2 Sheets—Sheet 1.

S. REGAN.

FIRE-GRATES FOR STEAM-BOILERS.

No. 194,263. Patented Aug. 14, 1877.

FIG. I.

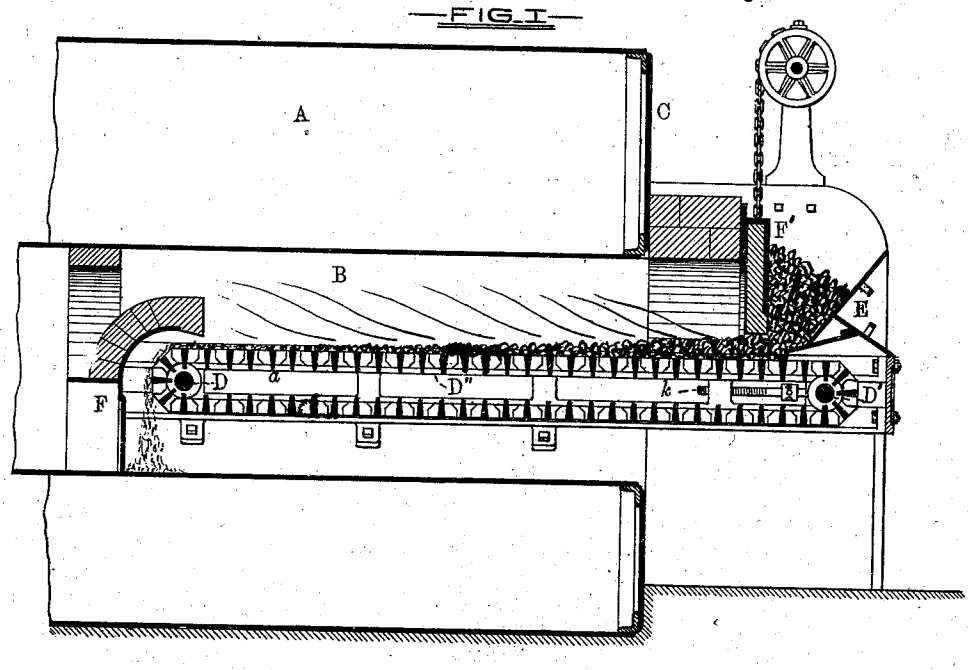
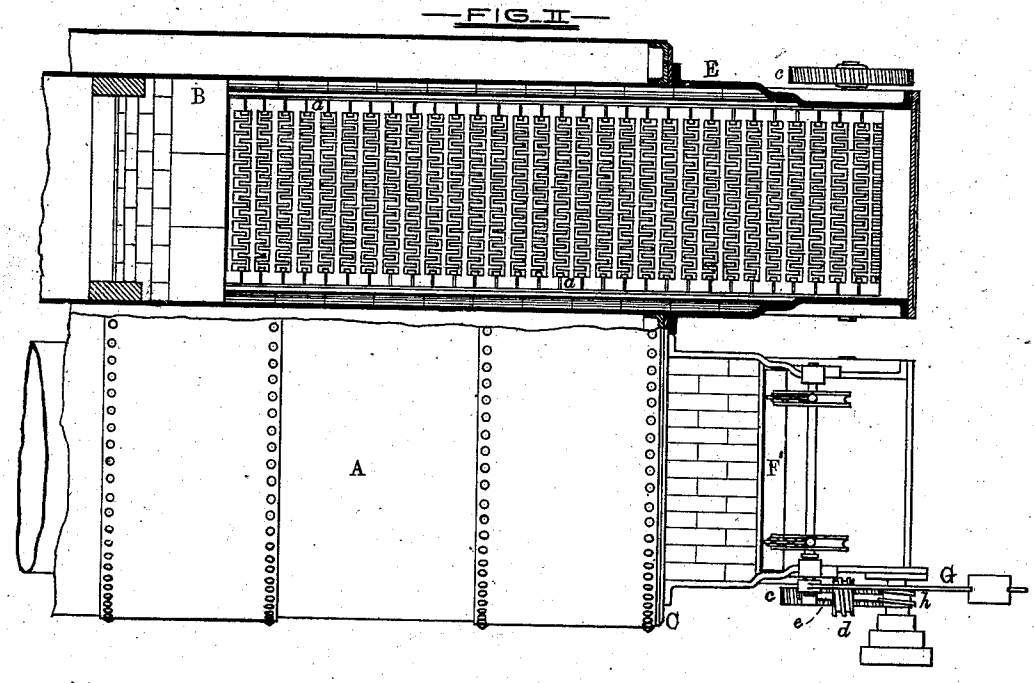


