

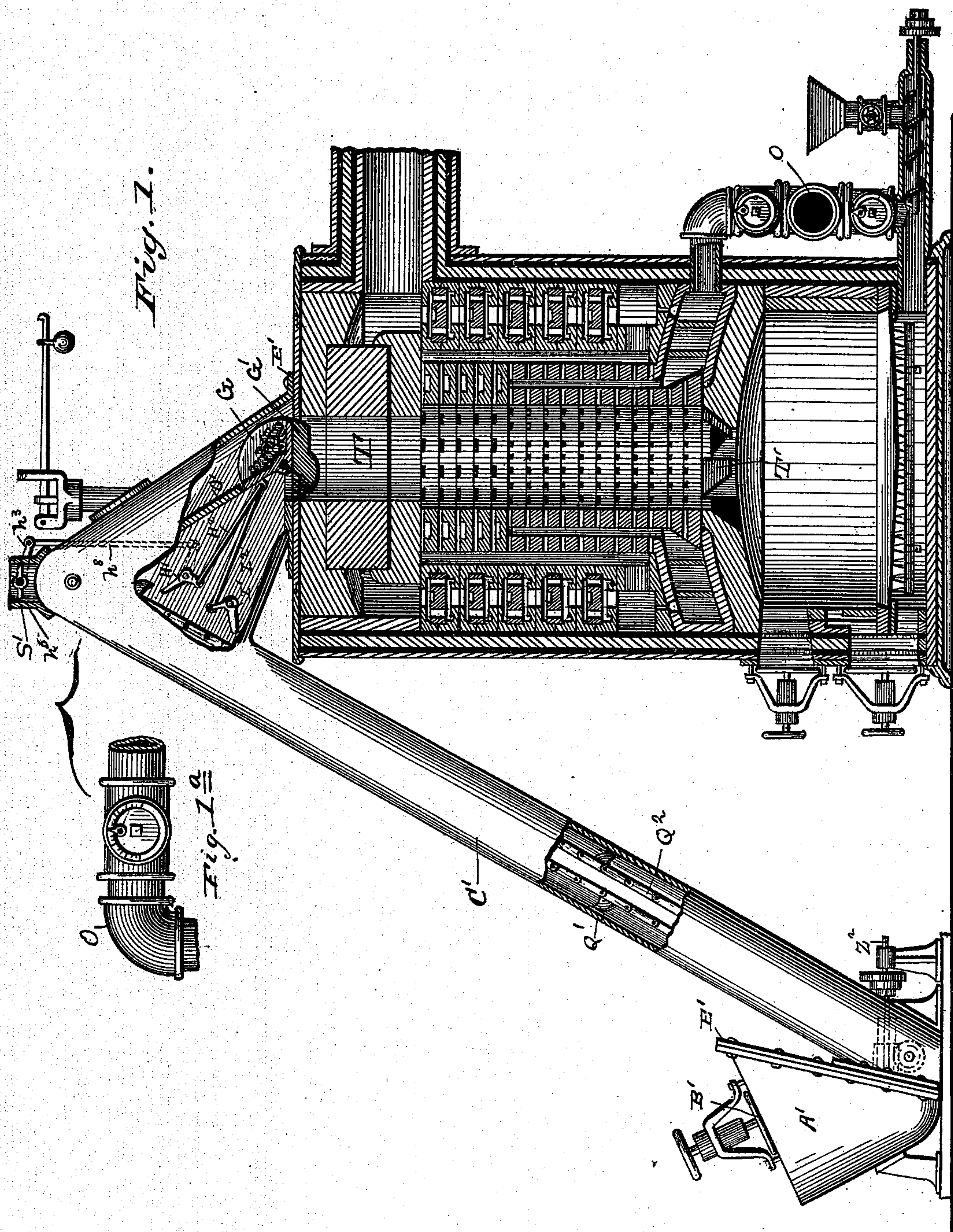
(No Model.)

3 Sheets—Sheet 1.

V. W. BLANCHARD.  
FUEL FEEDER FOR FURNACES.

No. 413,902.

Patented Oct. 29, 1889.



