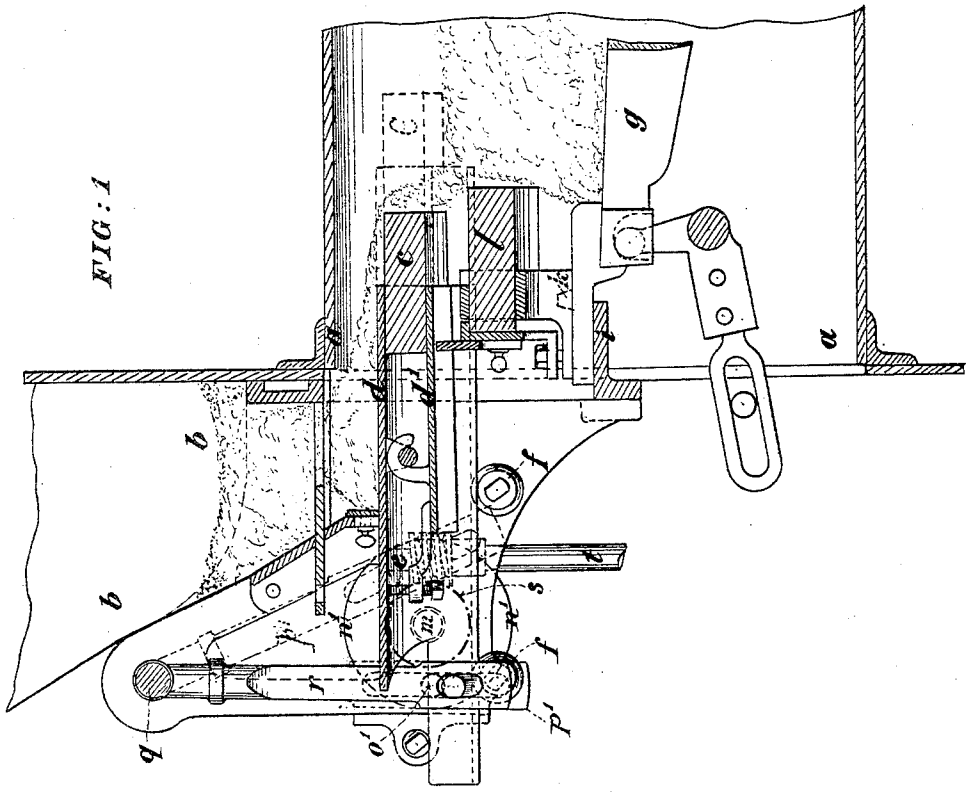
(No Model.) 3 Sheets—Sheet 1.

J. PROCTOR.

MECHANICAL STOKER FOR STEAM BOILERS.

No. 454,379. Patented June 16, 1891.

FIG. 1.



Witnesses.
George Baumann
John Revell

Inventor.
James Proctor
By his Attorneys,
Howson and Howson

(No Model.) 3 Sheets—Sheet 2.

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MECHANICAL STOKER FOR STEAM BOILERS.

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Fig. 2.

