(No Model.) 4 Sheets—Sheet 1.

A. F. BROWN.

UNDERFEED STOKER.

No. 570,978. Patented Nov. 10, 1896.

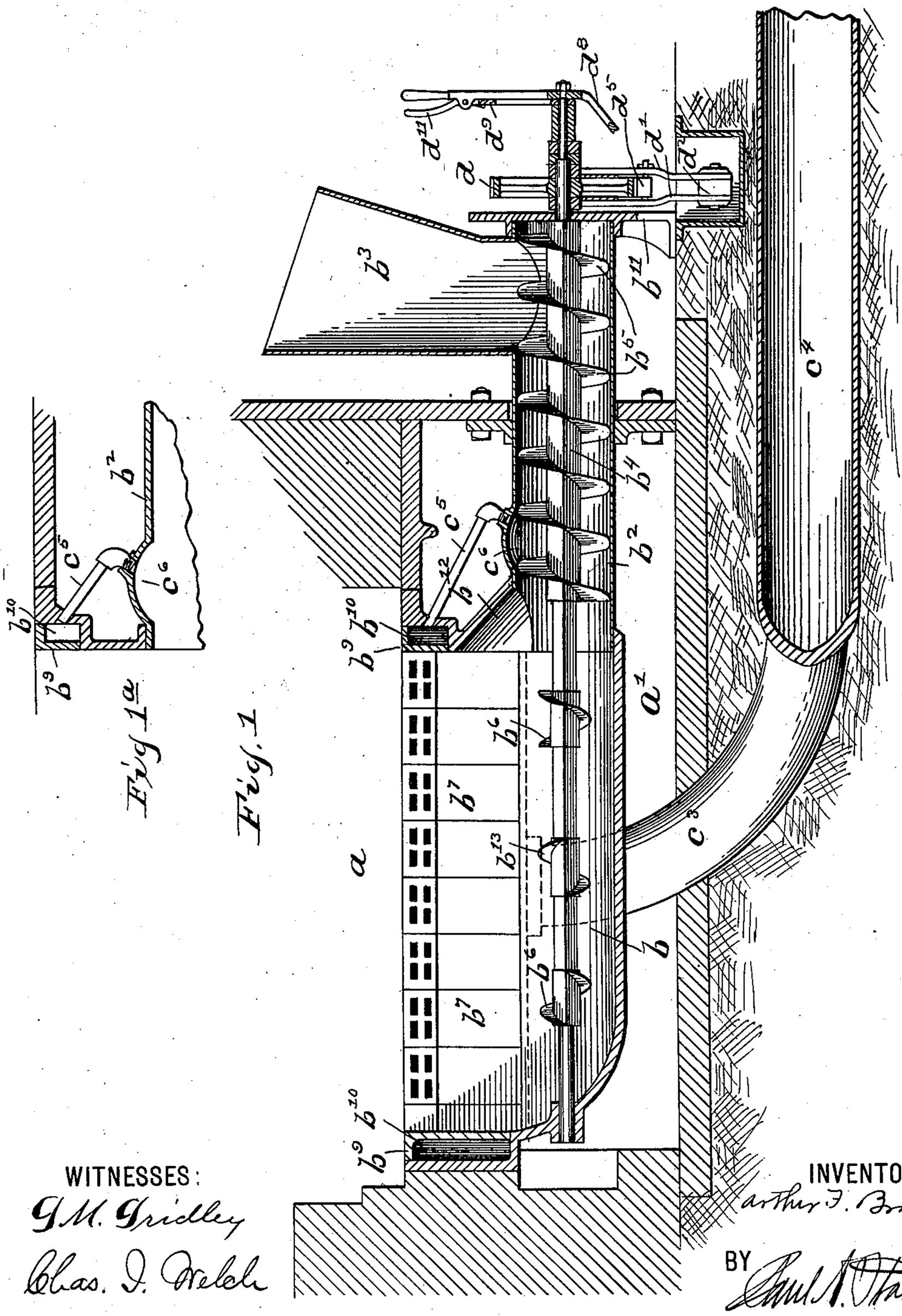

Fig. 1.

Fig. 1ª

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UNDERFEED STOKER.

No. 570,978. Patented Nov. 10, 1896.

