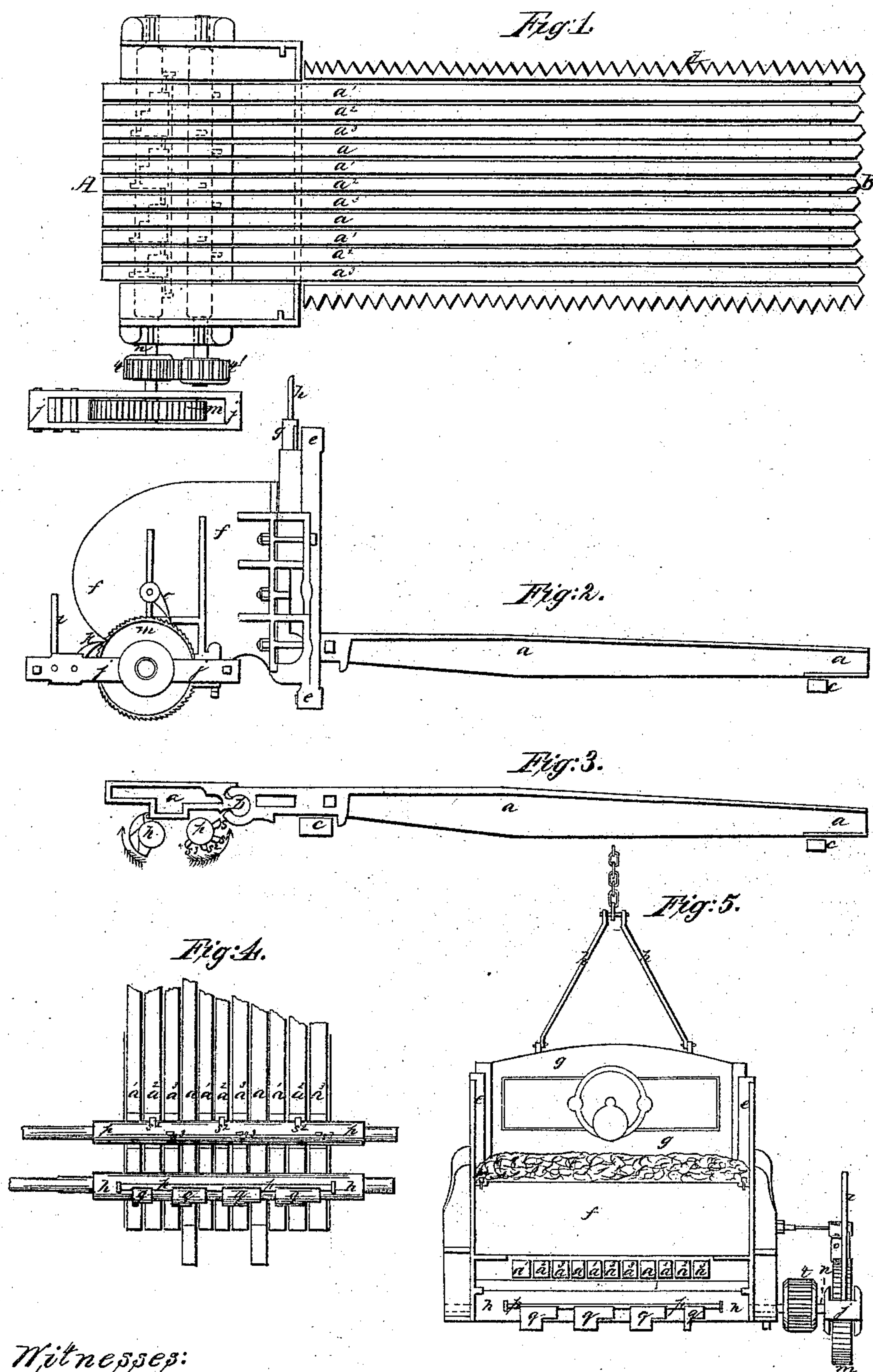


*Wilson & Smith,
Furnace Grate.*

N^o 68,139.

Patented Aug. 27, 1867.



Witnesses:

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United States Patent Office.

WILLIAM A. WILSON AND JAMES SMITH, OF LIVERPOOL ENGLAND.

Letters Patent No. 68,139, dated August 27, 1867.

GRATE FOR FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN :

Be it known that we, WILLIAM ASHLEY WILSON and JAMES SMITH, both of Liverpool, England, have invented certain new and useful "Improvements in Furnace Fire-Grates;" and we do hereby declare that the following is a full and exact description of the construction and mode of operation thereof, reference being made to the sheet of drawings which accompany this, and to the figures and letters thereon; that is to say—

Our invention consists in a certain novel mode of constructing, arranging, and moving the bars and other parts which constitute furnace fire-grates, by which the following desiderata are secured: first, the fuel during combustion, and as it is "burat down," is carried towards the flue leading to the chimney; second, the spaces for the admission of air between the bars are maintained in a free and open condition all over the fire-grate; third, the formation of "clinker" on the bars is prevented. Amongst other results it follows that the fuel is more perfectly consumed and a greater amount of heat given out than in ordinary furnaces, and that the escape of black smoke into the atmosphere is prevented.

We will describe what we consider the best means of carrying out our invention.

