No. 686,053. Patented Nov. 5, 1901.

J. GOLDSWORTHY.

AUTOMATIC STOKER.

(Application filed July 1, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

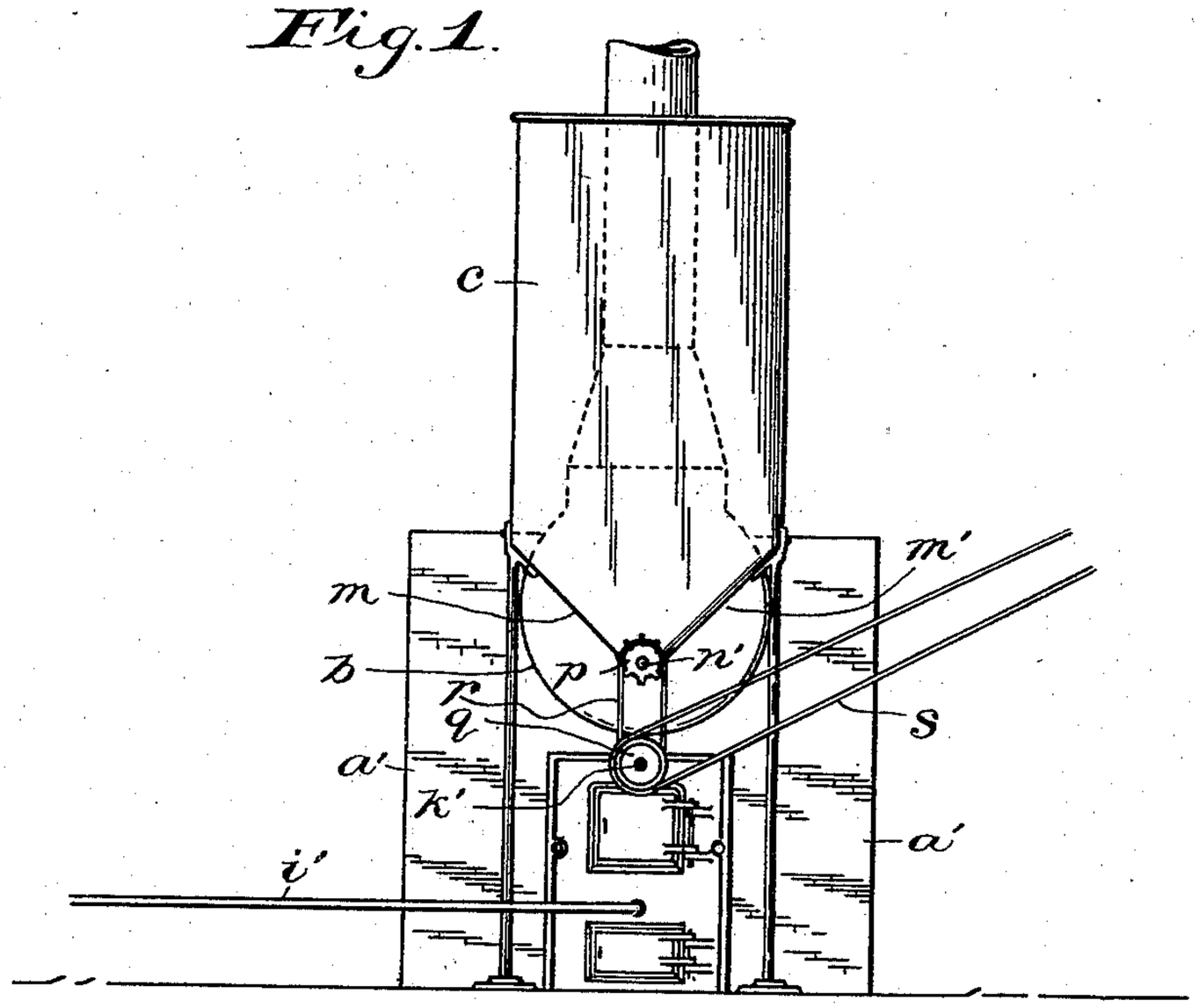

Fig. 2.