Fig. 2

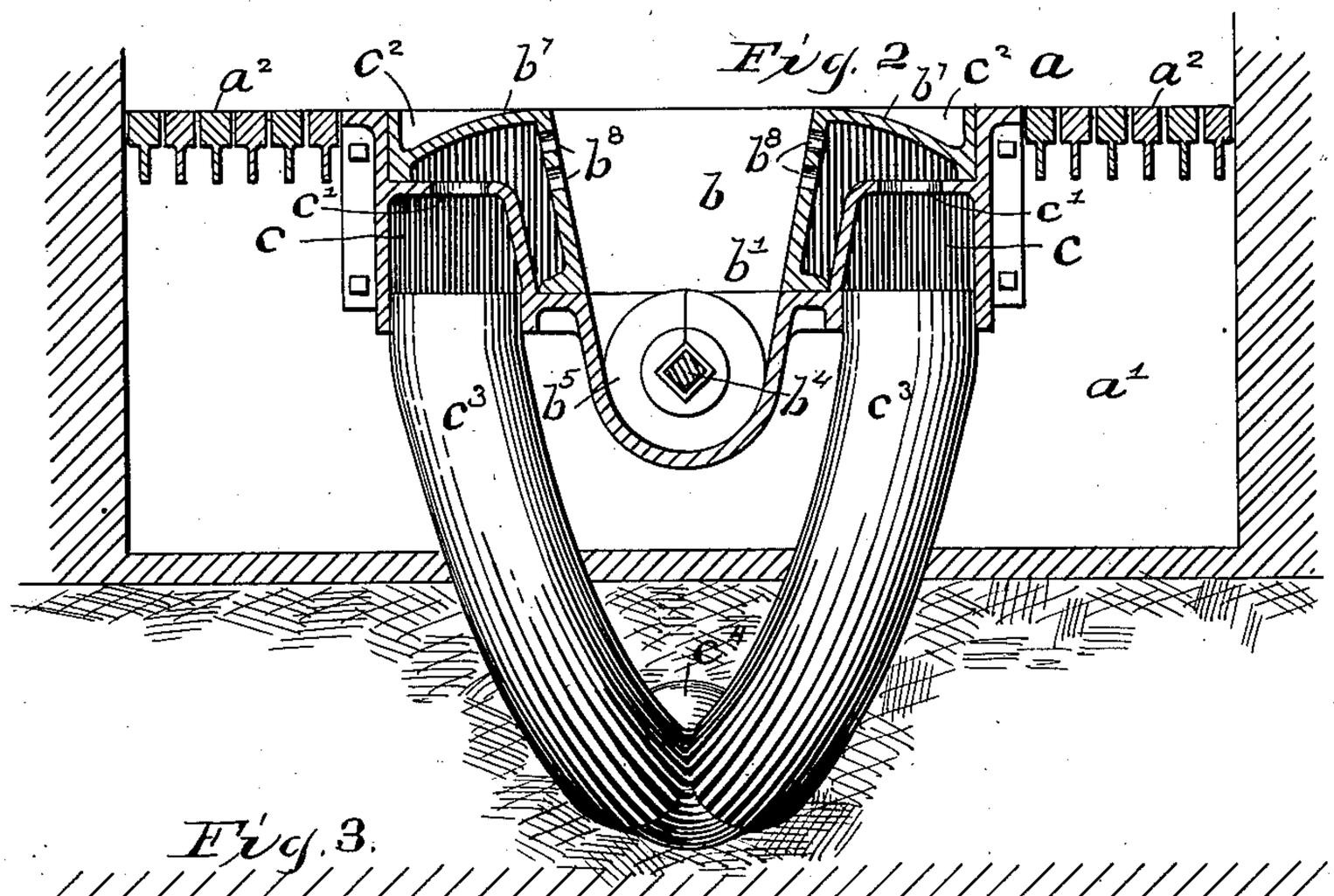
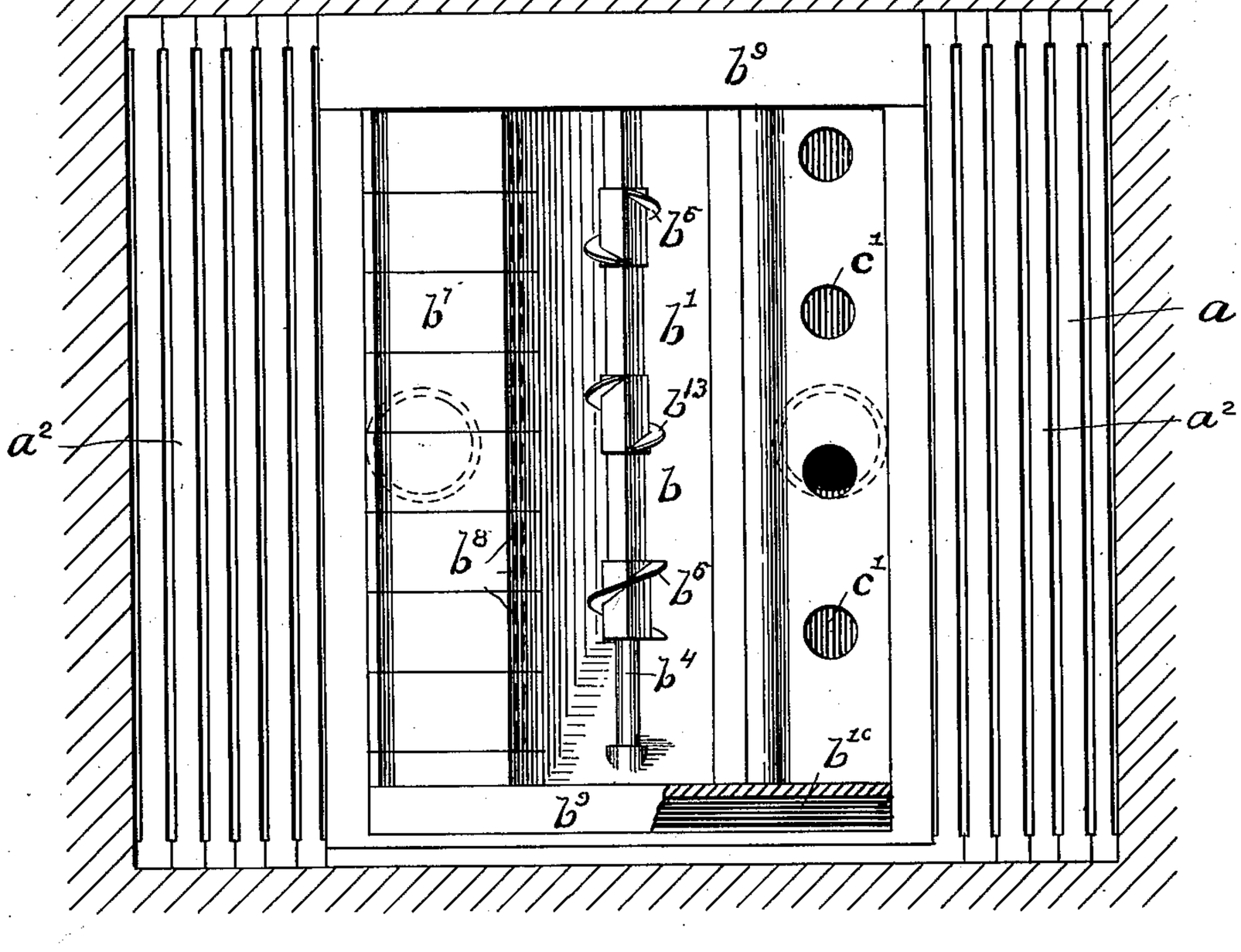