FIG. II.



WITNESSES.

Wm. W. Towson

W. W. Thaxton

INVENTOR.

Simon Regan,

by G. H. & H. T. Howard

Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

2 Sheets—Sheet 2.

S. REGAN.

FIRE-GRATES FOR STEAM-BOILERS.

No. 194,263. Patented Aug. 14, 1877.

FIG. III

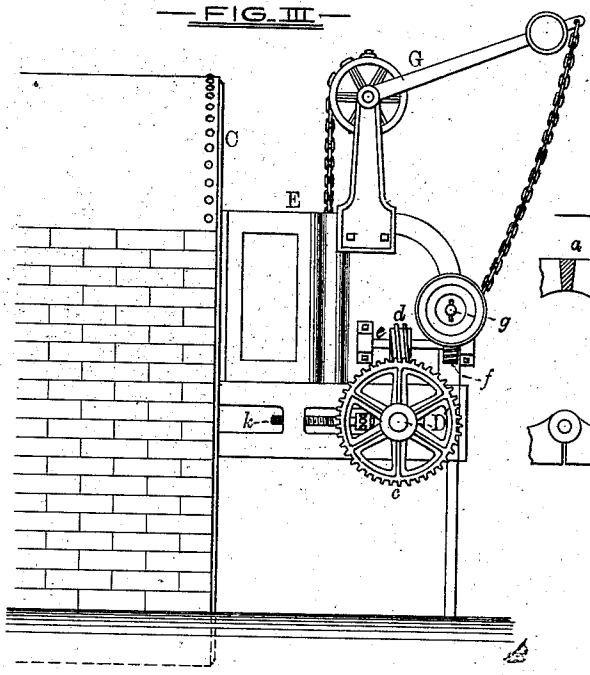


FIG. V

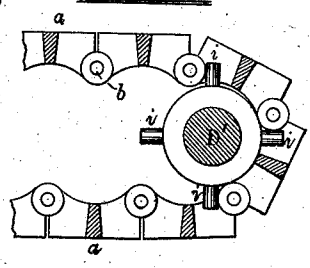


FIG. VI

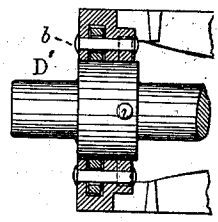


FIG. VII

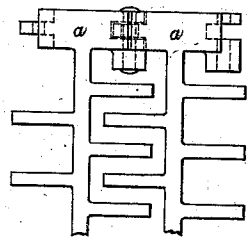
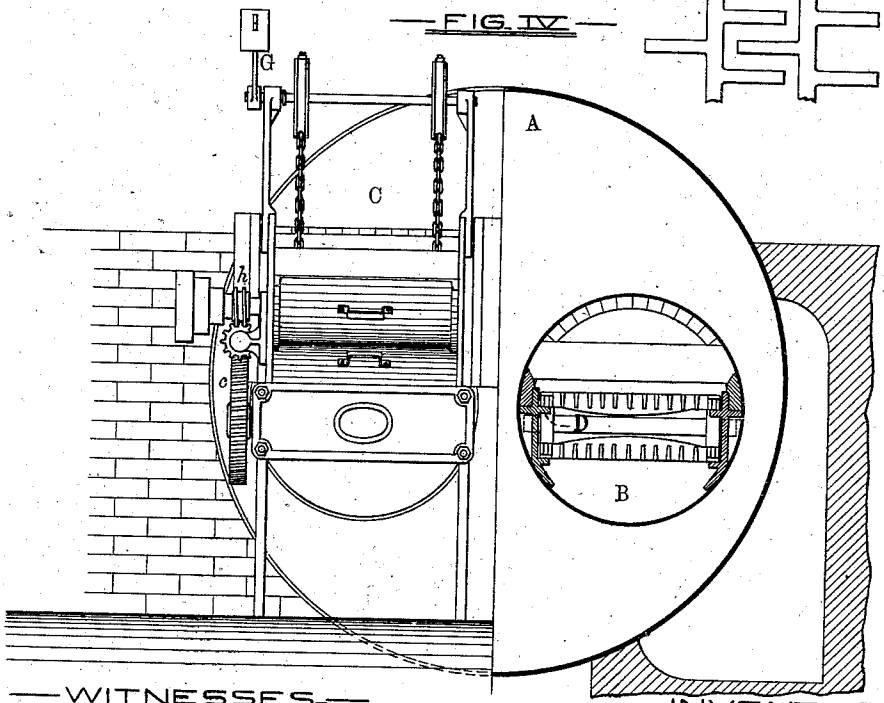


FIG. IV



WITNESSES.

Wm. W. Towson

Edwin H. Howard

INVENTOR.

Simon Regan,

by G. H. & W. T. Howard

Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

SIMON REGAN, OF BOW, ENGLAND, ASSIGNOR OF ONE-HALF HIS RIGHT TO THOMAS GEMMELL, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN FIRE-GRATES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **194,263**, dated August 14, 1877; application filed April 27, 1877; patented in England, December 8, 1874, for fourteen years.

To all whom it may concern:

Be it known that I, SIMON REGAN, of Bow, in the county of Middlesex, England, engineer, have invented certain Improvements in Fire Grates and their Attachments as Applied to Boilers and other Heating Apparatus, of which the following is a specification; and I do hereby declare that in the same is contained a full, clear, and exact description of my said invention, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

This invention relates to certain improvements described in Letters Patent of Great Britain, numbered 4,218, granted to me on the 8th day of December, A. D. 1874, and entitled "Boilers and Furnaces."

My invention has reference to the grates which consist of series of grate-bars attached together at their ends in such manner as to form continuous or endless-chain grates, the said chain-grates revolving over rollers, the front ones of which are driven by means of suitable gearing, to which steam or other power is applied.

