(No Model.) 2 Sheets—Sheet 1.

E. & A. W. BENNIS.

FURNACE.

No. 528,219. Patented Oct. 30, 1894.

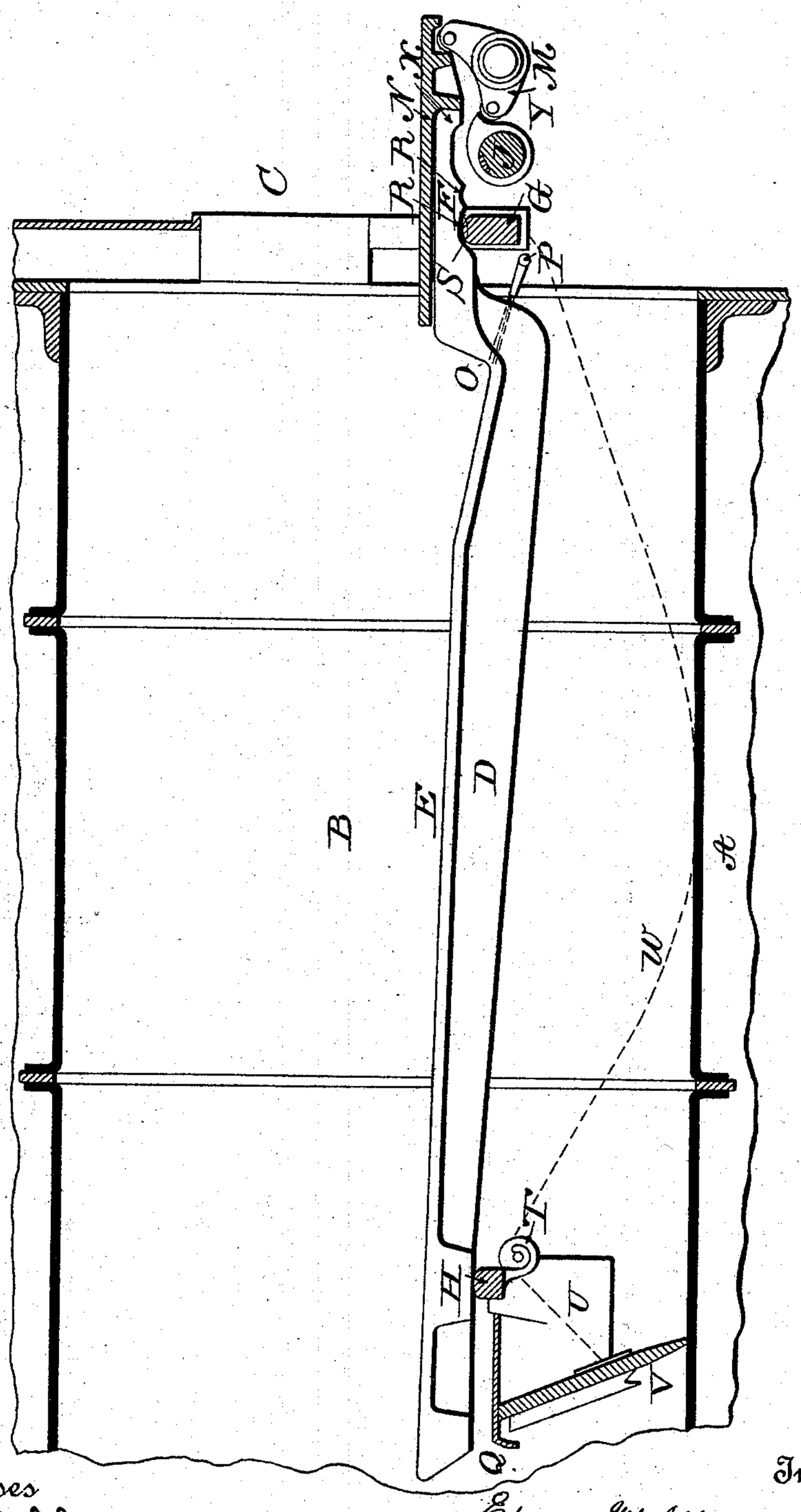

Fig. 1.

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Fig. 5.

