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PATENTED OCT. 27, 1903.

T. JONES.

APPARATUS FOR CHARGING AND CLEANING FURNACES.

APPLICATION FILED SEPT. 10, 1902.

NO MODEL.

3 SHEETS—SHEET 1.

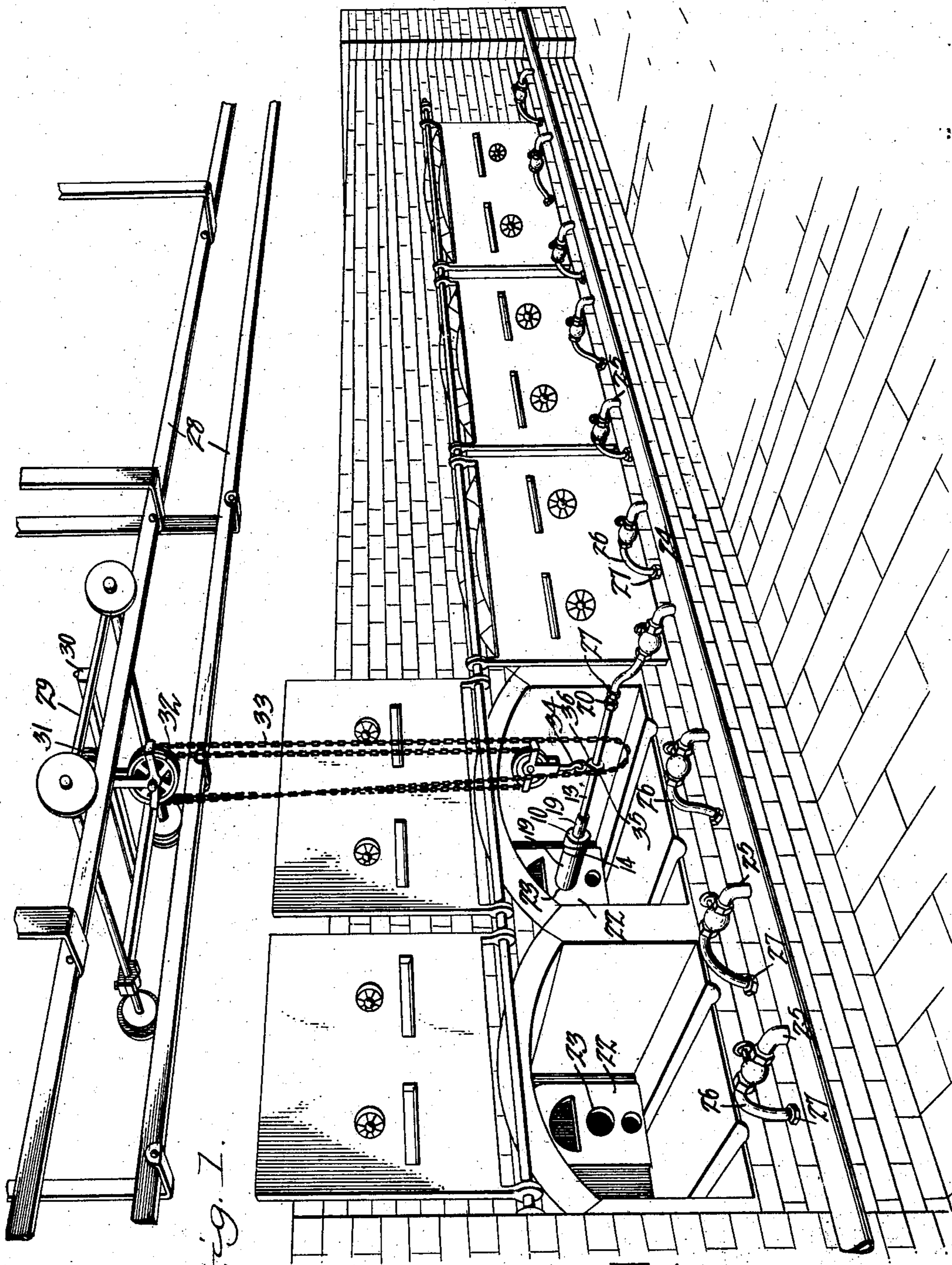


Fig. 1.