WITNESSES

*Phil C. Dietrich*  
*A. E. Dowell*

INVENTOR

*Virgil W. Blanchard*  
By *his Attorney*  
*W. Alexander*



(No Model.)

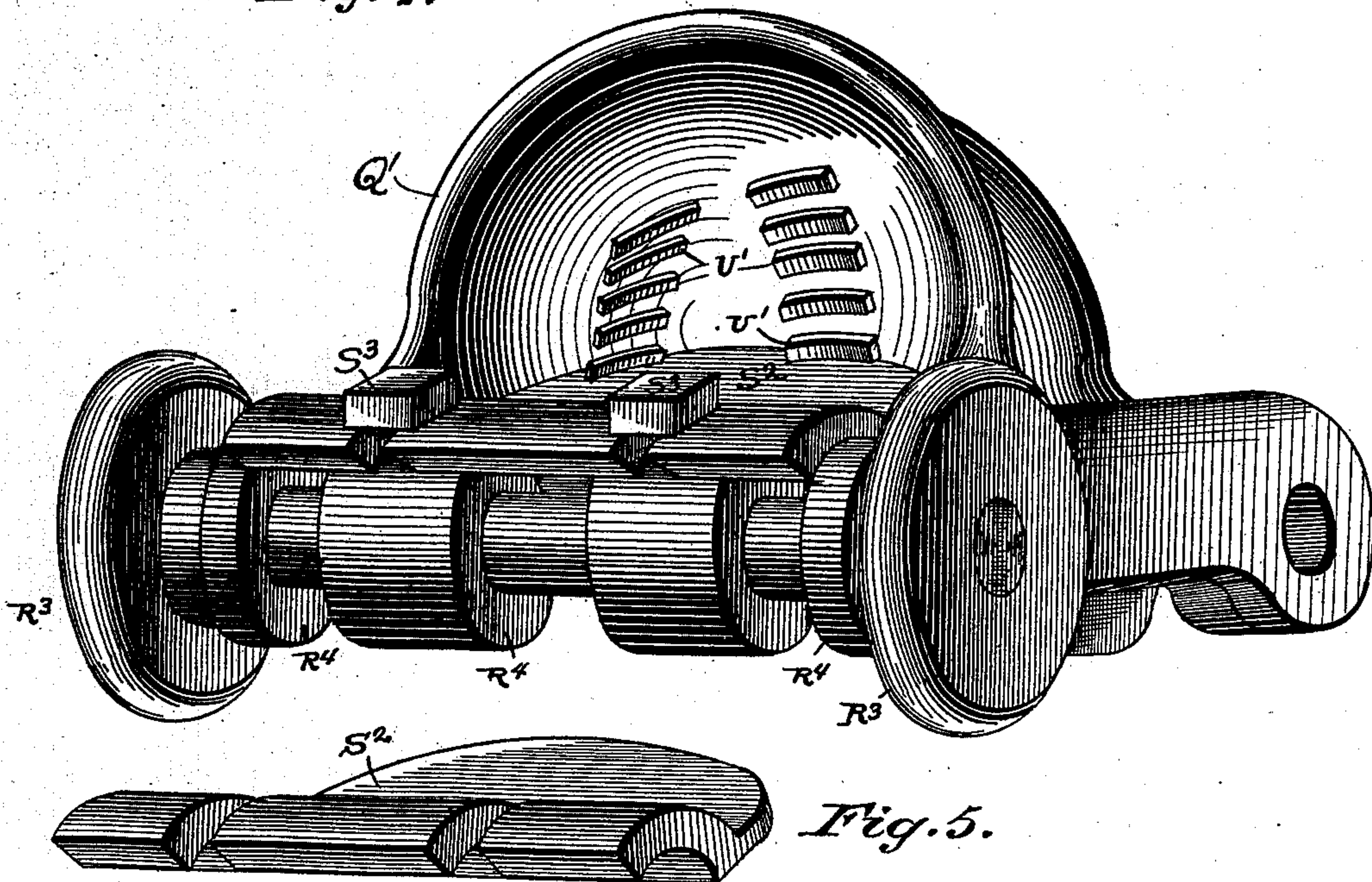