Fig. 3.



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UNDERFEED STOKER.

No. 570,978. Patented Nov. 10, 1896.

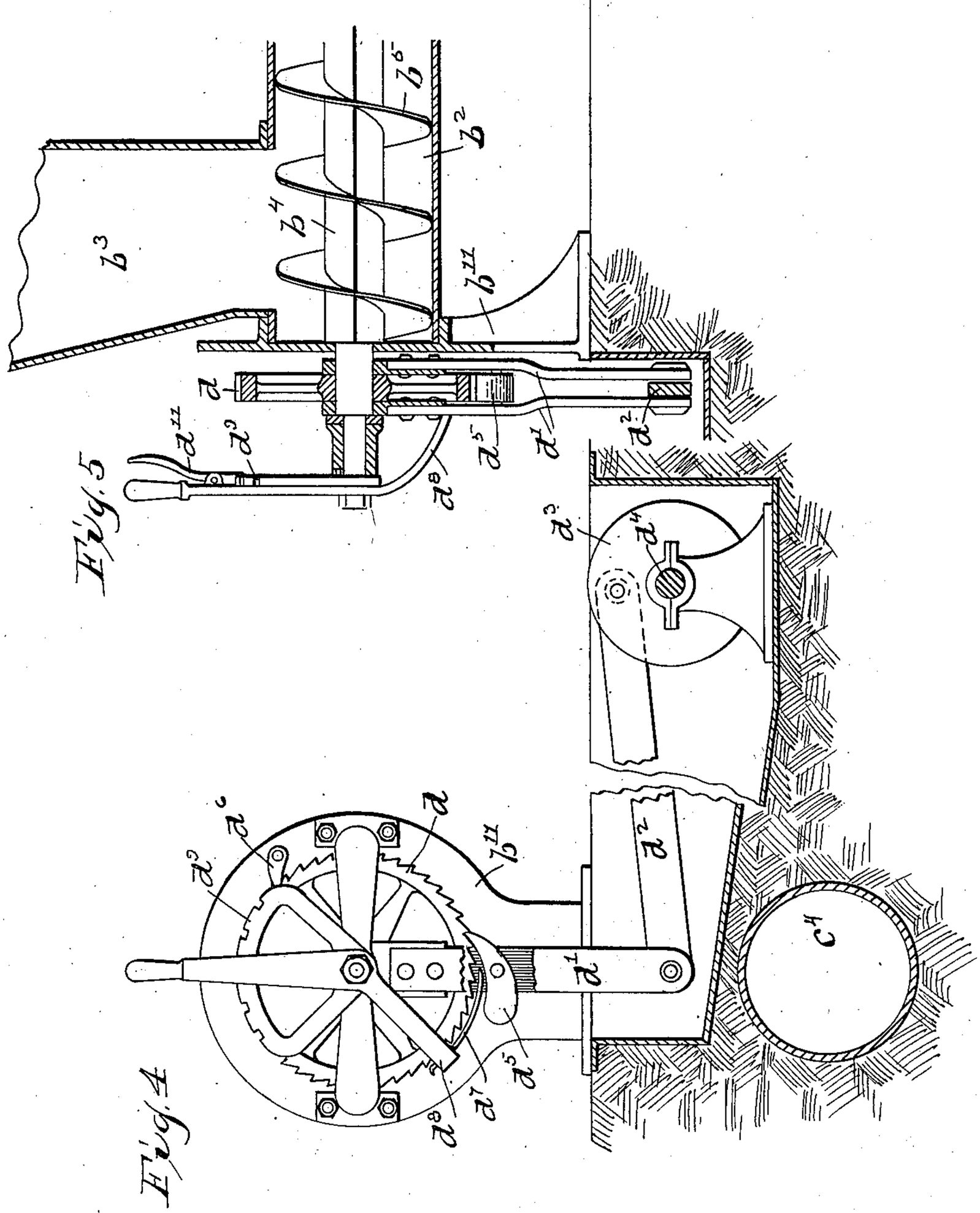

Fig. 5

Fig. 4

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No. 570,978. Patented Nov. 10, 1896.