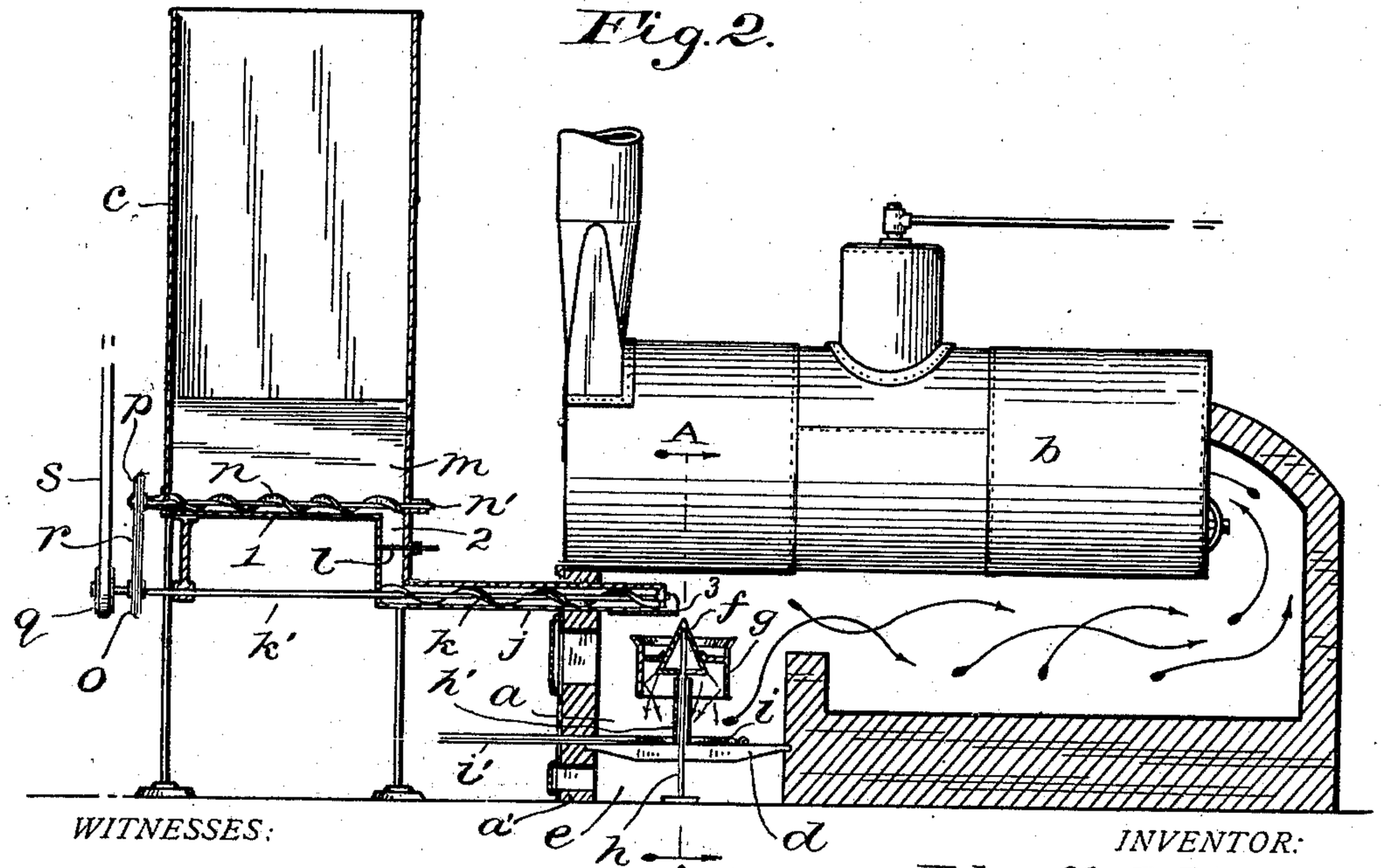

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Fig. 3.