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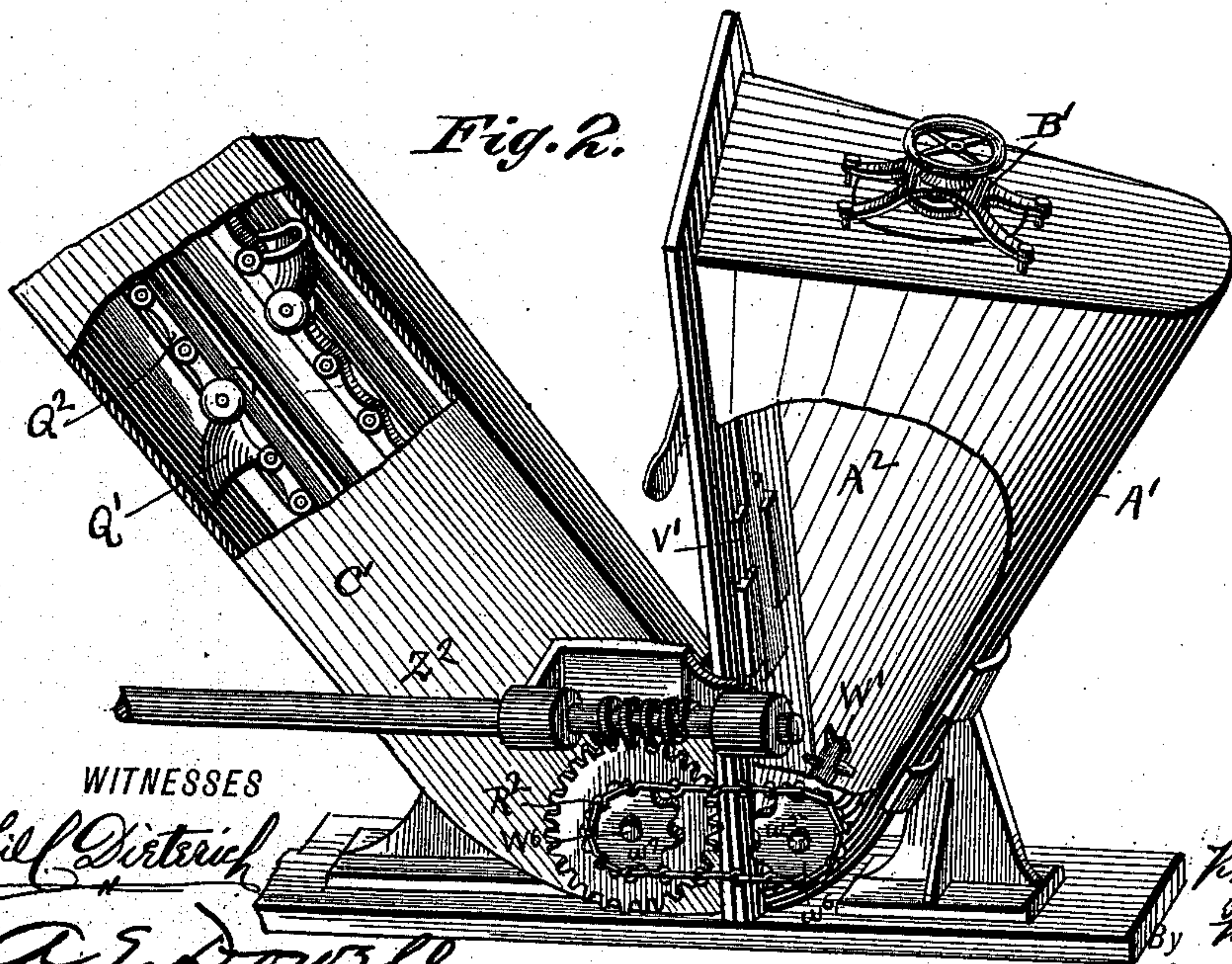
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*Fig. 4.*