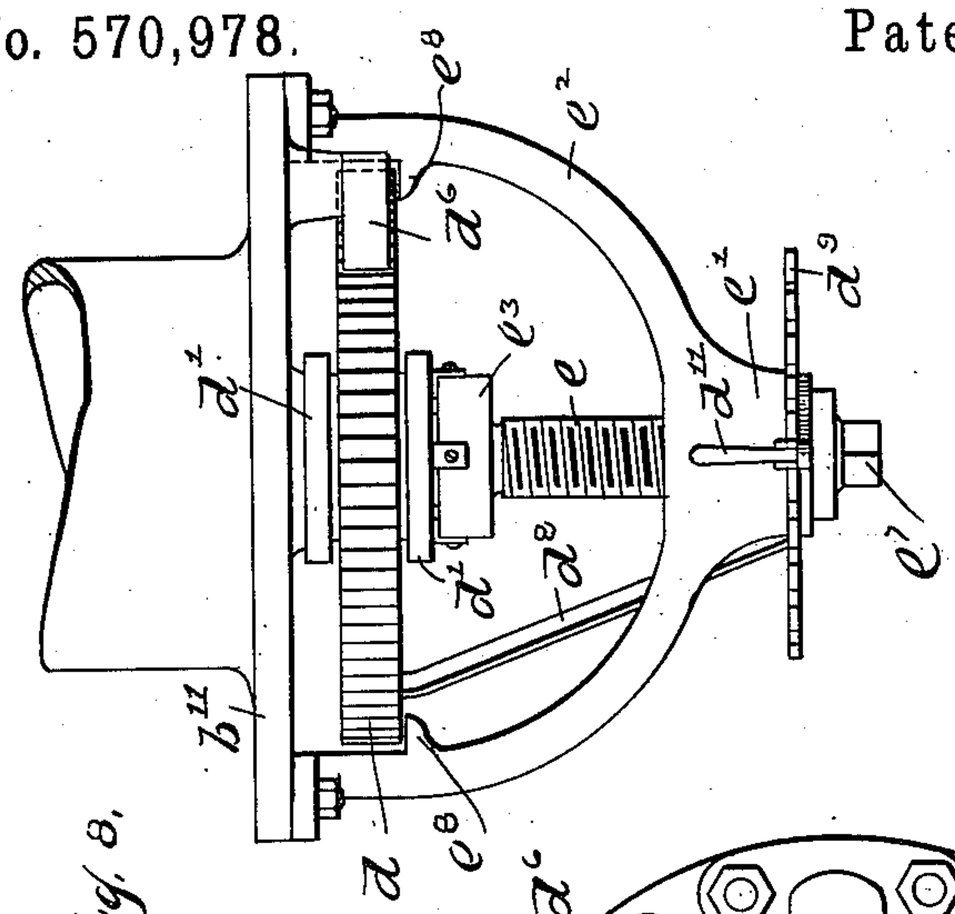

Fig. 8.