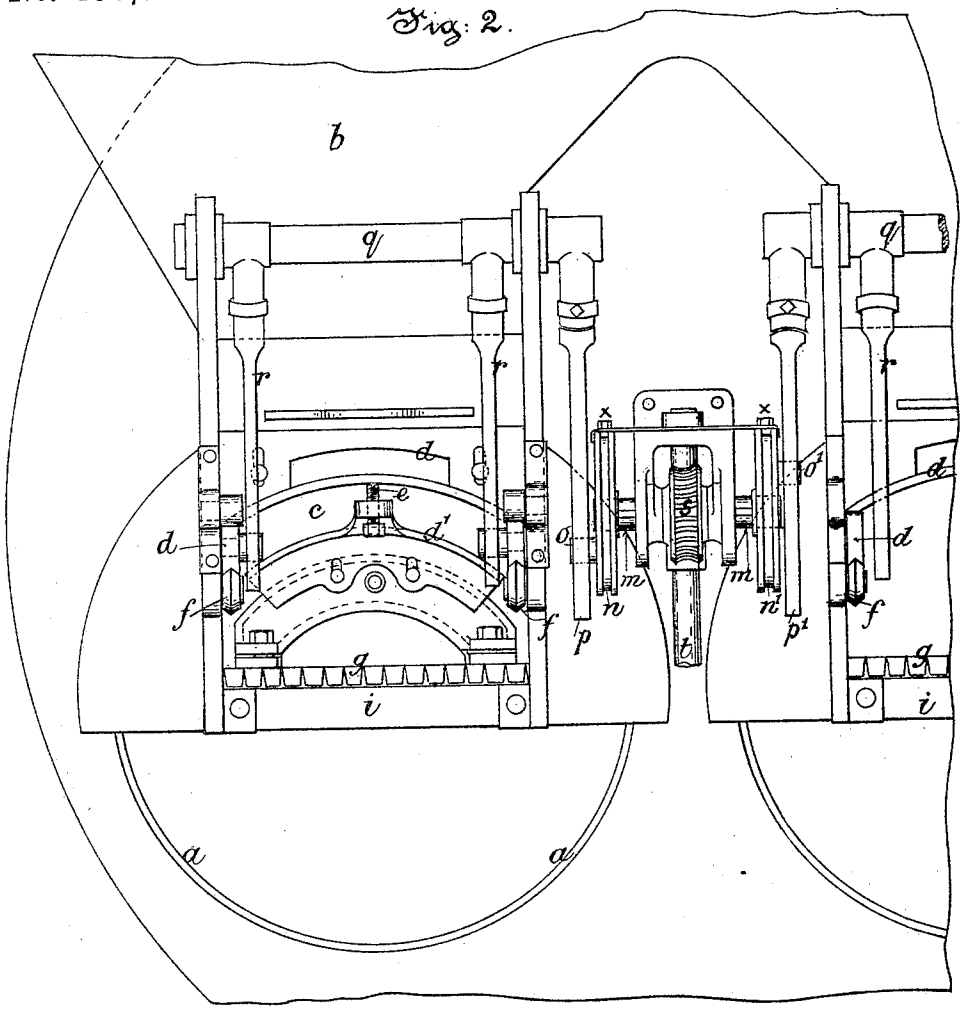
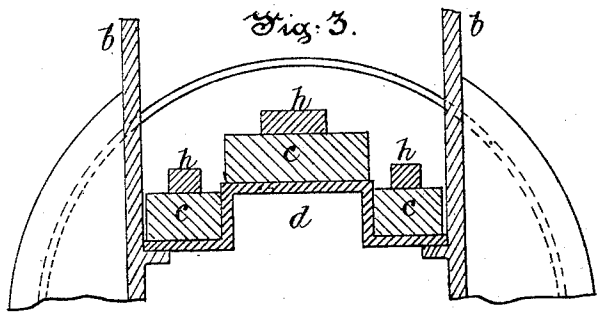


Fig. 3.



Witnesses.
John Revell
S. C. Connor

Inventor.
James Proctor
By his Attorneys
Howson and Howson

(No Model.) 3 Sheets—Sheet 3.

J. PROCTOR.

MECHANICAL STOKER FOR STEAM BOILERS.

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Fig. 4.

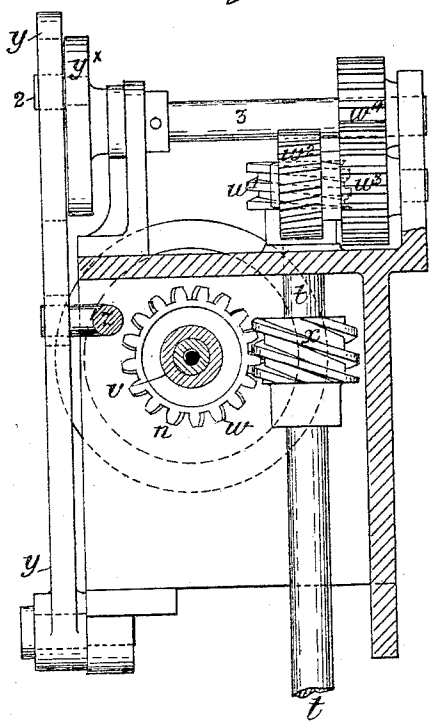


Fig. 5.

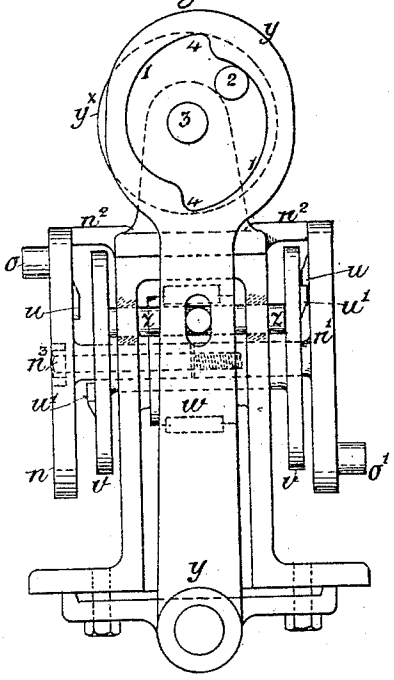
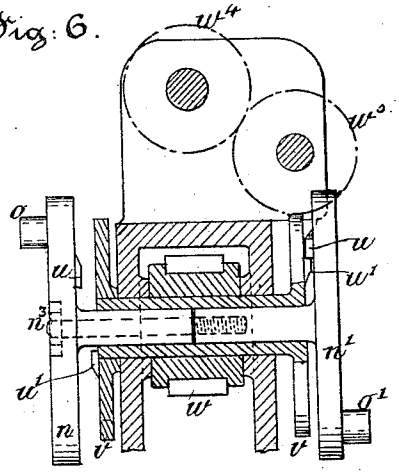


Fig. 6.