*Fig. 5.*

*Fig. 6.*



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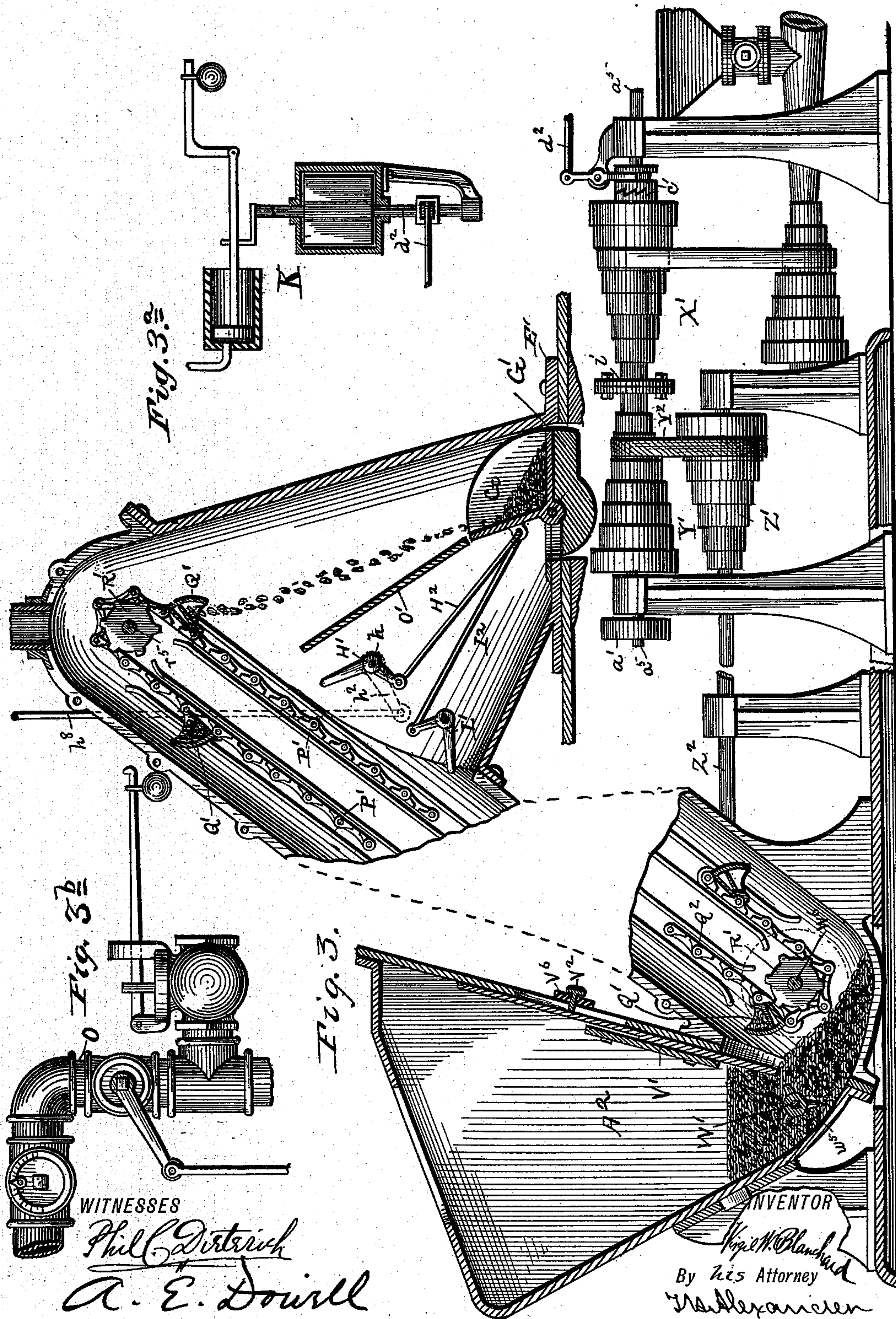
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# UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y., ASSIGNOR TO JOSEPH A. DAVIS, OF SAME PLACE.

## FUEL-FEEDER FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 413,902, dated October 29, 1889.

Application filed April 5, 1889. Serial No. 306,071. (No model.)