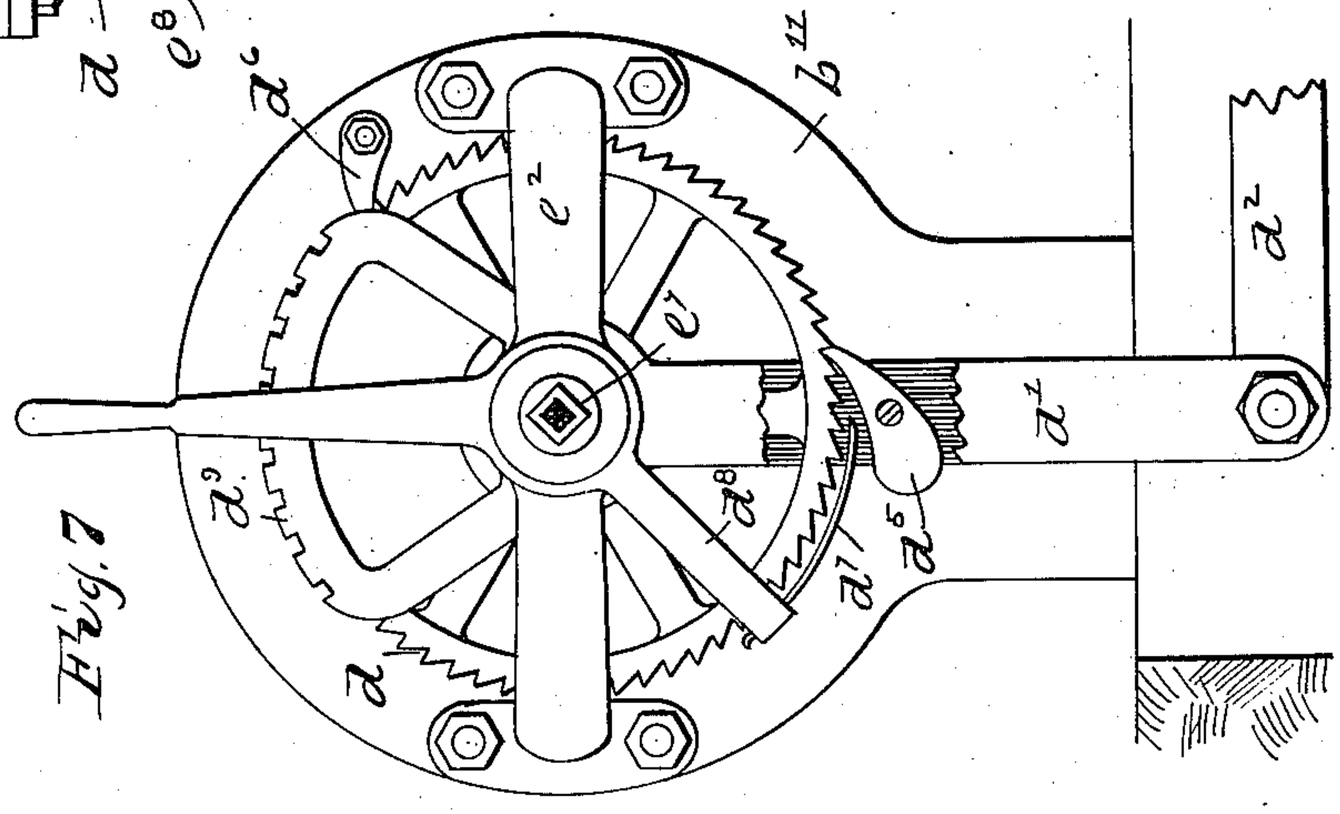

Fig. 7

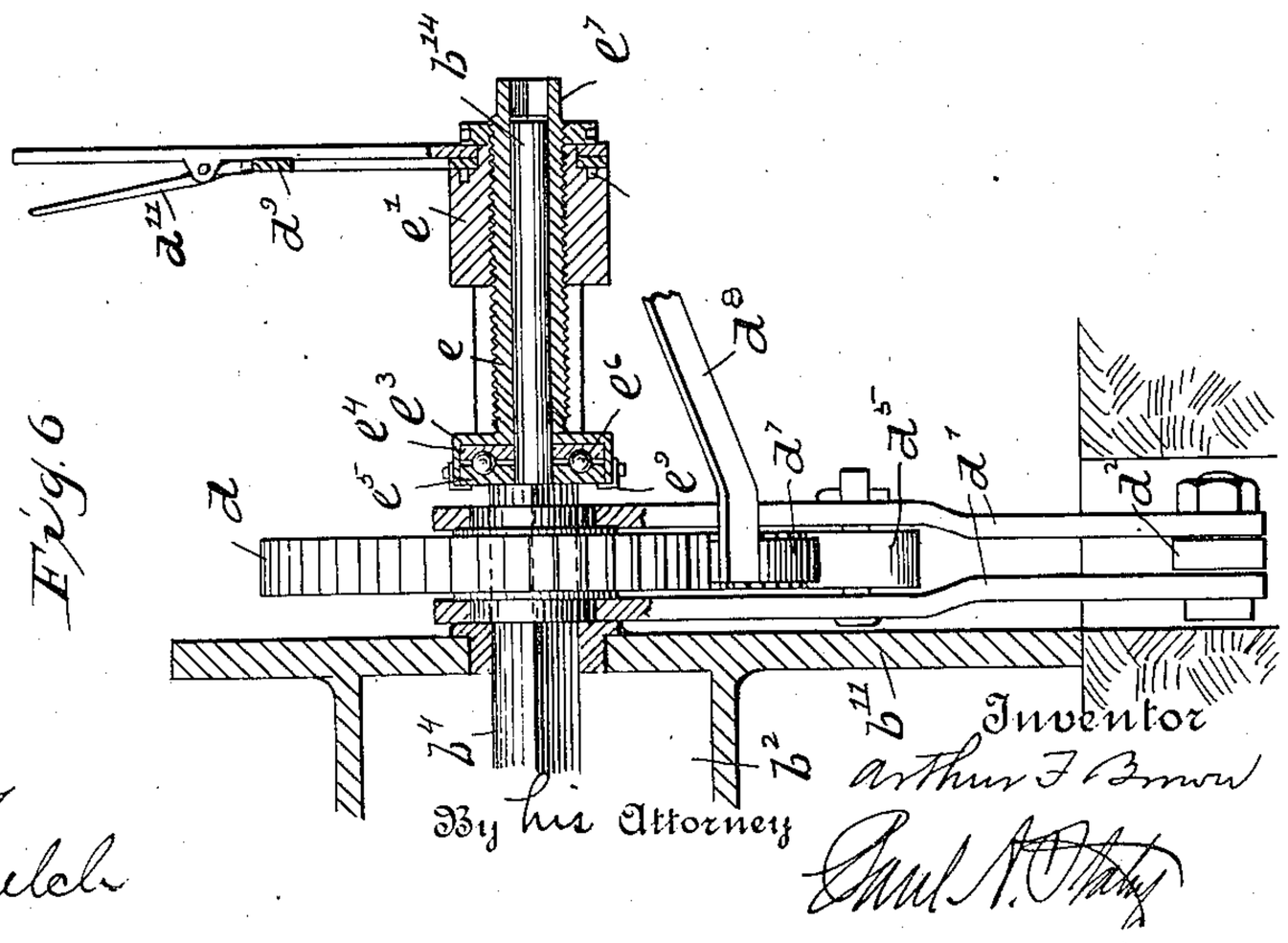

Fig. 6

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UNITED STATES PATENT OFFICE.