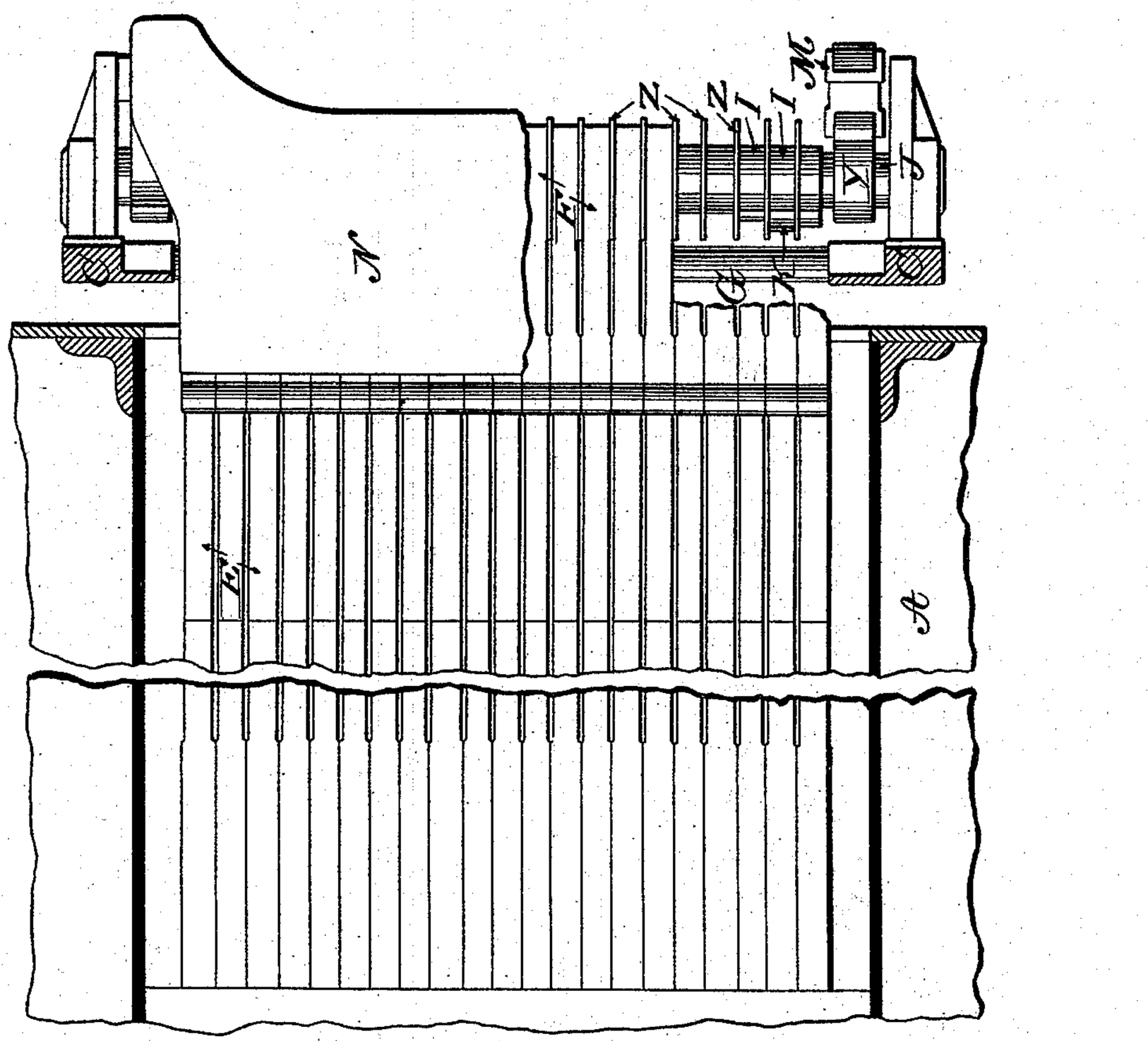


Fig. 2.

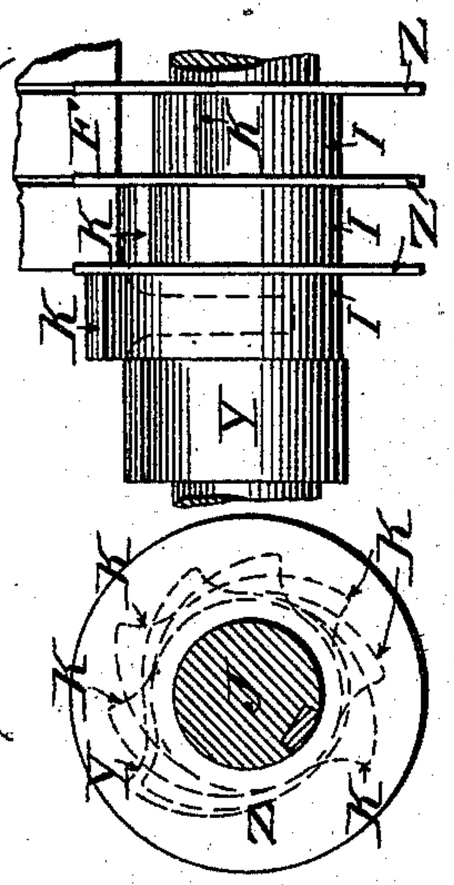


Fig. 3.