*To all whom it may concern:*

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Fuel-Feeders for Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification, in which—

Figure 1 is a section taken diametrically through one of my improved furnaces, showing a fuel-feeder applied thereto. Fig. 1<sup>a</sup> is a detail view of the blast-pipe. Fig. 2 is a perspective view in detail showing part of the fuel-feeder whereby I automatically feed fuel. Fig. 3 is a sectional detail in elevation of my improved fuel-feeder. Fig. 3<sup>a</sup> is a detail of the automatic regulator. Fig. 3<sup>b</sup> is a detail of the pipe supplying air to the top of the fuel-elevator casing. Fig. 4 is a perspective view of my bucket and its guide-rollers. Fig. 5 is a perspective view of a bucket-coverer.

My object mainly is, first, to supply the fuel-chamber of a furnace with the minimum quantity of fuel at regular intervals, so that I compensate for the loss which is constantly taking place incident to the process of combustion; second, to cause such supply of fuel without cooling the furnace or diminishing the gas-pressure therein.

While my invention is applicable to furnaces generally it is especially applicable to furnaces wherein air is forced into them under pressure. Such a furnace is fully described by me in my Letters Patent, numbered 289,963, dated December 11, 1883.

In order to fully explain my invention, I show in Fig. 1 one practical application of it. It will be seen that a cylinder or conduit extends upward from the fuel-chamber to a fire-brick valve G' in the massive fire-brick roof of the furnace, so that fuel discharged into the cavity beneath by a downward vibration of said valve will be delivered through the central passage T upon the grate or incandescent bed of fuel thereon. By means of the chutes or inclined planes formed in the

roof or dome of the fire-chamber the charges of fuel dropped from the valve G' will be evenly distributed.

If fuel is continuously fed upon the upper surface of the aforesaid valve G', it is evident that by depressing and elevating the same at short intervals of time, controlled by means hereinafter explained, said fuel will be supplied regularly to the fire-chamber.

A' represents the gas-tight fuel-receptacle; B', the door hermetically closing this receptacle; C', the gas-tight conduit containing the elevating mechanism, consisting, essentially, of an endless chain and coal-elevating buckets, hereinafter fully explained in detail.

It will be observed that the outlet of the casing, at the lower extremity of its upper descending portion, is provided with a flange E', by means of which and bolts it is firmly secured to the capping-plate of the furnace-wall, forming at said connection a gas-tight joint. By this means the cavity within the conduit or casing of the elevator is made continuous with the central passage T of the furnace by oscillating the fuel-discharge valve G', by which they are separated.

S' represents a blast-pipe, which is suitably connected with the main blast-pipe O, (the connection not being shown,) and which enters the tube or casing C' at its upper angle, by means of which pipe a current of fresh air is delivered into its interior under pressure derived from a blower. This air passes downward into the central cylindrical cavity of the furnace through the loose joint between the fire-brick valve G' and the opening which it fits freely. By means of this blast the upper part of the casing C' and the mechanism therein are kept comparatively cool, while at the same time the blast assists in driving the fuel into the furnace when valve G' is opened. The blast also supplies the hydrogen point or zone of combustion in the top closed chamber of the furnace with fresh oxygen from above to complete its combustion.

The devices for elevating and feeding the fuel into the furnace are as follows:

A<sup>2</sup> designates a fuel-receptacle beside the furnace, having a feed-opening, which may be hermetically closed by a door B', and com-