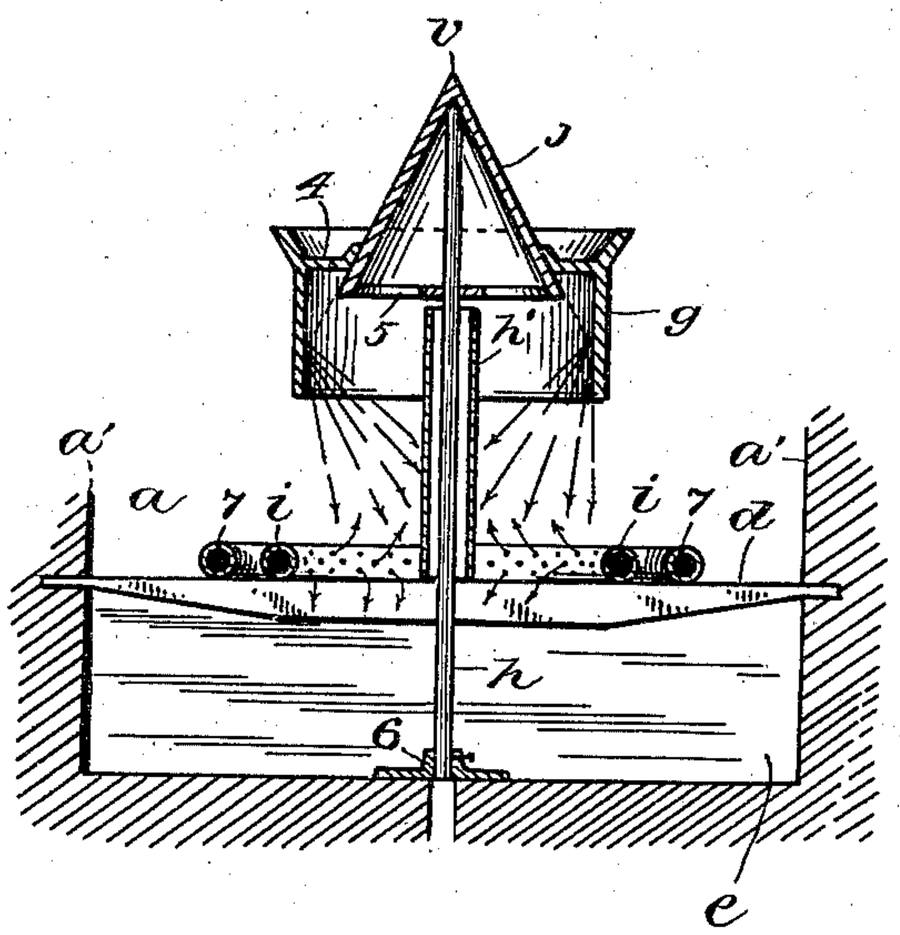

Fig. 4.

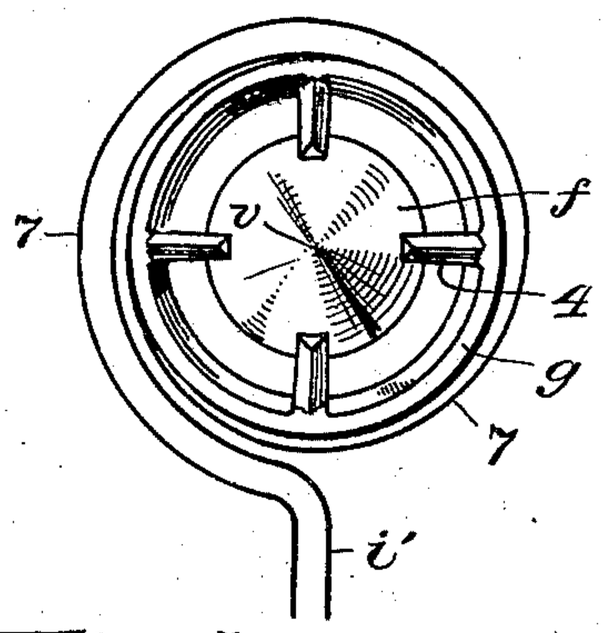

Fig. 5.

