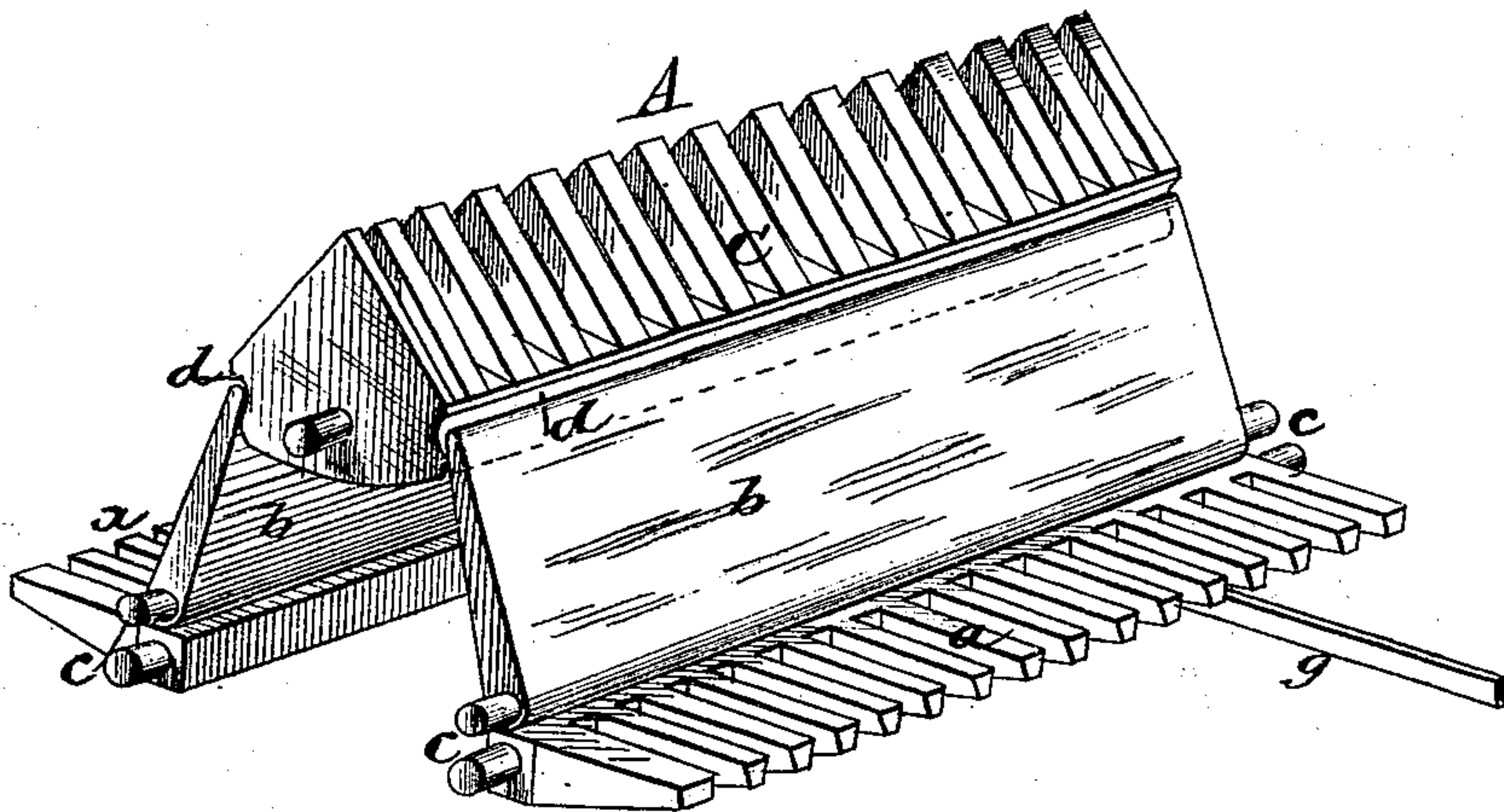


B. HERSHEY.  
GRATES FOR FURNACES.

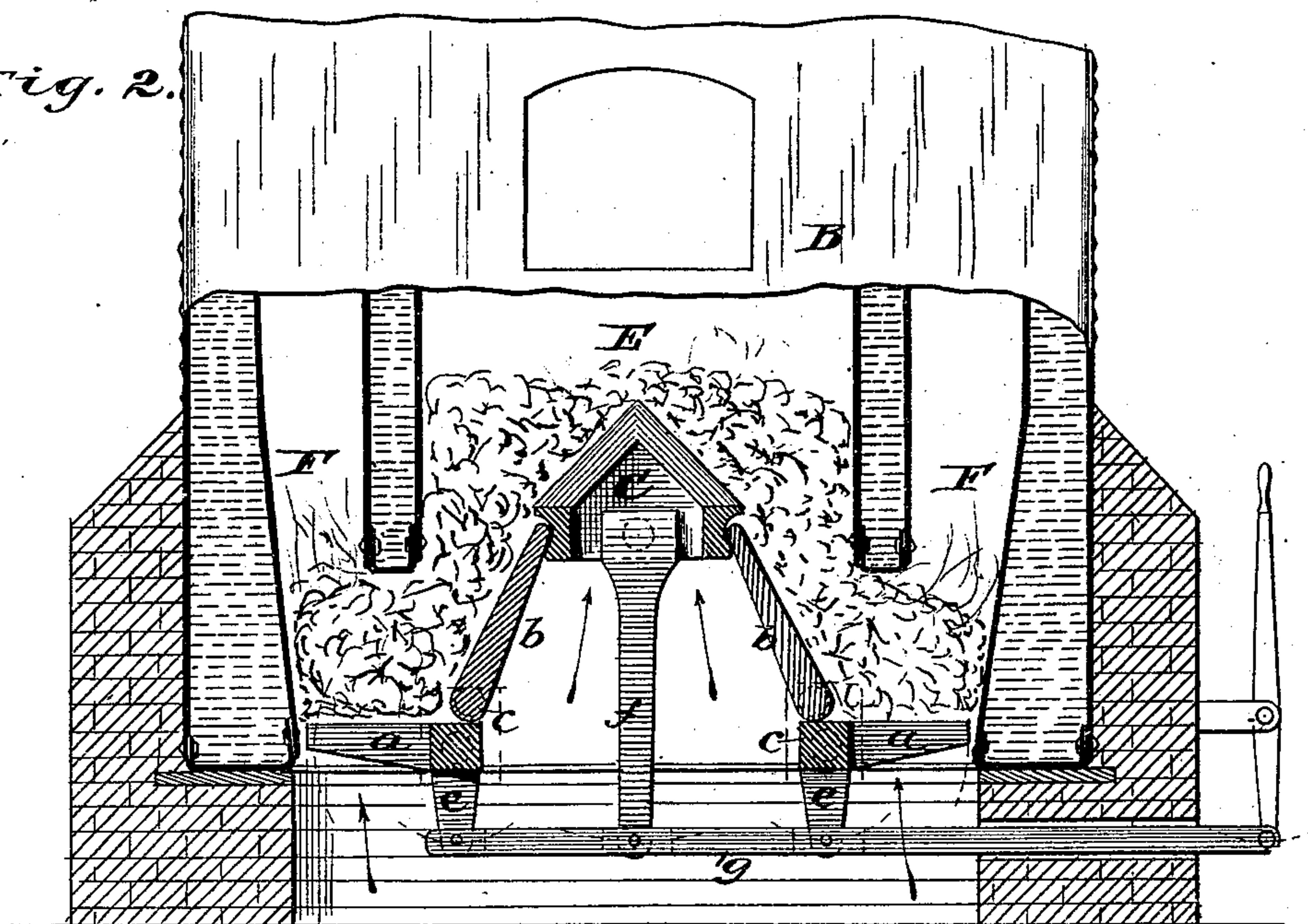
No. 189,218.

Patented April 3, 1877.

*Fig. 1.*



*Fig. 2.*



*Attest:*  
*H. B. Perrine*  
*J. S. Coomer*

*Benj. Hershey.*  
*Inventor.*  
*James L. Norris.*  
*Attorney.*

B. HERSHEY.  
GRATES FOR FURNACES.

No. 189,218.

Patented April 3, 1877.