communicating with the lower end of casing C' through an opening closed by an adjustable gate V', operated by a pivoted lever V<sup>6</sup>, engaging a headed stud V<sup>2</sup>, projecting through a slot in receptacle A<sup>2</sup>. In said receptacle is mounted an agitator-wheel W', the shaft w<sup>5</sup> of which extends outside the receptacle and is provided with a sprocket-wheel w<sup>6</sup>, operated by a chain from a sprocket w<sup>7</sup> on a shaft W<sup>6</sup>, journaled in the lower end of casing C', and which is operated by worm-gearing from a horizontal shaft Z<sup>2</sup>. On the other end of shaft Z<sup>2</sup> is a cone-pulley Z', driven by a belt Y<sup>2</sup> from a cone-pulley Y' on another shaft a<sup>5</sup>, which shaft is driven by a pulley a', belted to the main engine. (Not shown in the drawings.) Another cone-pulley X' is mounted on shaft a<sup>5</sup> and connected to cone Y' by a joint i. Both pulleys Y' and X' turn loosely on shaft a<sup>5</sup>, but may be locked thereto by a clutch c', which is operated by means of a rod d<sup>2</sup>, connected to a steam-governor device K, (indicated in Fig. 3,) by which the clutch is thrown into or out of engagement at a predetermined steam-pressure, so that the feeding of fuel is automatically regulated thereby to feed the fuel when below this pressure and cut off feed when the pressure exceeds the amount desired.

R' is a sprocket-wheel mounted on shaft W<sup>6</sup> in the lower end of casing C', and a similar sprocket-wheel R' is mounted on the shaft w<sup>5</sup> in the upper end of the casing, and on these sprockets is an endless carrier-chain Q<sup>2</sup>, which will be carried through the coal or fuel fed into the lower end of the casing from receptacle A<sup>2</sup>.

Q' Q' designate elevating-buckets secured on chain Q<sup>2</sup>, and clearly shown in perspective, Fig. 4. Each bucket has an adjustable bottom, (shown detached from the bucket in Fig. 5,) by means of which the capacity of the bucket to carry fuel is varied. By loosening the set-screws S<sup>3</sup> the bottom S<sup>2</sup> may be set free and its rounded end can then be engaged with any one of a series of notches formed between lugs U' in the interior of the bucket and fastened rigidly in the adjusted position by tightening the said screws. In securing each bucket to its truck that supports the endless chain Q<sup>2</sup> in its journey in the tube or casing C' it will be observed that the axle of the truck between its wheels R<sup>3</sup> R<sup>3</sup> passes through ears R<sup>4</sup>, that spring from the lateral walls of said bucket, thus forming a simple and strong hinged connection.

P' P' are channels or ways in the side walls of casing C', that serve as ways for the trucks that support the endless chain Q<sup>2</sup>, which carries the fuel-elevating buckets, the latter being clearly shown in both ascending and descending position. Preferably casing C' is formed in two longitudinal halves bolted together. The agitator W' prevents bridging of the fuel in receptacle A<sup>2</sup>, and forces it into the lower end of casing C', to be carried up by the buckets. The fuel falls from the buck-

ets as they pass over the upper sprocket-wheel R' upon a deflector O', which directs it onto the hopper G on top of valve G', which hopper moves with the valve, so that if the latter is turned downward the fuel is fed into the furnace-flue T, through which it falls upon deflectors T', by which it is scattered over the grate.

The valve G' is automatically operated as follows:

H' designates a pivoted tripping-lever, its short arm being jointed by a connecting-rod H<sup>2</sup> with the back of the hopper G, while its long arm extends upward, so that it is in the path of the descending buckets Q'.

I' is a second tripping-lever pivoted in casing C' below lever H', and similarly connected by its short arm to a rod I<sup>2</sup>, jointed to the hopper G, and having a long arm, which, when the valve is closed, lies out of the way of the descending buckets Q', but when said valve is opened is thrown into the path of said buckets. As the buckets descend after delivering their contents into hopper G, they strike the long arm of tripping-lever H' and tilt valve G' sufficiently by means of connecting-rod H<sup>2</sup> to discharge the fuel into the furnace; at the same time the lever I' is shifted so that its long arm lies in the path of the bucket, and as the latter continues its descent it engages said arm and causes the closing of the valve through rod I<sup>2</sup>, bringing lever H' back to its first position. The said levers are so adjusted and set in relation to each other that at the moment the fire-brick valve is opened its closure will begin by the contact of the bucket with the lever-arms, as described; hence it becomes evident that by means of the automatic mechanism referred to for regulating the movement of the carrier-chain, lump or powdered fuel can be elevated in small quantities and at frequent intervals and delivered from receptacle A<sup>2</sup> into the furnace. On the shaft h, that carries lever H', and outside the casing C', is secured an arm h<sup>2</sup>, which is connected by a rod h<sup>3</sup> to a crank-arm h<sup>3</sup> on the stem of a valve h<sup>5</sup>, located in the air-pipe S', and these parts are so adjusted that at the moment the valve G' is tripped, as described, to admit fuel into the furnace, valve h<sup>5</sup> is opened and a volume of air under pressure is admitted into the casing sufficient to force the fuel into the furnace and to prevent escape of gases from the latter, the pressure of air being diminished when valve G' is closed by the simultaneous partial closing of valve h<sup>5</sup>, as is evident. The casing may be provided with a safety-valve to prevent too great pressure therein.