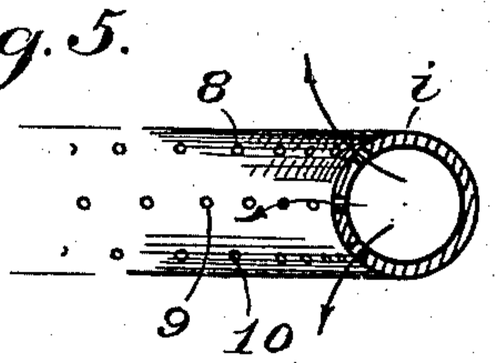

Fig. 6.

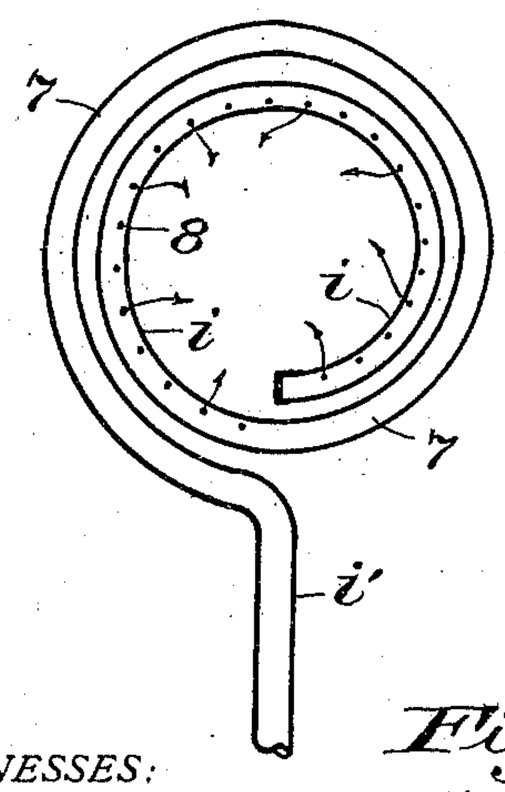

Fig. 7.

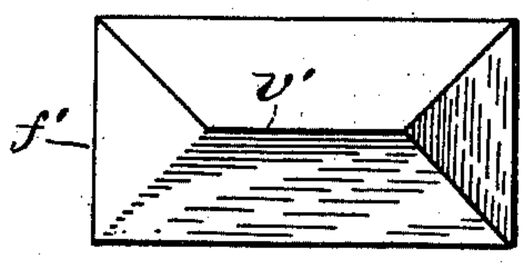

Fig. 8.

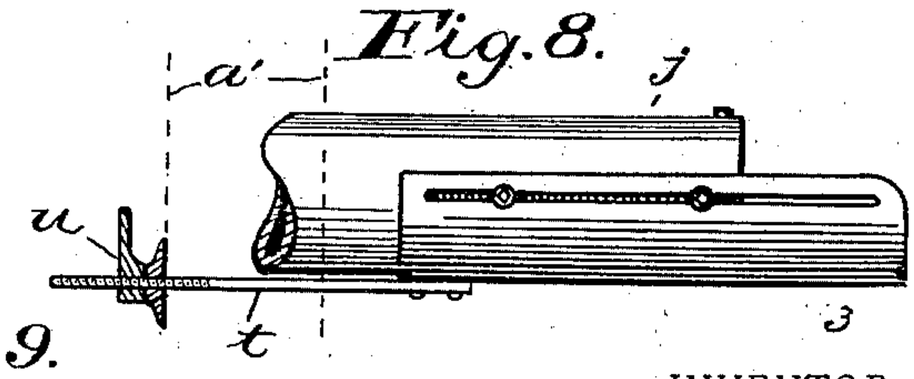

Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN GOLDSWORTHY, OF INDIANAPOLIS, INDIANA.