Witnesses:

E. F. Howard

R. M. Elliott

T. JONES, Inventor.

by

C. A. Howard

Attorneys.

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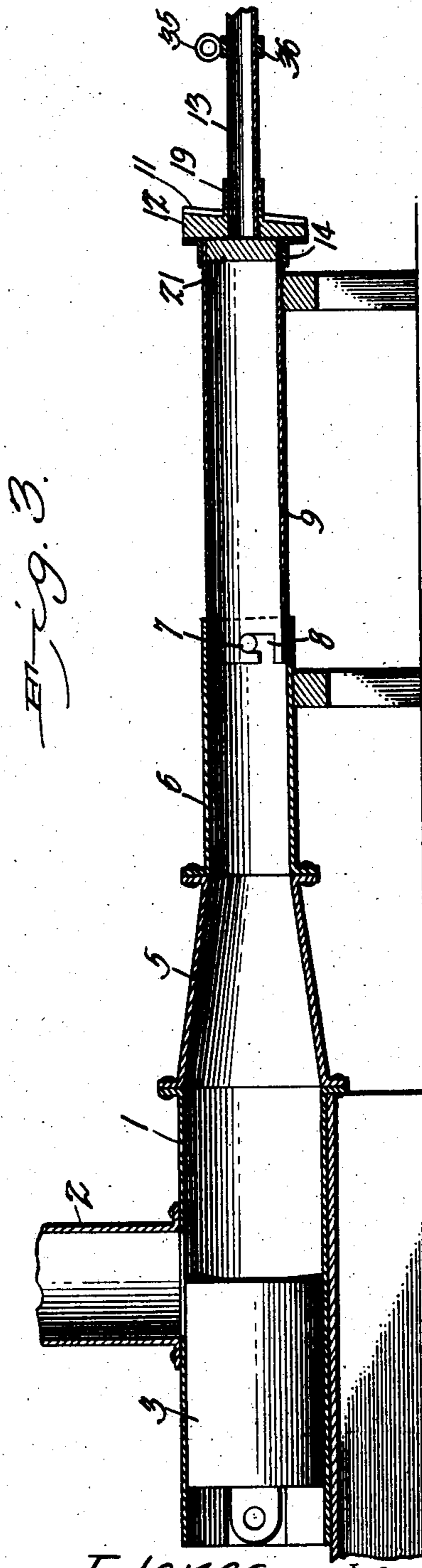
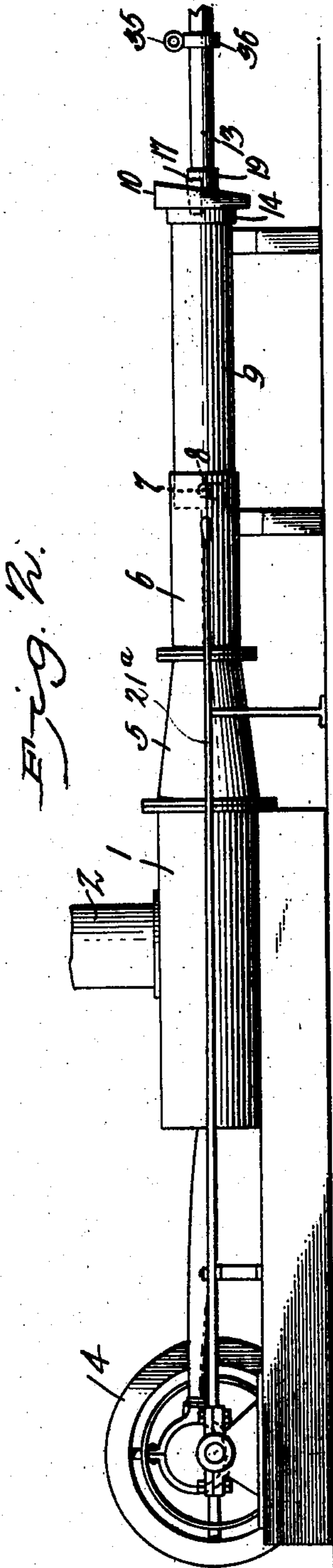
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3 SHEETS—SHEET 2.