ARTHUR F. BROWN, OF DAYTON, OHIO, ASSIGNOR TO THE AMERICAN STOKER COMPANY, OF SAME PLACE.

UNDERFEED STOKER.

SPECIFICATION forming part of Letters Patent No. 570,978, dated November 10, 1896.

Application filed October 28, 1895. Serial No. 567,129. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR F. BROWN, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Underfeed Stokers for Steam-Boilers, of which the following is a specification.

My invention relates to improvements in underfeed stokers for steam-boilers; and it consists in the constructions and combinations of parts hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a device embodying my invention. Fig. 1^a is a detail of the device for counteracting the back pressure in the conduit. Fig. 2 is a transverse sectional view of the same. Fig. 3 is a plan view of a portion of the same with some of the parts removed. Fig. 4 is an end elevation, and Fig. 5 a sectional elevation, of a portion of the same, showing the driving mechanism. Figs. 6, 7, and 8 are details of the same, showing devices for adjusting the driving and feeding mechanism.

Like parts are represented by similar letters of reference in the several views.

In the said drawings, a represents a furnace of any suitable construction, and a' the ash-pit of the same. b is a magazine into which the fuel is fed, and which is located in the ash-pit or below the furnace, so that the top of said magazine stands substantially flush with the bottom of the furnace, which may be provided at each side of the magazine with the usual grate-bars a^2, if desired.

The main body of the magazine is substantially U shape, as shown in Fig. 2, and is provided at the bottom with a chamber b', which forms a substantial continuation of a pipe or conduit b^2, which leads therefrom to the outside of the furnace wall or front, and is there provided with a hopper b^3. Extending through the chamber b', the conduit b^2, and below the hopper b^3 is a rotating shaft b^4, on which are located conveyer-flights b^5, forming a screw conveyer. That portion of the conveyer which is within the chamber b' at the bottom of the magazine is preferably reduced, either in pitch or diameter, so as to afford less carrying capacity and thus produce a distribution of the fuel, as hereinafter more fully specified, the construction shown in the drawings in Figs. 1 and 3 illustrating conveyer-flights b^6 of reduced diameter.

The fuel is fed into the hopper b^3 and means are provided for rotating the shaft b^4, so that the fuel will be conveyed from the hopper through the conduit into the chamber, from whence, by reason of the constructions herein described and more fully explained hereinafter, it will be caused to raise vertically into the magazine and spread over the bottom of the furnace.

The magazine is provided at each side and along the top with a series of twyer-blocks b^7, which have at the top suitable discharge-openings b^8, which discharge laterally into the upper portion of the magazine. These twyer-blocks b^7 are each formed in cross-section substantially L-shaped and are adapted to partially surround an air trunk or conduit c, one of which is formed on each side of the magazine.

Openings c' in the tops of the air trunks or conduits c establish a communication between the air-trunks and the respective twyer-blocks, the twyer-blocks being hollow on their under sides, so as to form an air-chamber which extends substantially around the top and exposed side of said air-trunk. The twyer-blocks are also preferably formed slightly curved or at an angle at the top, so as to leave a space c^2 on the top of the same, which may be filled with fire-clay or other protecting substance. The twyer-blocks b^7 are separable and removable, so that they may be readily removed or replaced for repairs or otherwise. The respective ends of the magazine are also preferably provided with removable blocks b^9, which are formed with an air-chamber b^{10}, which may or may not communicate with the air-trunk, these blocks being adapted to form a protection for the ends of the magazine and may be replaced when warped or damaged by heat.

The respective air-trunks c are connected by branch pipes c^3 to a main pipe or conduit c^4, which is preferably arranged beneath the

floor of the ash-pit and leads to any suitable source of air supply, such as a fan or pressure-blower.