AUTOMATIC STOKER.

SPECIFICATION forming part of Letters Patent No. 686,053, dated November 5, 1901.

Application filed July 1, 1901. Serial No. 66,679. (No model.)

To all whom it may concern:

Be it known that I, JOHN GOLDSWORTHY, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Automatic Stokers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to devices and apparatus whereby coal or other solid fuel may be automatically supplied to and spread or distributed in a furnace for generating heat; and it has particular reference to the devices whereby improved results are obtained in the consumption of the fuel resulting from better combustion than is ordinarily attained in practice.

The object of the invention is to provide a reliable automatic stoker which will give the highest degree of economy in fuel and at the same time incidentally aid in the suppression of the smoke nuisance; and with these objects fully attained the invention may be cheaply manufactured and is durable and economical in repairs expense.

Referring to the drawings, Figure 1 represents a front elevation of a boiler-setting, together with a fuel-bin, having portions of my invention shown in connection therewith; Fig. 2, a side view of a steam-boiler in connection with a furnace and a fuel-bin, shown in vertical central section, in which the general arrangement of a stoker constructed in accordance with my invention is illustrated, also partly in section; Fig. 3, a vertical central sectional view of a furnace and portions of my invention connected therewith as on a line A A; Fig. 4, a top plan view of the fuel distributing or spreading devices; Fig. 5, a fragmentary detail view of the blast-pipe for use in spreading the fuel; Fig. 6, a top plan view of the blast-pipe and air-heating pipe; Fig. 7, a top plan view of a device for spreading the fuel employed in large furnaces; Fig. 8, a fragmentary detail view showing an adjustable delivery end for the conveyer, and Fig. 9 an end view of the conveyer that delivers the fuel into the furnace.

Similar reference characters in the several figures of the drawings indicate like parts.

In practically carrying out my invention any form of furnace may be equipped with my improvements, in the illustration of which I select a steam-boiler furnace *a*, having suitable walls *a'*, in which is mounted the boiler *b*. A suitable bin *c* is employed for storing the fuel and from which it is fed to the furnace above the grates *d*, set in the usual manner, with an ash-pit *e* below them.

A column *h* is suitably supported in the ash-pit *e*, preferably by means of a socket-base 6, that would permit of the column being let down through the base when desired into a suitable opening in the bottom of the pit. The column extends between two grate-bars up to a suitable height and supports a fuel-spreading device *f*, having substantially the shape of a cone or a pyramidal form, as *f'*, according to conditions. In most cases I prefer the circular form, the apex *v* of which is central over the top of the column *h*. In some cases an oblong rectangular pyramid, as *f'*, having a ridge *v'*, may be employed with a suitable number of conveyers of fuel.

The fuel-spreading device includes a hollow deflector *g*, which conforms to the exterior plan shape of the part *f* or *f'*. As shown, the part *f* being circular the part *g* is also circular, and the parts *f* and *g* are connected by means of arms 4, they both being steadied in proper positions by means of a guide-bar 5, attached to the part *f*. A protecting-case *h'* of cast-iron or other suitable material extends from the grates *d* up nearly to the bar 5, covering the part of the column most exposed to the furnace-heat.