Witnesses:
E. H. Howard
R. M. Elliott

by *T. JONES*, Inventor:
C. H. Howard
Attorneys.

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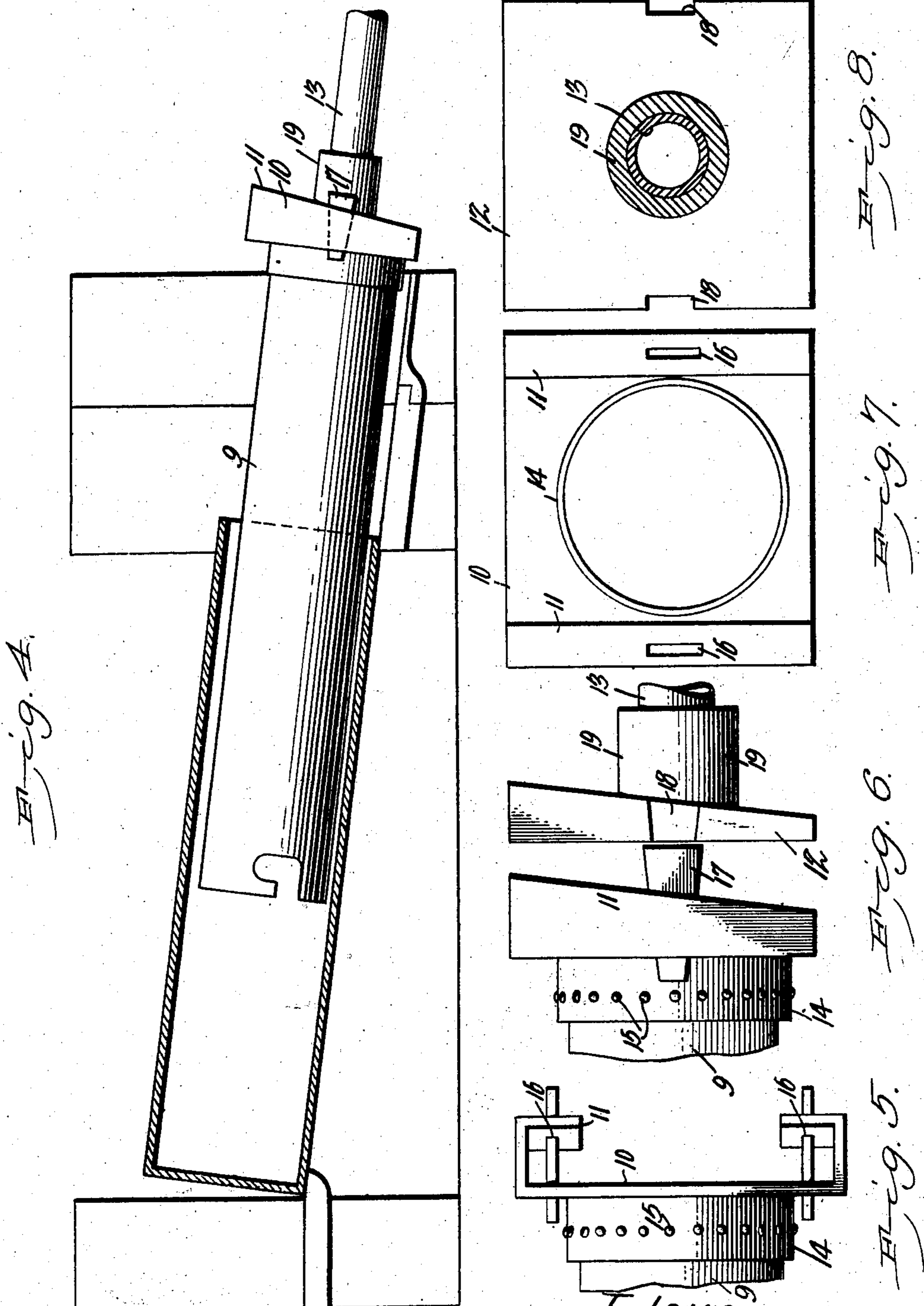
T. JONES.

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3 SHEETS—SHEET 3.