My invention further has reference to the grate-charging devices, or the mechanism whereby the fuel is introduced to the chain-grates, and to certain attachments to the furnace and to the chain-grates before alluded to, whereby their efficiency in operation is secured.

In the further description of my invention which follows, reference is made to the accompanying drawing, forming a part hereof, and in which—

Figure 1 is a longitudinal section of a part of a boiler provided with my improvements. Fig. 2 is a partly-sectional plan of the boiler and attachments. Fig. 3 is a side elevation of parts of the improvements; and Fig. 4 is a front view of the invention, a portion of the same being shown in section. Figs. 5, 6, and 7 are views on an enlarged scale of portions of the chain-grates and their attachments.

Similar letters of reference indicate similar parts in all the figures.

A is the shell of the boiler, and B B are the flues, extending within the same from the front head C thereof, to which they are secured. The endless-chain grates before alluded to consist of series of grate-bars *a*, hinged together at their ends, and supported partially within the flues B by means of the revoluble shafts D D′ and the longitudinal frame D″.

The grate-bars *a*, as shown in the drawing, consist of bars having projections on either side, which, when two bars are placed together, are mutually disposed and arranged, as shown—that is to say, the projections on one side of one bar extend between the projections on the opposite side of the adjoining bar—thus, while decreasing the area of the spaces between the bars, giving a well-diffused draft-area to the entire grate, and producing an excellent support for minute particles of coal or other fuel. The bars *a* are linked together, as shown more particularly in Figs. 5, 6, and 7, each bar being provided at one side with single tongues and at the other side with double tongues or grooves, which parts, when the bars are fitted to each other, are interlocked by means of pins passing through the tongues and grooves, and through bosses at the sides of the double joints, as shown in the said figures of the drawing.