Above the grates *d* is a perforated pipe *i* for conveying either dry steam or air or a mixture of both and projecting the same into the furnace for the double purpose of aiding in spreading the fuel and for supplying air for combustion with the fuel. There are preferably several horizontal rows of perforations, as 8, projecting upwardly-inclined jets, a row 9, providing horizontal jets, and a row 10 of downwardly-inclined jets, all directed toward the center of the furnace or, literally, toward the column *h*. The pipe *i* is surrounded by

an imperforate pipe 7, in which the air when used may be heated before entering the pipe *i*, which is connected thereto, the pipe 7 being connected by a supply-pipe *i'*, which may be served by a blast-fan or blower of any suitable character.

A conveyer comprising a tube *j*, a shaft *k'*, and a spiral blade *k* extends into the furnace above the conical spreader member *f*, the tube having an extension delivery end 3, that may be adjusted so as to cause the fuel to fall directly upon the apex of the cone. The end piece 3 has a threaded rod *t* attached thereto, which extends through the wall *a'*, and a threaded nut *u* on the rod at the outer side of the wall or other suitable means is employed for adjusting and fixing the positions of the end 3. The outer end of the tube is connected with a chute 2, having a regulating-gate *t* therein, the chute communicating with the bottom of the bin *c*, which bottom is in the form of a trough having two opposing sloping sides *m m'*, at the bottom 1 of which is a conveyer comprising a shaft *n'* and a spiral blade *n*, adapted to force the fuel to the chute 2, so as to constantly supply the tube *j*. The shaft *k'* has a sprocket-wheel *o*, and the shaft *n'* has a like wheel *p*, the two wheels being connected by a sprocket-chain *r*, so that the two conveyers may operate uniformly. The shaft *k'* also has a pulley *q*, connected by a belt *s*, suitably driven, and other suitable means may be employed for driving the conveyers. The members *f* and *g*, as also the case *h'*, may be composed of fire-clay, or they may be made of hollow iron castings with water circulating through them, if desired, thereby augmenting the heating-surface for generating steam. The column *h* may be made extensible, so that the members *f* and *g* may be adjusted vertically. In arranging the bin for fuel and the conveyers they may be placed where most convenient, the tube *j* preferably entering the furnace through a side wall, so that the usual stoke-hole and ash-pit door may not be obstructed. Any suitable manually-operated device may be desirable in some cases whereby to operate the conveyers when starting a fire in the furnace to be used at intervals until steam may be produced with which to supply a motor for applying power to the driving of the conveyers.

In practical use the coal or what fuel is to be used is to be pulverized or broken, if lump coal, so that it may readily pass through the conveyers, and particularly so in order that the fuel may spread in small particles about the furnace, it being desirable that the fuel be entirely or nearly consumed before it can fall upon the grates. A fire having been kindled upon the grates an artificial blast from the pipe *i* should in some cases be produced in order to aid combustion and keep the fuel agitated, and thus incidentally avoid smoke, while utilizing all the possible heat units contained in the fuel, the conveyers being operated as slowly as may be required until a strong fire is acquired, when the conveyers may be operated at the necessary speed to properly meet the heat requirements. As the fuel passes through the tube *j*, which will become hot, the fuel will also become heated, and as it leaves the tube combustion will begin and continue while the fuel falls upon the spreader member *f* and down the inclined or sloping sides thereof to the deflecting member *g* and thence to the cross-blasts from the pipe *i*, the jets having the tendency to force the small unconsumed particles of fuel upward into space until entirely consumed, whereby the most satisfactory results may be had. Any unconsumed fuel falling through space may be completely consumed upon the grates while being agitated by the air or steam-blasts from the pipe *i*. The action of the air-jets when correctly designed is such that the fuel that may come within range will be scattered practically over the whole grate-surface, while the fuel falling in a state of combustion from the conveyer over the scattering devices above the jets will fill the upper space of the furnace with hot flames, the conditions being so favorable that little or no smoke will be thrown off, and thus both an economy in the use of fuel effected and a nuisance prevented.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A furnace provided with a fuel-spreading member having inclined surfaces, and means whereby fuel falling from the inclined surfaces may be deflected and scattered.