Fig. 3

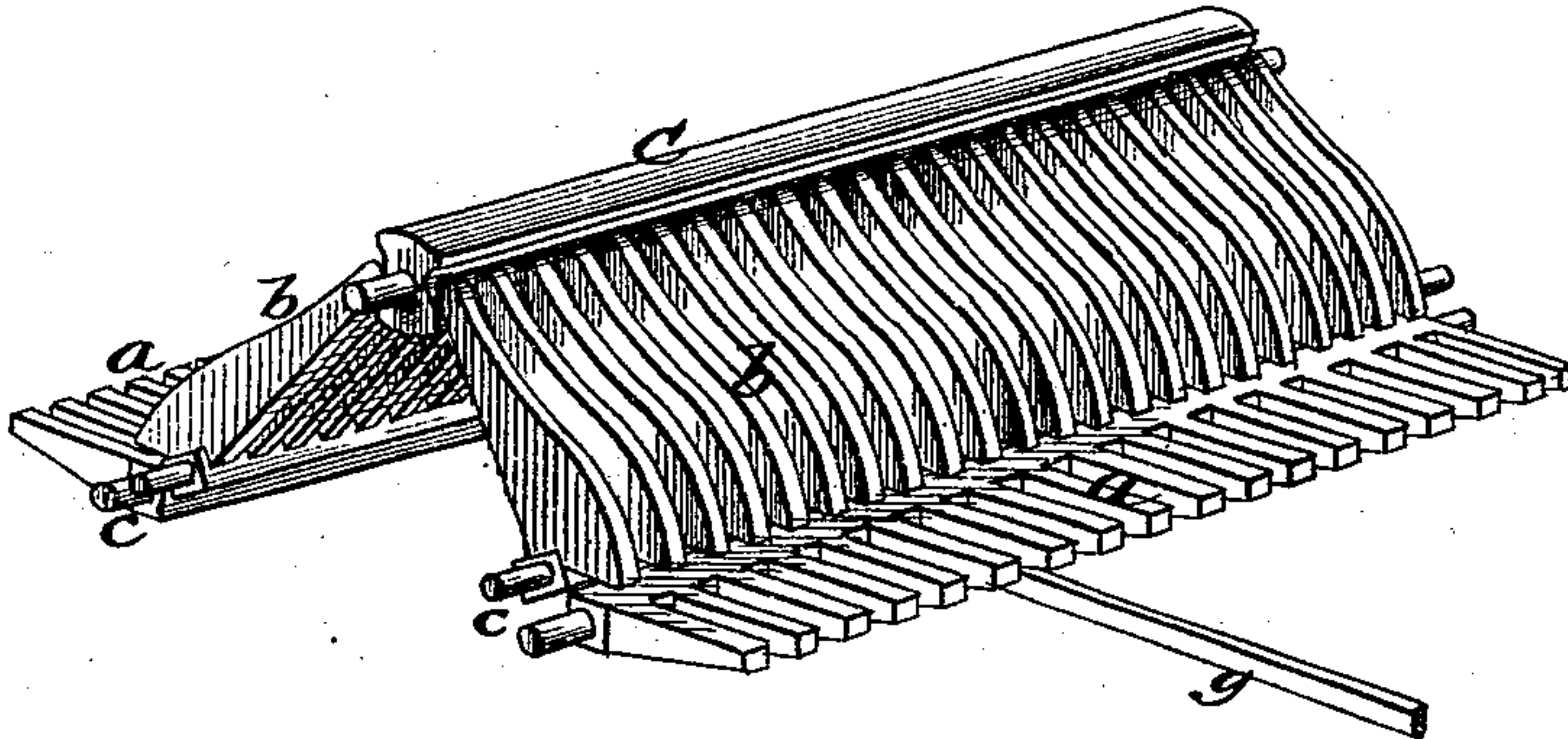
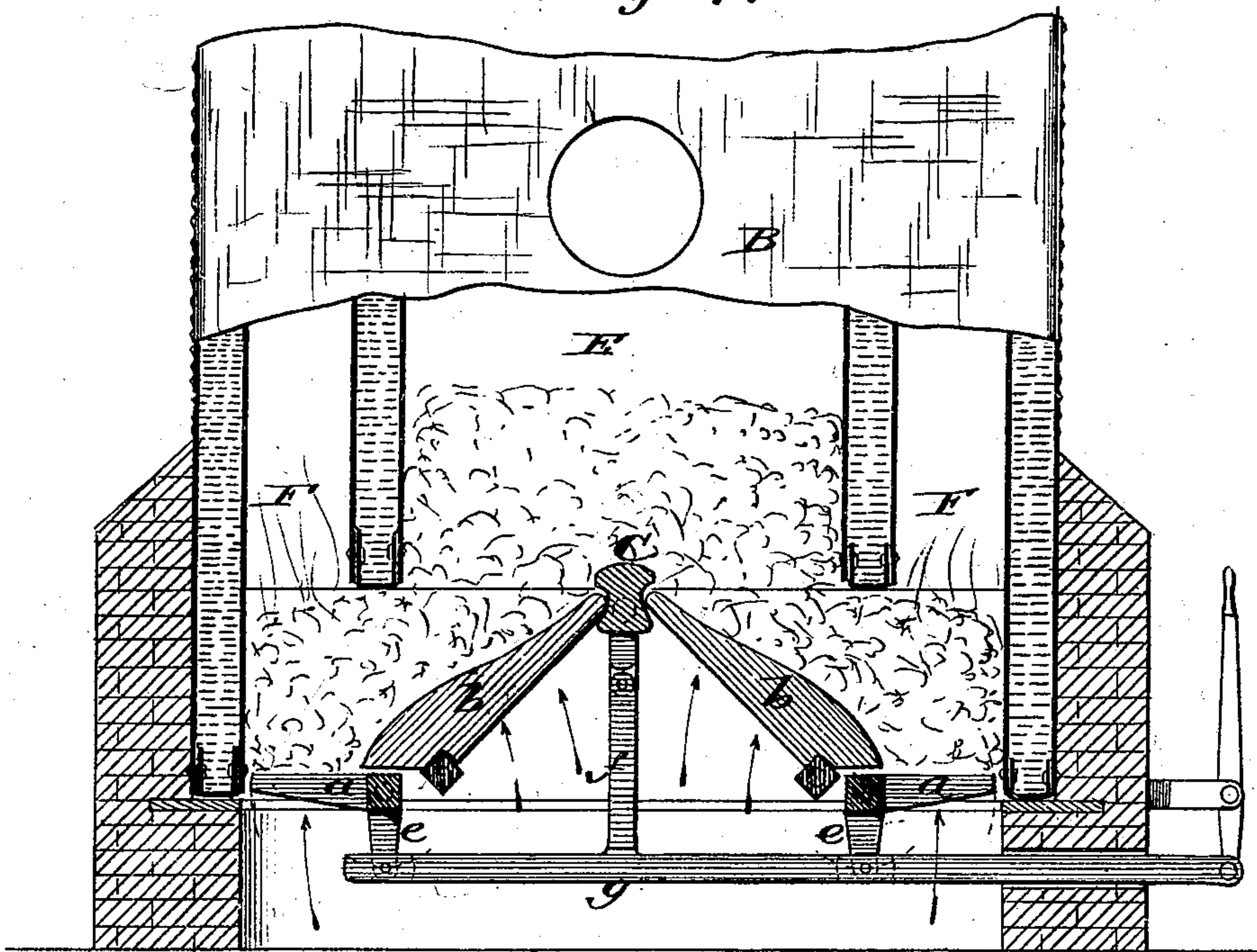