Witnesses:
E. F. Stewart
R. M. Elliott

by

T. Jones, Inventor:
Chas. H. Jones
Attorneys.

UNITED STATES PATENT OFFICE.

THOMAS JONES, OF IOLA, KANSAS.

APPARATUS FOR CHARGING AND CLEANING FURNACES.

SPECIFICATION forming part of Letters Patent No. 742,196, dated October 27, 1903.

Application filed September 10, 1902. Serial No. 122,889. (No model.)

To all whom it may concern:

Be it known that I, THOMAS JONES, a citizen of the United States, residing at Iola, in the county of Allen and State of Kansas, have invented a new and useful Apparatus for Charging Furnaces, of which the following is a specification.

This invention relates generally to an apparatus for charging furnaces, and particularly to the carrying out of the procedure in connection with zinc or spelter furnaces.

The object of the invention is in a ready, simple, rapid, inexpensive, thoroughly feasible, and practical manner to effect charging of the muffles or retorts of a zinc or spelter furnace, to insure that the charge of material shall be properly placed within the muffle, to render unnecessary the employment of skilled and expensive labor for the purpose, and generally to reduce the cost of operating such furnaces.

With these and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the apparatus for charging furnaces, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like numerals of reference indicate corresponding parts, there is illustrated one form of embodiment of the invention capable of carrying the same into practical operation, it being understood that the elements therein exhibited may be varied as to shape, proportion, and exact manner of assemblage without departing from the spirit thereof.

In the drawings, Figure 1 is a view in perspective, exhibiting a stand of furnaces equipped with the charging apparatus of the present invention. Fig. 2 is a view in side elevation of one form of compressing mechanism employed. Fig. 3 is a view in vertical longitudinal section through the compressing mechanism and adjunctive cooperating parts associated therewith, the engine being omitted. Fig. 4 is a view in sectional elevation through a muffle, showing the manner in which a charge of material is supplied thereto. Fig. 5 is a view in plan of the rear end of the charging-tube or holder. Fig. 6 is a collective detail view showing the manner of connecting the pressure-exerting mechanism

with the charging-tube or holder. Fig. 7 is a view in end elevation of the charging-tube or holder viewed from the rear. Fig. 8 is a similar view of the forward end of the pressure-exerting mechanism.

The procedure generally practiced in charging retort or muffle furnaces employed for reducing zinc ore is to mix certain proportions of coal, coke, and zinc ore, crushed or reduced to the proper degree of fineness, and then convey this mixture to the furnace-house on cars, whence it is shoveled into the retorts or muffles by skilled laborers. This work is slow, laborious, and expensive and has the inherent disadvantage of not being thoroughly effective of the best results, inasmuch as, owing to carelessness on the part of the workmen, the retorts or muffles will not be properly charged at all times—that is to say, all of the muffles will not receive the same amount of material, and frequently their rear ends are not supplied at all or the muffles are too tightly or too loosely charged, resulting in a loss of efficiency by a part of the retorts or muffles being improperly charged and a part of the charge intended to go into the furnace being left out to be used the following day. Under the procedure of the present invention, these objectionable features are positively overcome in a manner that is at once simple and thoroughly reliable, as in practice the material is placed properly within the muffles and in predetermined and exact quantities, and, further, the number of workmen required for the purpose is reduced to the minimum.

The apparatus herein described embodies one arrangement of mechanism that will be found thoroughly effective for the purpose designed; but it will be apparent that the broad and underlying principles of the invention may be carried into effect in many other ways than that shown, and for this reason it is to be understood that the invention is not to be limited to the precise arrangement herein shown.

In carrying the invention into practice the material—in this instance zinc ore—is mixed with the proper proportions of coal and coke, to which is added a small amount of crude petroleum or coal-tar or other suitable material for the purpose of presenting an ag-