2. A furnace provided with a fuel-spreading member having inclined surfaces, a deflecting member opposing the inclined surfaces, and a conveyer delivering fuel upon the inclined surfaces.

3. A furnace provided with a fuel-spreading member having inclined surfaces, a deflecting member opposing the inclined surfaces, a pipe having a plurality of jet-orifices directed substantially toward a common center, and a conveyer delivering fuel upon the inclined surfaces, against the deflector, and in range of the jets from the jet-orifices.

4. An automatic stoker including a fixed combined spreading and deflecting apparatus, and an adjustable conveyer whereby the fuel may be delivered at the center of the apparatus under varying degrees of feed velocity.

5. An automatic stoker including a conveyer-tube, a spreading member having inclined sides meeting in an apex below the conveyer-tube delivering-orifice, and a deflecting member having faces opposing the inclined sides of the spreading member, whereby the fuel falling from the conveyer may be spread outwardly and then deflected inwardly.

6. An automatic stoker including a conveyer, a conical spreading member having its apex in range of the delivery end of the con-

veyer, and a circular deflector extending about the lower portions of the spreading member.

7. An automatic stoker including a fuel-spreading member having inclined surfaces, a vertically-adjustable fixed column supporting the spreading member, grate-bars, and a removable case inclosing the column and extending from the grate-bars to the spreading member.

8. An automatic stoker including a column, a conical spreading member supported upon the top of the column, a circular deflector supported by the spreading member, and a conveyer having its delivery end above the apex of the conical member.

9. An automatic stoker including a conical fuel-spreading member, a column centrally supporting the said member, a circular deflecting member supported by said conical member, a blast-pipe having jet-orifices directed in diverging planes toward the said column, and a conveyer having its delivery end situated adjustably above the apex of the said conical member, whereby fuel from the conveyer may be spread and deflected and agitated and also be mixed with air-currents while in space.

10. In a furnace having grate-bars and an ash-pit, the combination of a column extending from the ash-pit to a point above the grate-bars, a conical fuel-spreading member mounted upon the column, a deflector extending about the said spreading member and supported thereby, a blast-pipe situated below said deflector for agitating and scattering fuel deflected thereby, and a conveyer having its delivery end situated above the apex of said spreading member.

11. In a furnace having grate-bars and an ash-pit, the combination of a socket in the pit, a stationary column adjustable vertically in the socket and extending above the grate-bars, a case about the column above the grate-bars, and a fuel-spreading member supported removably upon the top of the column.

12. In a furnace, the combination of a fuel-spreading apparatus comprising a spreading member having inclined exterior surfaces, a deflecting member opposing the inclined surfaces, and a blast-pipe having jet-orifices situated below the said spreading and deflecting members, with a conveyer having its delivery end above the said spreading member, and the grate-bars below said blast-pipe.

13. In an automatic stoker, the combination of the furnace, the fuel-spreading apparatus in the furnace, the conveyer having its delivery end above said spreading apparatus, the chute having the regulating-gate therein communicating with said conveyer, the bin having the trough or valley at the bottom thereof in communication with said chute, the conveyer in said trough, means for driving said conveyers, the column in said furnace supporting said spreading apparatus, and the blast-pipe below said spreading apparatus.

14. In an automatic stoker, the combination of the furnace, the fuel-spreading apparatus comprising a combined spreader and deflector in the furnace, the conveyer having the adjustable delivery end above the spreading apparatus, the bin communicating with said conveyer, the conveyer in said bin, and the column supporting said apparatus.

15. In an automatic stoker, the combination of the furnace, the conical spreading member, the deflecting member, the horizontal conveyer-tube above the spreading member, the extensible end connected to said tube, and the adjusting members extending through the wall of the furnace whereby said end may be adjusted relatively to the center of said conical member and said deflecting member.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN GOLDSWORTHY.

Witnesses:

HARRY D. PIERSON,

E. T. SILVIUS.