By means of the sliding gate V', and the adjustable bottoms S<sup>2</sup> in the buckets Q', and the cone-pulleys Y' and Z', not only the quantity of fuel carried by the fuel-elevating buckets in a single journey, but the speed or rapidity of its elevation, may be regulated as the engineer desires. By means of the clutch c', actuated by the governor, as described,



an intermission in the fuel-feeding process is realized whenever additional fuel in the furnace for the production of steam is not required.

5 Having thus described my invention, I claim—

1. In combination with a furnace and an endless-chain fuel-elevator, substantially as described, a valve adapted to receive the  
10 fuel from the buckets and deliver it into the furnace, and the mechanism, substantially as described, whereby said valve is automatically opened and closed by the buckets, as and for the purpose set forth.

15 2. The combination, with the furnace, the automatically-operated valve G', and the endless-chain fuel-elevator and its casing, of the air-supply pipe for said casing and the devices for automatically regulating the ad-  
20 mission of air into the casing at the moment valve G' is operated, all substantially as specified.

3. The combination, with the elevator-casing, its endless chain and buckets, and the  
25 trucks therefor, of the tracks or ways for the trucks, substantially as specified.

4. The combination of the elevator-casing, its endless chain and buckets, and the receptacle A<sup>2</sup> with the agitator-wheel and the ad-  
30 justable gate, substantially as described.

5. The combination, with the fuel-elevating buckets, of the adjustable bottoms, constructed and arranged substantially as specified.

6. The combination of the furnace, the  
35 feed-valve G', and the elevator-casing and elevator chain and buckets therein with the tripping-levers and connections thereof to said valve and the mechanism for operating said chain, all substantially as specified.

40 7. The combination, with the furnace and the elevator-casing and chain and buckets, of the worm-gearing and shafting for operating said chain, and the pulleys and clutch

and governor for automatically operating said shafts, all substantially as specified. 45

8. The herein-described elevator-buckets Q', having lugs U' and adjustable bottoms S<sup>2</sup>, substantially as and for the purpose set forth.

9. The combination of the valve G' and the  
50 tripping-levers H' and I', connected to said valve, with the endless-chain elevator and the buckets thereon adapted to operate said levers, all substantially as set forth.

10. The combination of the valve G' and  
55 the tripping-levers H' and I', connected thereto, with the endless-chain elevator and its buckets adapted to operate said levers, and the valve h<sup>5</sup> and the connections between the same and lever H', all substantially as set  
60 forth.

11. The combination, with the furnace, the casing C', and fuel-receptacle A<sup>2</sup>, and the agitator-wheel W', elevator-chain Q<sup>2</sup>, and its  
65 buckets, of the shaft Z<sup>2</sup> and its connections for operating said chain, the cone-pulleys Z' and Y', shaft a<sup>5</sup>, and clutch c', connected to a steam-governor, all substantially in the manner and for the purpose set forth.

12. The combination, with the furnace, the  
70 air-tight casing C', the fuel-elevator chain and buckets therein, and the air-supply pipe S', and the devices, substantially as described, for automatically controlling the operation of said chain, of the valve G', levers H' I',  
75 rods H<sup>2</sup> I<sup>2</sup>, and arms h h and rod, all constructed substantially in the manner and for the purpose specified.

In testimony that I claim the foregoing as my own I affix my signature in presence of  
80 two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:

W. R. KEYWORTH,  
F. O. MCCLEARY.