Witnesses.
John Revell
S. C. Connor

Inventor.
James Proctor
By his Attorneys
Howson and Howson

UNITED STATES PATENT OFFICE.

JAMES PROCTOR, OF BURNLEY, ENGLAND.

MECHANICAL STOKER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 454,379, dated June 16, 1891.

Application filed August 26, 1890. Serial No. 363,089. (No model.)

To all whom it may concern:

Be it known that I, JAMES PROCTOR, a subject of the Queen of Great Britain and Ireland, residing at Burnley, in the county of Lancaster, England, have invented Improvements in Mechanical Stokers for Steam-Boiler and other Furnaces, of which the following is a specification.

This invention relates principally to mechanical stokers for steam-boiler furnaces wherein the coal or fuel is deposited upon or onto moving or self-cleaning fire-bars in contradistinction to its being thrown or jerked onto the bars.

On the drawings annexed to this specification, Figure 1 is a vertical longitudinal section of the front end of a steam-boiler fitted with my improved mechanical stoker, and and Fig. 2 is a partial front elevation thereof. Fig. 3 is a transverse section showing a modification of the same, and Figs. 4, 5, and 6 are detached views illustrating a modified apparatus for imparting reciprocating motion to the working parts thereof.

a is the front end of the boiler-flue, and *b* is the coal-hopper. Below the open bottom of the coal-hopper *b* and within the mouth of the flue *a* I mount a tile or slab *c* of fire-clay (or by preference a number of bricks or sections) inclosed between two metal plates *d* and *d'* or in a metal shoe. The lower plate *d'* may be hung from the upper plate and can be adjusted thereto, so as to grip the slab *c*, by means of a set-screw *e*.

I prefer to arch the metal plates *d d'* or the shoe, as shown at Fig. 2, to follow the form of the crown of the furnace, or I otherwise raise the central part thereof in the form of a step, as shown at Fig. 3, in order to obtain more heating-surface of fire-clay and better access to the fire for hand-firing and other purposes, and I prefer to make the fire-clay extend about six inches or more farther into the furnace than the metal plates or shoe. This slab, with its plates or shoe, forms a carrier to receive the fuel from the open mouth of the hopper and carry it forward and distribute it onto the fire-bars of the furnace, as hereinafter described. It is mounted on anti-friction wheels or rollers *f* and is capable of moving to and fro from about eight to twelve inches or even more beneath the supply of fuel in the direction of the fire-bars *g*, and as the coal rests upon the carrier it is carried forward by the inward motion thereof, while the coal above in the hopper *b* falls by its own gravity to fill up the space of that which is carried forward, but on the return movement the weight of the rest of the coal behind prevents that which has been so carried forward from returning, and as the carrier recedes this coal will fall by its own gravity over the inner edge of the slab *c*, and will be deposited or spread upon the fire for a distance corresponding with its traverse, thus forming what may be called a "gravitating feed." As the carrier advances again it skims or pushes this fuel (which has been coked) forward, and as it returns again it deposits a fresh supply of fuel in the place thereof, so that the carrier not only supplies the fuel, but also assists the fire-bars in carrying the same forward toward the bridge.

In some cases I make the fire-clay slabs or bricks *c* and their supporting-plate *d* stationary at the bottom of the ram-box, and I mount two or more rams or pushers *h* (see Fig. 3) to move over the said fire-clay slabs or bricks, whereby the coal or fuel is pushed onto the fire-bars *g*, and as I insert the slabs or fire-bricks or tiles from the outside they can be easily removed and replaced. The effect of using these bricks or slabs is that in consequence of their being placed within the furnace they attain an incandescent heat, and the fuel before falling thereupon is considerably heated and upon falling off becomes readily ignited.

I raise or crank up the front ends of the fire-bars *g*, as shown at Fig. 1. Such raised ends extend over and move to and fro above the dead-plate *i* and form a kind of traveling-grid. On two or more of such raised ends of the fire-bars I cast or fix a small projection *k*, taking into a recess in the bottom of an arched doorway *l*, formed of fire-clay, preferably secured in a metal shoe, or the recesses may be in the fire-bars and the projections on the bottom of the doorway, and thus the arched doorway *l* has a reciprocating motion to and fro with the fire-bars. This arched doorway is of great importance on account of the inner end of the tile projecting into the fire and producing a very intense

heat, thereby assisting the combustion. The arched opening therein leaves ample room for manipulating the fire while the machine is at work; but if it is required to fire up by hand this arched doorway *l* can be readily disengaged from the fire-bars and removed.