Fig. 4.



Attest:  
H. L. Perrine  
J. L. D. Soule.

Benj Hershey.  
Inventor.

By James L. Norris.  
Attorney.



# UNITED STATES PATENT OFFICE.

BENJAMIN HERSHEY, OF ERIE, ASSIGNOR OF ONE-HALF HIS RIGHT TO  
JOHN E. SHAW, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN GRATES FOR FURNACES.

Specification forming part of Letters Patent No. **189,218**, dated April 3, 1877; application filed  
February 20, 1877.

*To all whom it may concern:*

Be it known that I, BENJAMIN HERSHEY, of Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boiler Furnace-Grates, of which the following is a specification:

This invention relates to certain improvements in grates for steam-boiler and other furnaces.

The invention is designed particularly to be employed in connection with that class of boiler-furnaces constructed with inner and outer water-legs, but may be employed with advantage in other varieties of furnaces; and its object is to produce a grate in which the fuel may be distributed from a fuel-chamber proper above said grate automatically over the fire-bed of the grate in such relative position to the interior portions of the combustion-chamber as to insure the most perfect and thorough combustion.

This is accomplished by the peculiar construction of the grate, which has an elevated central portion, upon which the raw fuel partly rests in such manner that the coked fuel will be fed down upon the grate at each side, so as to give a thinner body of the fuel for the draft to pass through at the point where the raw fuel comes in contact with such draft, thereby insuring a more thorough coking of the fuel, and a more perfect consumption of the first products of combustion before the charred portions settle down into the grate-space proper.