glomerate mass. To present this mass in the best possible shape for charging, it is subjected to suitable pressure. The materials may be compressed into charges of suitable size, and these may be placed in suitable holders, or the materials may be forced directly into the holders under requisite pressure and contained therein until used. In the present instance the latter procedure is observed, and the mechanism for compressing the material comprises a receiving-chamber 1, with which is associated, preferably at its top, a feed pipe or spout 2, down which the materials are fed. This chamber is preferably of the same diameter throughout its entire length and houses a plunger 3, driven by a suitable engine or motor 4. (Clearly shown in Fig. 2.) Secured to the discharge end of the receiving-chamber is a compression-chamber 5 of tapered form, and attached to the discharge end of the compression-chamber is a delivery-chamber 6, preferably of the same diameter throughout and provided near its discharge end with pins or projections 7 (one only being shown) to be engaged by L-shaped locking-slots 8, arranged at the inner end of the charging-tube or holder 9, which latter may be made of any suitable material, preferably of sheet metal. It is to be noted at this point that although the elements of the compressing-machine and the charging-tube or holder are shown as circular in cross-section they may be rectangular, square, or of any other preferred contour and still be within the scope of the invention.

The outer end of the charging-tube or holder 9 has connected with it a plate 10, (exhibited in detail in Figs. 5 and 7,) each side of the plate being provided with an intumed flange 11, that is disposed at an angle to the outer face of the plate, thus to present wedge-shaped recesses to be engaged by a similarly-shaped head 12, carried by the fluid-supply pipe or handle 13. The plate 10 is herein shown as provided with a tubular extension 14, in which the outer end of the charging-tube 9 is seated and is held there by rivets or bolts 15; but this manner of assembling these parts is not essential and may be varied. The flanges 11, as also the plate 10, are provided with slots 16 to be engaged by a wedge-shaped locking-key 17, which when the head 12 is in position between the flanges engage recesses 18 in the sides thereof, thus to insure positive locked action between the parts, the recesses being clearly shown in Fig. 8. By the angular disposition of the inner faces of the flanges with relation to the plate 10 and by the coaction between the outer wall of the head 12 and the flanges the said head will be tightly forced up against the plate 10, and thus preclude the escape of air or other fluid employed in expelling the charge of material from the holder.

The manner of associating the supply-pipe 13 with the head 12 is in this instance effected by providing the latter with a tubular off-

set 19, in which the pipe is threaded. The pipe 13 is provided at its free end with a suitable coupling 20, (shown in Fig. 1,) by which to connect with a source of air-supply presently to be described. The charging-tube houses a follower-head 21, which operates to prevent escape of material from the tube when the same is being filled and also to provide a means for forcing the material from the tube into the muffle, as will presently appear.

In Figs. 2 and 3 the fluid-supply pipe 13 is shown as connected up with the charging-tube through the medium of the head 12 and plate 10, these two elements constituting a clutch; but this is merely for the purpose of rendering clear an understanding of the device, as in actual practice the fluid-supply pipe is not connected with the discharge-pipe until the latter is to be inserted within the muffle or retort.

The operation of the apparatus so far described is as follows: The material is fed from any suitable source of supply to the chute 2, whence it passes to the receiving-chamber 1, and the plunger 3 forces it in successive impulses through the delivery-chamber 6 and into the charging-tube 9, which has previously been connected with the delivery-chamber in the manner described, it being understood that when the tube is being filled the follower-head is positioned in the outer end thereof. In order to stop the feed of material to the charging-tube when the same is filled, suitable clutch mechanism (not necessary to be shown) is associated with the drive-shaft of the motor or engine and is thrown into and out of operation through the medium of a lever 21^a, disposed adjacent to the delivery-chamber 6 and in convenient reach of the operator. As fast as the tubes are filled they are disconnected from the compressing apparatus and placed upon suitable cars (not shown) provided for the purpose, and when the desired number is furnished the cars are removed to the furnace-house, now to be described.

As shown in Fig. 1, there is a bank of muffles 22 provided, which may be of the usual or any preferred construction, each muffle having an opening 23 to receive the charging-tube.

The means for supplying, in this instance, aeriform fluid to the supply-pipe 13 comprises a main 24, connected at one end with a suitable air-compressor or other source of air under pressure, and the main is provided with valved branches 25, with which connect sections of hose 26, carrying coupling elements 27 to engage with the coupling 20 of the supply-pipe. The form of coupling herein shown is an ordinary hose-coupling; but any other form of device adapted for the purpose may be employed and still be within the scope of the invention.