The outer end of the fuel-conduit b^2, as well as the hopper, is preferably supported by a head b^{11}, through which the end of the conveyer-shaft b^4 is adapted to extend. On this shaft is mounted a ratchet-wheel d, on each side of which is journaled an arm d', the opposite ends of which are pivoted to a pitman d^2, connected at its other end to a suitable crank-head d^3 on a shaft d^4, to which power is transmitted from any suitable source of supply, the construction being such that the arms d' are caused to vibrate on the shaft b^4 as the crank-head d^3 revolves. Pivoted between the arms d' is a pawl d^5, adapted to engage the teeth of the ratchet-wheel d, a holding-pawl d^6 being provided on the head b^{11} and adapted to engage in the ratchet-teeth and prevent the backward rotation of said ratchet-wheel. By this construction the pawl d^5 is adapted at each revolution of the crank-shaft to travel over a definite number of teeth of the ratchet-wheel, and, if unobstructed, would turn the conveyer-shaft a definite distance at each stroke. To provide for varying the movement of the conveyer-shaft, and thus the amount of feed, I employ a movable track b^7, which is secured to an adjustable arm d^8, pivoted at the center of the shaft b^4, so as to be moved around the ratchet-wheel. This track d^7 is sufficiently long so that when moved under the pawl d^5 the pawl will complete its entire stroke on said track. By shifting the track more or less out of the path of the pawl, the pawl will be caused to engage the teeth for a greater or less portion of its stroke, and thus vary the movement imparted at each stroke to the conveyer-shaft and conveyer. A notched segment d^9 is provided adjacent to the arm d^8, a suitable holding-pawl d^{11} being provided on said lever to engage in the notched segment and hold said lever in different positions of adjustment.

As before stated, the fuel is fed into the hopper b^3, and as the conveyer is revolved it is carried through the conduit into the chamber in the bottom of the magazine. To provide for distributing the coal or other fuel, the conveyer-flights are reduced in size in the magazine, so that only a portion of the fuel fed to the chamber b' will be carried longitudinally therein. This will cause the coal to rise in the magazine and become distributed evenly in the length thereof. The front end of the magazine where the conduit joins the same is cut out at an angle, as shown at b^{12}, forming an angularly-arranged passage-way from the top of the conduit upwardly into the magazine. This angularly-arranged passage begins at or near the point where the conveyer-flights are reduced or changed in their carrying capacity, so that a portion of the fuel which is brought to this point will rise in said passage from the fact that more fuel is brought to this point than is carried into the magazine longitudinally. This angular passage permits the fuel to be delivered at the front end of the magazine. It may be found desirable in some cases to place one or more conveyer-flights on the shaft in a reverse direction, as shown at b^{13}, to assist in holding back the fuel, and thus causing it to rise vertically by the pressure of the fresh fuel against the same.

To provide for adjusting the conveyer longitudinally and thus regulate the distribution of the fuel longitudinally in the magazine, I preferably support the front end of the shaft in a screw-threaded sleeve e, which is screwed into a boss e' on a yoke e^2, which yoke is connected to the head b^{11}. The sleeve e is bored out to receive the end b^{14} of the shaft, which is shouldered down at this point to enter said sleeve. The front end of the sleeve e is provided with an enlarged cylindrical portion e^3, which is cupped out to receive bearing-plates e^4 e^5, which are each formed with circular grooves on the adjacent faces adapted to receive antifriction-balls e^6, which are placed between the plates. One of these plates is adapted to turn with the shaft b^4, the shoulder of which rests against said plate, the other plate, e^4, being adapted to rest in the cylindrical portion of the sleeve. The end thrust is thus received on the ball-bearings formed in said sleeve. The opposite end of the sleeve where it extends through the boss e' is formed square in cross-section, as shown at e^7, and adapted to receive a wrench by means of which it may be adjusted back and forth in the bearing-boss, and thus adjust the conveyer-shaft longitudinally through the conduit and the magazine. For the purposes of this adjustment the ratchet-wheel d is constructed with a square opening, which fits on the square portion of the shaft b^4, and the pivoted arms d' are journaled on the hubs of said wheel on opposite sides thereof. Projecting lugs e^8 on the yoke e^2 prevent lateral movement of said ratchet-wheel as the shaft is adjusted back and forth. The bearing-plates e^4 e^5 in the cylindrical portion e^3 of the screw-threaded sleeve e are held in position by suitable retaining-clips e^9, which are bolted or otherwise secured to the cylindrical casing and project inwardly, so as to engage and hold the plate e^5.

In stokers of this class it sometimes happens under certain conditions and with certain kinds of fuel that the air introduced into the twyers will not find ready escape through the burning fuel, and a slight pressure will accumulate in the magazine sufficient to cause a portion of the smoke and gases to find their way back through the conveyer and into the hopper b^3. To obviate this, I provide means for counteracting this pressure in the conduit, and thus prevent the escape of air or gas through this passage. This is preferably accomplished by introducing a jet of air from the main trunk or any other portion of the air supply into the conduit, preferably at an

angle in the direction in which the fuel moves. This I have shown in Figs. 1 and 1ª, in which a small pipe c^5 is introduced at an angle into the top of the conduit b^2. In case the air-chamber b^{10} is connected with the air-trunk then the pipe c^5 may be connected directly with this air-space and receive its supply therefrom, as shown in the drawings. To prevent the choking of the pipe c^5 by the inwardly-passing fuel in the conduit, I preferably construct the conduit at this point with a circular concave pocket c^6, into the top of which the pipe c^5 is made to enter, so that an air-space is formed at this point which will prevent the choking of the pipe by the fuel. This air-space being circular and concave, any fuel which should be crowded into the same through any obstruction in the feed would find easy passage from said pocket as soon as the irregularities of the feed were overcome.