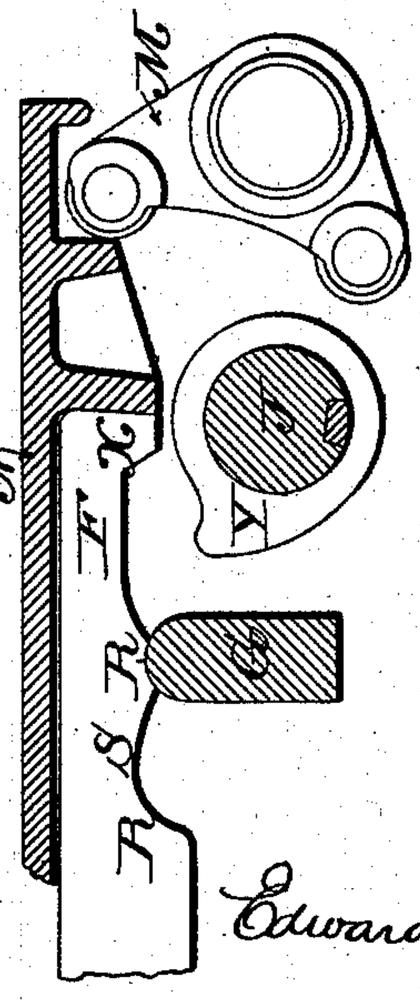
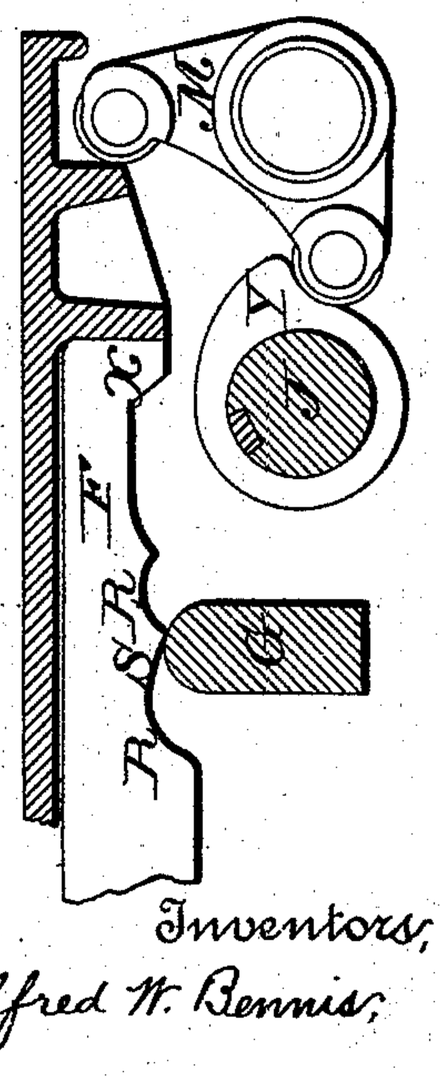


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD BENNIS AND ALFRED W. BENNIS, OF BOLTON, ENGLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 528,219, dated October 30, 1894.

Application filed October 9, 1893. Serial No. 487,696. (No model.)

To all whom it may concern:

Be it known that we, EDWARD BENNIS and ALFRED WILLIAM BENNIS, subjects of the Queen of Great Britain, residing at Bolton, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention has for its object a furnace for use with mechanical stoker firing (small fuel) or with hand-firing, or may be used in connection with the firing of other fuel, such as wood, lignite or patent fuels. The object obtained by the movement and shape of the bars is to automatically move the fuel and clinker to the rear of the furnace, keeping the fire open below, so that the air can enter freely through the air spaces in the bars, and partially breaking up the clinker for the same purpose. It is best described by the aid of the accompanying drawings, in which—

Figure 1 is along a tubular section of a furnace. Fig. 2 is a front view of the section of the bars and the elevations of the cams. Figs. 3 and 4 are enlarged views showing the cams and lever in different positions; Fig. 5, a plan of furnace.

In the drawings—A, is the boiler; B, the flue; C, the furnace front; D, the lower flat or rib of the fire bars; E, the upper surface of the same; F, the front end of the fire bar, which rests upon a bearer, and is the part that moves the rest.

G is the front bearer; H, the back bearer placed in the flue; I, a row of cams on a transverse shaft.

J, is the cam shaft, which carries the cams, both for bringing the bars out and for operating the lever, which, by pressure against the dead plate, pushes the bars in; K, cams showing the one beak by which the bars are moved from the back to the front of the furnace, this movement being from one to three inches or thereabout in length, as may be necessary.

M is the lever by which the bars are pushed into the fire.

N N, is the dead plate against which lever M presses, which dead plate in its turn presses against the end pieces F of the bars, and pushes the bars simultaneously toward the rear end of the furnace the required distance, the bars being brought back one by one by the action of the cams I, keyed upon the cam shaft J.