Arranged at a suitable distance above the front of the furnace is a pair of tracks 28, which may be suspended in any preferred

manner from the ceiling of a room or otherwise. Upon these tracks is mounted a four-wheeled platform or carrier 29, to the frame of which is connected a section of track 30, disposed at right angles to the front of the furnace, and on this track is mounted a trolley 31 of any preferred construction, carrying at its lower end a sheave 32, from which is suspended a set of differential chain-hoists 33, the chain being provided at its lower end with a hook or catch 34 to engage a ring 35, carried by a collar 36, adjustably mounted on the supply-pipe 13, the wheeled platform, trolley, and differential chain-hoist constituting, in effect, an overhead crane.

The operation of charging a muffle is as follows: A charging-tube is taken and the follower-head being positioned therein a supply-pipe is connected with the tube in the manner already described. The hook of the chain-hoist is hooked into engagement with the ring 35 and the hoist operated to bring the tube in position to enter the opening 23 of the muffle, after which the hose from the air-pipe is coupled with the supply-pipe 13. The charging-tube is now pushed into the muffle until its inner end contacts with the rear wall thereof and air is fed to the supply-pipe and impinges the follower-head 21, thereby forcing out the charge of material and at the same time pushing the charging-tube out of the muffle, the charge being deposited at the proper point within the muffle. The follower-head 21 may be left in the tube or taken out and used in charging other tubes which are being compressed, thus keeping a supply of follower-heads at the compressor and also at the furnace, or they may be left in the tubes until the charge is blown into the retort. When the charge is expelled, the follower-head holds it in the tube tight against the rear end of the retort until the tube is forced out, and as soon as this takes place the air escapes and the operator shuts off the air and changes the tube. The follower-head may remain in the outer end of the retort and be taken away by the operator or may fall upon the end of the shelf of the furnace-front and taken thence; but in either case it will be used over and over again. As soon as one charging-tube is empty it is disconnected from the supply-pipe and another associated therewith, and this is kept up until the muffles are properly charged.

As herein shown, there is a flexible air-discharge pipe opposite each muffle, although it is to be understood that this is not essential, as one of these pipes may be made, by having it of sufficient length, to supply air to several muffles, or, if preferred, to the whole series.

The charging-tubes are by preference made somewhat longer than the retorts or muffles, so that when the latter are being charged the tube may be forced into them a sufficient distance to bring its end into engagement with their rear walls, and under this arrangement

the follower-head will be located a few inches from the outer end of the tube to present a chamber in which the compressed air will be discharged, and will thus act more directly on the follower. The charging-tubes may, however, be made shorter than the muffles and will be found to operate in a thoroughly efficient manner.

Instead of employing the lever 21^a for operating the clutch mechanism of the engine 4 to stop the compressor when a holder has received a charge automatically-operating mechanism may be associated with the holder to effect stoppage of the engine when a holder is filled.

It is to be understood that this invention is adapted for use in connection with furnaces employing the Silician type of muffles, and as its application thereto will be obvious detailed illustration is omitted.

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

1. An apparatus for charging a retort, comprising a holder for containing the material to be treated and means for forcing the charge from the holder without altering the position of the holder in so doing.

2. An apparatus for charging a retort, comprising a holder for containing the material to be treated, and means for supplying fluid under pressure to the holder to force the charge therefrom.

3. An apparatus for charging a retort, comprising a holder for containing the material to be charged, and means detachably associated therewith for supplying fluid under pressure to force the charge therefrom.

4. An apparatus for charging a retort, comprising a holder, a follower-head loosely mounted therein, and means for supplying fluid under pressure to the holder.

5. An apparatus for charging a retort, comprising a holder, means for supplying fluid under pressure thereto, and mechanism for detachably connecting the holder and fluid-supplying means.

6. An apparatus for charging a retort, comprising a holder provided at one end with means for association with a compressing apparatus and at its opposite end with means for connection with fluid-supply mechanism.

7. The combination with a furnace, of a traveling crane, means for supplying air under pressure, a holder for containing material to be treated, a detachable device connecting with the holder and with air-supply means and serving to introduce compressed air into the holder, and mechanism connecting the said device and the crane.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

THOMAS JONES.

Witnesses:

NELSON F. ACERS,
HARRY THOMPSON.