The bars resemble in form those in ordinary use in coal-burning fire-grates, and are disposed or placed in a horizontal or nearly horizontal position, parallel to each other, and either longitudinally or transversely in the furnace. We prefer placing them longitudinally, that is, in length from front to back, and hereinafter we will specify that arrangement. These said bars are made in one or in several lengths, but when they are in more than one length they must be coupled together so as to act as if there were but one length. They rest on bearers in the usual manner, and are provided with side frame pieces when necessary. Across the ash-pit, and near the front thereof, we place two drums, hereinafter described, the ends of which rest in bearings. These drums are geared together by toothed wheels so that when in motion they rotate in opposite directions, motion being communicated in any convenient way. On one of these drums there is mounted, or there is cast therewith, a wing or protection, which, as the drum rotates, comes into contact with the ends of the bars, or with raised portions thereof, and pushes them, *en masse*, from front to back of the furnace, and by this motion the fuel resting on the bars is carried towards the bridge. In some cases, when the furnaces are very large, more than one wing could be employed to push the bars backwards in divisions or sections, and when that is the mode used stationary bars between the divisions or sections might be serviceable. On the other drum there is a number of tappets, either fastened thereto or cast therewith, disposed thereon like the helix of a screw, or irregularly, so that as the drum rotates the tappets come into contact with projecting portions of the bars and move them singly, the one after the other, from back to front of the furnace, or several bars are taken forward at a time, care being taken that the bars on both sides of each shall remain stationary during that time. We prefer to move only one bar, or several widely separated bars at a time, in the motion from back to front, as it is undesirable that the fuel should be carried in this direction. Still, two or more bars next each other could be moved. The motion or travel of the bars in a furnace of ordinary length need not exceed four inches, for the repeated motion will prevent the formation of "clinker," and keep the spaces between the bars perfectly free so as to admit air.

The accompanying sheet of drawings contains views illustrative of one of our furnace fire-grates, (suitable for a Cornish steam-boiler,) in combination with a hopper from which the fuel is carried or fed by the motion of the bars, motion being given to operate the parts by a reciprocating connecting-rod.

Figure 1 is a plan view, the hopper being omitted.

Figure 2, a side elevation, the side frame piece being removed.

Figure 3, a horizontal section through fig. 1 at A B.

Figure 4 represents the bars turned over, the drums being in position; and

Figure 5 a front elevation.

In all these views the same letters denote like parts.

$a^1 a^2 a^3$ the bars, here shown made in two lengths, and joined together by projecting pieces b , and corresponding sockets. The object in making the bars in two lengths is to prevent twisting and bending, and to allow for expansion. c , the bearers. d , side frame pieces, the outer edges of which are pectinated that the frame may be more readily fitted where there are projecting rivets. e , frame suitable for attaching to the end of a

boiler. *f*, fuel-hopper, secured to *e*, and provided with sliding-door *g*; the said door can be balanced by a weight attached to a chain led away from the suspender *h*, over a pulley. For the purpose of regulating the feed of fuel it is only necessary to leave a greater or lesser distance between the bottom of *g* and the upper surface of the bars *a*. *i*, reciprocating-rod from any convenient power connected to the lever frame *j*, whereto the impulse pallet *k* is jointed. When power is not available a lever shipped on to *j* could be operated by hand. *m*, a ratchet-wheel secured on the drum *n*, and *o* a check-pallet. The drum *n* has fitted thereto a stiff bar, *p*, and is provided with projecting inclined surfaces *q*, for the purpose hereinafter mentioned. *r*, the inner drum, provided with tappets *s* *s*¹ *s*² *s*³. By the toothed wheels *t* *t'* the drums *n* and *r* are geared together, and are caused to rotate intermittently in opposite directions, the bar *p* pushing the whole backwards at one operation, and the tappets drawing them forwards, in the following order: First by *s*, the two bars marked *a*, as shown by fig. 5, by *s*¹ three bars marked *a*¹, by *s*² three bars marked *a*², and by *s*³ three bars marked *a*³. The projecting surfaces *q*, as they travel round, serve to prevent any but those bars with which tappets are in contact from being carried forward. As an illustration, in fig. 5 the bars *a*³ *a*¹ *a*³ *a*¹ are prevented from moving forwards until their respective tappets come into contact with them. Where the coal or fuel used is not of a caking character and the fuel is fed in a thin stream, these projections *q* are not required.

The operation of the several parts of our said fire-grate is as follows: Reciprocating motion (twenty-four strokes per minute answers well) given to the rod *i*, gives an up-and-down motion to the lower frame *j*. At each upward stroke of *j* the pallet *k* causes the ratchet-wheel *m* to make a partial revolution. This motion is given to *n*, and by the wheels *t* *t'* to *r*, by which means the whole of the bars are first pushed backwards by *p*, and afterwards drawn forwards in the manner shown on the drawings, or singly one after the other, or otherwise, as may be desired, the tappets being disposed on *r* so as to produce the required movement.

It will be obvious the fuel-hopper might be dispensed with and the fuel supplied by hand in the ordinary manner, and although we prefer to use the hopper described, we do not claim it as of our invention. It will also be obvious that a space between the back end of the bars and the bridge would be requisite so as to allow incombustible matters to fall into the ash-pit.

Having now described our invention and particularized an arrangement of parts which answers well in practice, we would have it understood that we do not confine ourselves to the exact details shown and described, as many modifications may be made without departing from the leading features of our invention. What we claim, is

1. We claim causing two or more of the bars of which a furnace fire-grate is composed to move together in one direction, and then causing them to move back a less number at a time, substantially as and for the purpose herein set forth.
2. We claim, in connection with the above, the combination of parts herein described, consisting of bars *a*, drums *n* *r*, and their attachments and operating mechanism *i* *j* *k* *m*, or their respective equivalents, adapted for causing bars to move, in the manner substantially as herein set forth.

In testimony whereof we have hereunto set our names in presence of two subscribing witnesses.

WILLIAM ASHLEY WILSON,
JAMES SMITH.

Witnesses:

JOHN P. KING,
JOHN DAVIES.