Having thus described my invention, I claim—

1. In an underfeed stoker, a fuel-hopper, a horizontal conduit leading from said hopper, and a feeding chamber or magazine having a curved bottom forming a substantial continuation of said conduit and provided with inclined sides and of a substantially uniform width, a screw conveyer extending from said hopper through said conduit and through the bottom portion of said magazine, and an angularly-arranged passage formed in said conduit and extending upwardly therefrom so as to communicate with the front of said magazine above the mouth of said conduit, substantially as specified.

2. In an underfeed stoker, a feed-magazine having air-trunks formed on each side thereof and removable twyer-blocks with openings at the top, said twyer-blocks being cored out and formed substantially L-shaped in cross-section so as to extend over and protect the inner side and top of said air-trunks, substantially as specified.

3. The combination with a feeding chamber or magazine having the air-trunks on the sides thereof, and devices for feeding the fuel into the bottom of said magazine, of removable plates surrounding said magazine at or near the top, said plates being formed in the nature of twyer-blocks and adapted to extend over the top and inner sides of said air-trunks, substantially as specified.

4. The combination with the fuel-hopper and a conduit, a conveyer extending through said conduit, a ratchet-wheel on the conveyer-shaft and a bearing-support for said shaft, a hand-lever journaled concentric with said shaft and carrying at one end a circular track adapted to project over said ratchet-wheel, and a stationary notched segment connected to said bearing-support, and a holding-pawl on said lever for engaging said notched segment so as to hold said track in different positions of adjustment, substantially as specified.

5. The combination with a fuel-magazine, a conduit leading thereto, and a conveyer in said conduit, said conveyer having flights of varying carrying capacity in the length thereof, and means, substantially as described, for moving said conveyer-shaft longitudinally through said conduit and magazine so as to vary the distribution caused by the varying carrying capacity of said conveyer, substantially as specified.

6. The combination with a fuel-magazine and a conduit leading thereto, a conveyer in said conduit, said conveyer having a substantially uniform carrying capacity through said conduit and having flights with a reduced carrying capacity within said magazine, and a movable sleeve for supporting the end of said conveyer-shaft, and means, substantially as described, for adjusting said sleeve in different positions to change the longitudinal position of said shaft, substantially as specified.

7. The combination with a conveyer-shaft having conveyer-flights of different carrying capacity, a conduit in which said shaft operates, and a magazine connected to said conduit, of a screw-threaded sleeve, a supporting-bearing for said sleeve, and antifriction bearing-plates in said sleeve, said sleeve being adapted to form a bearing for the front end of said shaft, substantially as specified.

8. The combination with a fuel-chamber, and a conduit leading thereto, said fuel-chamber being formed with inclined sides and a curved bottom which forms a substantial continuation of said conduit, a conveyer extending through said conduit and fuel-magazine and having a substantially uniform carrying capacity in said conduit and a reduced carrying capacity in said magazine, and an angularly-arranged passage-way formed in said conduit and leading from the top thereof so as to open into the front of said magazine and above said conduit, substantially as specified.

9. The combination with a fuel-magazine, and a conduit leading horizontally into the same, said magazine being formed of a substantially uniform width with inclined sides, and a curved bottom adapted to form a substantial continuation of said conduit, a conveyer extending through said conduit and magazine and having a substantially uniform carrying capacity in said conduit and provided with flights of a reduced carrying capacity in said magazine, a vertical angular passage-way formed at the top of said conduit of a width less than the diameter of said conduit and adapted to extend into the front of said magazine, substantially as specified.

10. The combination with a fuel-magazine, and a conduit leading horizontally into the same, a conveyer-shaft extending through said conduit and through the bottom of said magazine, said shaft having a conveyer of substantially uniform carrying capacity through said conduit, and of a reduced carrying capacity within said magazine, an angularly-

arranged passage from the top of said conduit into the front of said magazine, and means as described for adjusting the shaft and conveyer longitudinally through said conduit and magazine, substantially as specified.

11. The combination of a fuel-magazine, and a conduit leading into the same, a conveyer in said conduit, and twyer-openings in said magazine, an air-trunk connected to said twyer-openings, and an air-passage from said air-trunk communicating with said conduit in front of said magazine so as to form a draft from said conduit into said magazine, substantially as and for the purpose specified.

12. The combination with a magazine, and a conduit having feeding devices therein, twyer-openings in said magazine, and an air-trunk communicating with said twyer-openings, an air-passage communicating with said conduit at an angle thereto, and a connection from said air-passage to said air-trunk, substantially as specified.

13. The combination with a magazine and a conduit leading thereto, a conveyer in said conduit, and twyer-openings in said magazine, an air-trunk communicating with said twyer-openings, and an air-passage from said trunk to the conduit, said air-passage being adapted to enter said conduit at an angle thereto and into a concave pocket formed in said conduit, substantially as specified.

14. The combination with a fuel-magazine and a conduit leading thereto, said conduit being provided with a circular concave pocket therein, twyer-openings in said magazine, and an air-trunk communicating therewith, a passage from said air-trunk to said concave pocket in said conduit, substantially as specified.

In testimony whereof I have hereunto set my hand this 21st day of October, A. D. 1895.

ARTHUR F. BROWN.

Witnesses:
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WARREN HALL.