For moving the fuel carriers or pushers to and fro I mount a short transverse shaft *m* outside the hopper, (see Fig. 2,) and upon this shaft I place two disks or face-plates *n n'*, provided with crank pins or projections *o o'*, acting against two levers *p p'*, which are connected by means of rocking shafts *q* and levers *r* to the respective fuel carriers or pushers of the two furnaces.

The transverse shaft *m* has a worm-wheel *s* fixed at or near its center and driven by a worm *m'*, (shown dotted at Fig. 1,) keyed at the upper end of a vertical shaft *t*, which is driven at a suitable speed by any convenient means.

The disks or face-plates *n n'* are made to slide on feathers or keys upon the shaft *m*, so that either of them may be moved out of the way of its lever if not required to work, and they are preferably grooved round the edge, as shown at Fig. 2, so that they can be held in working position by a set-screw * or otherwise. The crank pins or projections may be so arranged that the two carriers will be caused to work either simultaneously in the same direction or alternately, as may be preferred. When working alternately I sometimes use the mechanism shown at Figs. 4, 5, and 6, in order to reduce to a minimum the time during which the carrier or pusher is projected into the furnace, so as to save as much as possible the wear occasioned by the action of the excessive heat of the fire upon the fire brick or slab, and also to reduce the strain upon the driving mechanism by causing only one of the carriers to be in motion at once, instead of both being in action, the one advancing and the other retiring at the same time. This I accomplish in the following manner: I actuate the carriers or pushers by means of rocking levers moved by pins or projections on revolving disks or face-plates *n n'*, as before; but in this case I mount the latter in such a manner that they can revolve independently of each other, the plate *n* revolving on a pin n^3, screwed into the bush of the plate *n'*. On the inner side of each plate I cast or fix a lug or projection *u*, (or a circular clutch,) and between the two I mount a double clutch *v*, having corresponding projections *u'* or teeth. This double clutch *v* can slide on the bosses of the two disks *n n'*, so that it can be put into gear with either one or the other, and the two disks themselves are held in position laterally by the fixed plate n^2. This double clutch is caused to revolve continuously by a worm-wheel *w* and worm *x* on the shaft *t* or other suitable gear, and its position is governed by a cam-lever *y*, to which it is connected by a sliding bar or rod *z* or otherwise. This cam-lever *y* is mounted between the two disks or face-plates *n* and *n'*, and is provided with an internal cam or slot 1, so formed that a crank pin or bowl 2 on a shaft 3, mounted transversely with regard to the clutches, can move the said cam-lever *y* into one position or the other and retain it there. The cam recess or slot 1 in the lever is made for this purpose with a step 4 at the top and at the bottom, either side being so curved as to form a "dwell" after the lever *y* has been moved from one position to the other. *w'* is a worm on the shaft *t*, actuating a worm-wheel w^2 and carrier-pinion w^3, driving a spur-pinion w^4 on the shaft 3. This gearing is so proportioned that the disks or face-plates *n* and *n'*, which actuate the carriers or pushers, are driven at twice the speed of that which moves the double clutch *v* out of gear with one clutch-plate and into gear with the other, and thus they will work intermittently, one carrier moving to and fro while the other is at rest, and vice versa.

I claim—

1. In combination with the open mouth of fuel-hopper, an arched or stepped carrier moving to and fro beneath the said mouth extending over the fire, carrying the fuel forward on its upper surface on its inward movement and dropping the fuel upon the fire-bars on its return movement, substantially as set forth.

2. In a furnace with moving fire-bars, the combination of a removable arched doorway supported upon the front ends of the fire-bars, which extend upward and forward above the dead-plate, so that the doorway is caused to move to and fro with the moving fire-bars, substantially as hereinbefore described.

3. The combination, with rocking levers for giving motion to the fuel carriers or pushers, of disks or face-plates operated by mechanism substantially as described, and with projections acting on the levers, the said disks or face-plates being made to slide on feathers or keys, so that either of them can be moved into or out of gear with the levers, so as to work either or both of them.

4. In a double furnace, the combination of fuel-carriers adapted to pass into the fire-places and over the fires with mechanism, substantially as described, for imparting a rapid intermittent reciprocating motion to the carriers to reduce to a minimum the time during which the said carriers are exposed to the heat of the furnace.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES PROCTOR.

Witnesses:

CHARLES A. DAVIES,

JNO. HUGHES.