Castings F secured within flues, and curved over the rear shaft D of the chain-grate, serve as bridge-walls or deflectors, to partially close or contract the area of the flues, and thereby concentrate the heat from the burning fuel upon the upper inner surfaces thereof. The construction of the ends of the grate-bars *a* is shown in Figs. 5, 6, and 7, and it will be seen that they are connected together by means of pins *b*, which allow the bars to pass freely around the shafts D D′. The shaft D′ are located within boxes E, bolted or otherwise secured to the front of the boiler, and are each revolved by means of a system of gearing from the outer end thereof. This gearing consists of a worm-wheel, *c*, fastened to the shaft D′, and driven by a worm, *d*, on the counter-shaft *e*. The shaft *e* carries a worm-pinion, *f*, which is revolved through the medium of a second counter-shaft, *g*, and a second worm, *h*, secured thereon. The motion of the shaft D′ is communicated to the chain-grates by means of prongs *i* extending from the said shafts, which prongs, as they are revolved, come in contact with the grate-bars. Steam-power is preferably used to operate the chain-grates. The second counter-shafts are therefore provided with cone-pulleys, to be used in connection with a

driving-belt. F′ F′ are charging doors or dampers, adapted to have a vertical movement within the boxes E, a portion of each of which is adapted as a receptacle for a supply of coal.

The charging-doors are elevated to allow of the admission of coal to the chain-grates by means of weighted levers G, fastened to shafts carrying chain-wheels, from which chains extend to the said doors. The distance between the shafts D D′ is adjusted to suit the length of the chain-grates by means of screws *k*, fitted to turn in threaded projections on the frames D″, which support the chain-grates between the shafts, as aforesaid.

The manner in which the flues are supplied with fuel is as follows: The coal-receptacles having been filled and the chain-grates set in motion, the charging-doors are elevated to such height as will admit of the deposit of a layer of coal upon the grates of the required thickness. The coal is thus carried along the flues, the speed of the grates being such as to allow of the coal being reduced to ashes before its deposit to the lower portion of the flues by the passage of the grates around the shafts D.

Having thus described my invention, what I claim as new, and wish to secure by Letters Patent of the United States, is—

1. The endless-chain grate consisting of the series of grate-bars *a*, hinged together at the several points *b*, the longitudinal grate-supports D″, and the shafts D D′, having prongs *i*, engaging the chains, as shown, combined in a boiler with a mechanism imparting movement to the chain-grates, substantially as specified.

2. Combined in a boiler, an endless-chain grate consisting of grate-bars, hinged together as specified, a front inclined fuel receptacle or feeder, and a vertically-adjustable feeding-door, as described.

3. The endless-chain grate of the boiler, combined with the longitudinal supports D″ and the screws *k*, working in threaded projections thereon, and adjusting the shaft D′ of the said endless-chain grate, substantially as described.

4. The endless grate consisting of a series of grate-bars linked together, substantially in the manner specified, combined in a boiler with a moving mechanism, consisting of the worm-wheels *c*, *d*, *f*, and *h*, and shafts D′, *e*, and *g*, the latter carrying the driving-pulley, as shown and described.

5. The grate-bars *a*, having projections at either side thereof, and tongued and grooved joints for attachment to each other, as specified.

6. The combination of a series of grate-bars, *a*, having interjacent projections and tongued and grooved joints, with pins for making the said series of bars endless when attached, as described, and for the purpose specified.

In testimony whereof I have hereunto subscribed my name this 27th day of February, in the year of our Lord 1877.

SIMON REGAN.

Witnesses:

JAMES JOHN LECORY,

AUG. L. PICAUD,

Clerks to Messrs. Comerford & Co., Public Notaries, 7 Takenhouse Yard, London.

2