My invention consists of a compound grate composed of two inclined grates or sections combined with two horizontal grates located in the lower part of the fire-chamber, the highest portion of the inner or inclined sections or grates standing about on a level with the lower portions of the inner water legs or walls of the fuel-chamber proper, forming a breaker to support and disintegrate the superincumbent mass, and give it a tendency to move down upon the inclined sections or grates, which form a junction with the lower or horizontal sections or grates, upon which the coked fuel finally rests. The inclined grates or sections at their upper ends rest against and are

supported by a central breaker, which, as well as the various sections of the grate, is capable of a vibratory motion, as more fully hereinafter set forth.

In the drawing, Figure 1 represents a perspective view of my improved grate detached from the furnace; Fig. 2, a transverse vertical section of a furnace, showing my improved grate; Fig. 3, a perspective view of a modification of my improved grate, and Fig. 4 a transverse vertical section of a furnace, showing such modified form of the grate.

The letter A represents the grate, composed of the horizontal sections *a a* and the inclined sections *b*, each supported in the lower part of the fire-chamber of the furnace B upon studs or pivots *c*, which admit of a proper vibratory motion of the said grates. The upper edges of the inclined sections *b* rest upon shoulders *d*, formed on each side of a breaker, C, which is located between said inclined sections upon pivots or studs at each end, and is also capable of a vibratory motion, so as to move with the sections when they are put in motion.

The inclined sections *b b* of the grate may be either made solid, as shown in Fig. 1, or slotted, as indicated in Fig. 3, the horizontal sections being invariably slotted. In case the sections *b* are made solid, as indicated in Fig. 1, the breaker C is made of considerable width, with inclined slotted sides, to form a passage for the air from below into the upper part of the fuel, so as to insure the thorough ignition and combustion of the gaseous parts of the fuel before it is coked and passes below, the inclined sides preventing the formation of air-spaces between the fuel, and consequent irregular combustion.

The inclined sections *b* are preferably made of fire-brick or other refractory material, which is of great advantage, as they are in the position where the most intense heat is produced, and would otherwise soon be destroyed.

In the modification shown in Fig. 3 said breaker may be constructed in the form of a narrow solid bar, the openings in the inclined slotted sections *b* serving to admit the air to the upper part of the burning fuel.

The lower horizontal sections *a a* of the grate and the central breaker are connected,



by means of suitable levers *ef*, with a rod, *g*, passing out through the furnace-walls, or with other suitable mechanism, by means of which a vibratory motion may be imparted to the grate to shake the same, in order to distribute the fuel and discharge the ashes, when necessary.

The furnace B is constructed with an inner fuel-chamber or magazine, E, which extends over the inclined sections of the grate, and forms, with the outer walls of the furnace, two flues, F F, one over each of the horizontal sections. The walls of both the furnace and said fuel-chamber are preferably constructed as represented, so as to form water-legs to the boiler, for the purpose of economizing the heat, and more rapidly and effectually generating steam. The inclined sections *a a* are so located with respect to the lower end of said fire-chamber as to be on, or nearly on, a horizontal line with the same, the lower edges of said inclined sections forming a junction with the inner edges of the horizontal sections *a a*, so as to naturally cause the coal, as it is coked and consumed, to fall toward said horizontal sections, admitting fresh fuel from the fuel-chamber above.

As thus constructed, it will be seen that the raw fuel as it passes from the fuel-chamber is in a much thinner body than immediately below where it rests upon the horizontal and inclined grates, thus providing for a more perfect passage of air at the point most necessary to consume the gaseous products of combustion, which are given off almost entirely from

the freshly-ignited fuel, the coking-fuel gradually packing down into a denser mass, and retarding the passage of air where a less quantity is required, thus automatically regulating the consumption of the fuel with the greatest nicety; and as the fresh fuel is gradually fed in from the fire-chamber, as required, it will be evident that the charging of the furnace with the raw fuel will in nowise interfere with its effective operation.

The construction shown in Fig. 1 of the drawings is in the most cases preferable, for the reason that the inclined solid sections form solid heated back walls to the combustion-chamber, and serve to retain the heat, and by lessening the amount of grate-surface overcome the danger of heating the grates in actual use, while they act as inclines, over which the fuel can slide downward, and admit fresh fuel to the combustion-chamber.

What I claim, and desire to secure by Letters Patent, is—

In a grate-furnace, the combination of the horizontal sections *a a*, the inclined sections *b b*, and the central independent breaker G, the whole arranged to operate and distribute the fuel, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

BENJAMIN HERSHEY.

Witnesses:

GEO. P. GRIFFITH,  
D. E. BURTON.