The cam beaks K, by their pressure against the projections X on the bar ends F, draw the bars away from the rear end of the furnace, and the cams I being arranged on the cam shaft J, the beaks K, slightly behind or before one another, cause the bars to be drawn out in an irregular manner, but only one in a set of eight or ten moving at a time. Thus the clinker and fire are held by a considerable number of bars against the action of one, so that the clinker is necessarily loosened from the bar and gradually left behind; but, as all the bars are pushed into the fire by the action of the lever M, when it is moved by the operating cams Y, and pushes against the dead plate, which in turn pushes all the bars in together, the furnace is carried forward to the rear end, and the whole of the bars moving together, the furnace fuel is acted upon in such a manner that practically none of it is left behind. This action results in the fuel and clinker being gradually moved to the rear end of the furnace. In the meantime, the combustible in the fuel is gradually consumed, and the clinker, with any ashes that may be adhering to it, drops over into a chamber formed behind the end of the bars by placing a bridge two or three feet or thereabout beyond the bar ends, in which chamber the clinker is intended to lie until any unburned fuel adhering to it is completely consumed and only waste left to be removed.

At a short distance inside the furnace door, and just about the end of the dead plate N, the fire bar drops two or three inches or thereabout at O, forming a recess for the purpose of containing a considerable mass of fuel near the front, the object of this mass of fuel being to keep the furnace lighted up at the front and prevent the fire moving away, which would leave only dead fuel when fed by a machine stoker. For the further purpose of keeping the fire bright at this point, a steam jet P is pointed toward the depression under the bar, thus causing a larger amount of air to enter at this point than would do so by the ordinary means.

The dead plate N N covers the bars to near

the point where the depression O takes place, and protects from coal dust and dirt falling from above the mechanism by which the bars are moved in and out, an important point in machine-moved furnace bars.

The head of the bar F, where it rests upon the front bearer G has cast upon it a slant S and two depressions R R, as shown, the intention being to cause the bar to rise a little as it goes into the furnace, and then drop to almost the same point at which it commenced its movement, the reverse taking place when the bar is drawn out. This action has the double use of preventing the bars from moving by the friction of one against another when not drawn by the cams, and also of assisting in the breaking up of the fuel and clinker.

Q is a dead plate; V, a door pivoted on brackets U. This door can be raised at any time by means of chain W, passing over pulley T, or other suitable means.

Z is a washer placed between each cam on shaft J and the next one, and having part of its periphery passing up between the bars. By this means, any possibility of one cam actuating more than one bar is obviated.

The mode of action is as follows:—The shaft J is kept revolving continually or intermittently by means of driving mechanism (which may be in connection with machine stoker). The cams Y press against the levers M, which, in their turn, press against the dead plate N, and this dead plate presses against the ends of the bars F and pushes them all inward together. When the cams Y have moved the levers M, they pass clear of them, and then the series of cams I come into action one after another, pressing against the projections X of the bars, thus drawing them out one by one as already described.

To prevent the cams I from shifting and operating the wrong bar, we make the bar heads at this point slightly narrower, and put between the bars a projecting disk or washer cast on the cam at one side, which, by passing up between the bars, effectually prevents any displacement.

We declare that what we claim is—

1. The combination, with a set of movable fire bars having reciprocating motion, of a depression O near the front, in which the fuel can collect, and a series of steam jets P, pointing upward and backward through the bars near this point.

2. In a set of fire bars, the combination of the transverse shaft J; the cams I having the beaks K fixed thereon; the bars F having the projection X thereon; with the cams Y, levers M; and dead plate N abutting against the ends of the bars, substantially as described.

3. The combination of the revolving cams I having projections K and being fixed on the same shaft J, the washers I placed between the cams and of larger radius than said projections K and the bar continuations F each resting on a cam and separated from each other by the washers I, whereby the action of each cam is confined to its particular bar.

4. In combination with the bearer G having a convex top, a fire bar having two correspondingly shaped but complementary recesses R R below and a point with sloping sides S between, whereby, whenever the bar is pushed in either direction till the point passes the apex of the bearer, the bar shall come to rest at the exact right point, the top of the concavity of the bar resting on the apex of the bearer.

5. In a furnace, the combination of a series of bars, each having at substantially the same point in its length a recess at the front end having a sloping rear with a device for reciprocally advancing the bars collectively and returning them severally, whereby a reservoir of fuel is formed at the front end, and thus the bars are not readily bared at that end by the travel of the fuel.

6. The combination of a shaft J, a series of cams I thereon capable of pushing their respective fire bars backward; with a further cam Y on same shaft, bell crank M and device X F pressing against all the bars and pressed by the bell crank, whereby one shaft can be used to propel the bars backward and forward and lift them up.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses.

EDWARD BENNIS.
ALFRED W. BENNIS.

Witnesses:
W. P. THOMPSON,
G. C. DYMOND.