(No Model.)

2 Sheets—Sheet 1.

O. S. GARRETSON.

HOT BLAST APPARATUS.

No. 596,494. Patented Jan. 4, 1898.

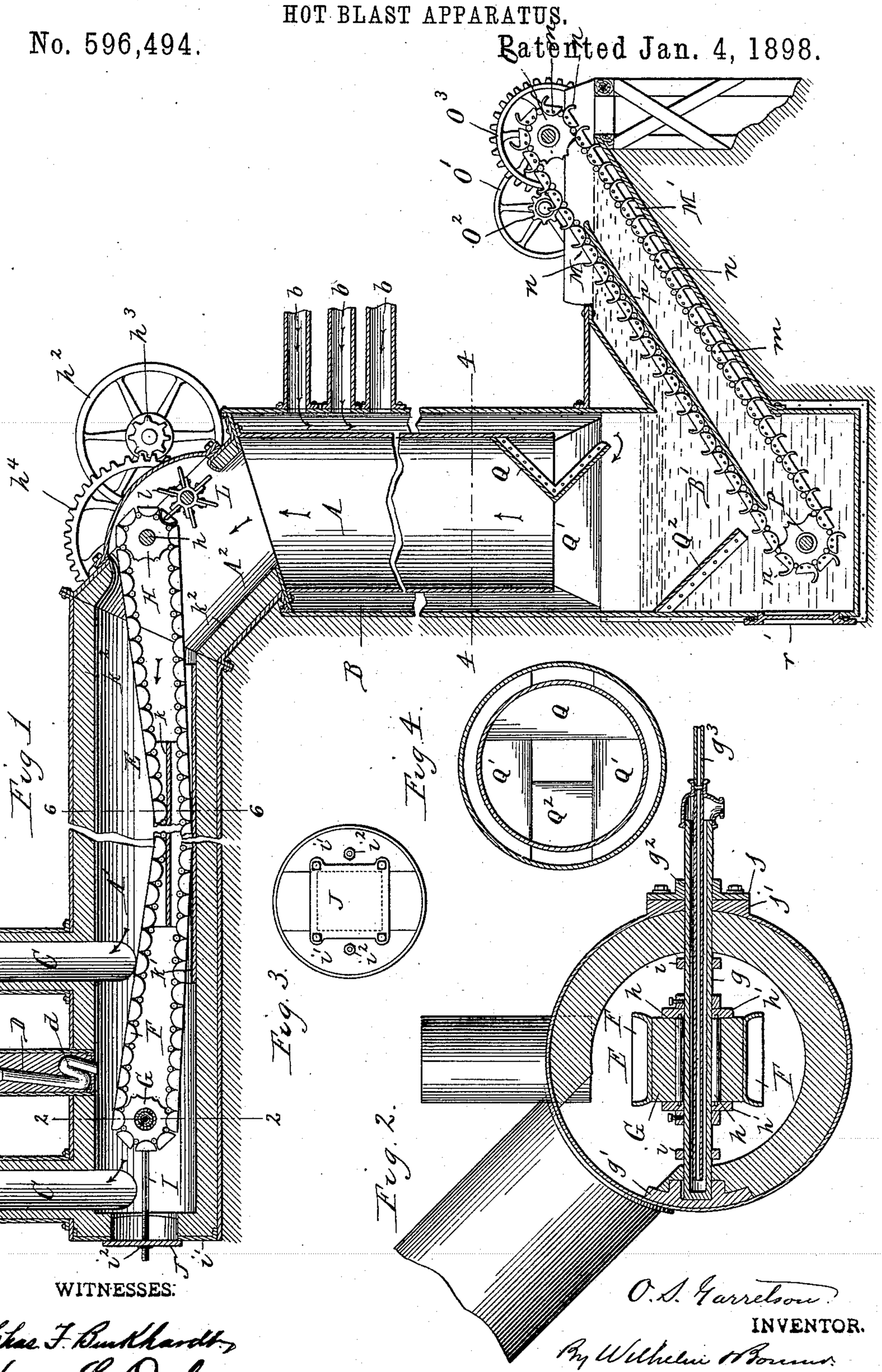

Fig. 1

Fig. 3.

Fig. 4.

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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HOT BLAST APPARATUS.

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Fig. 5

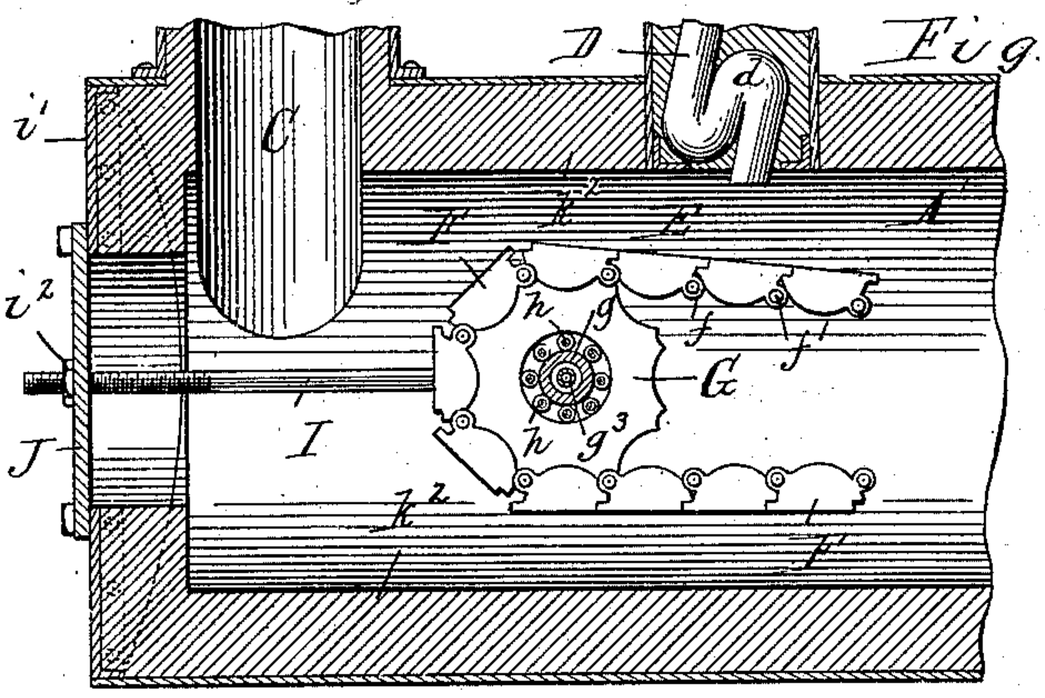


Fig. 7.

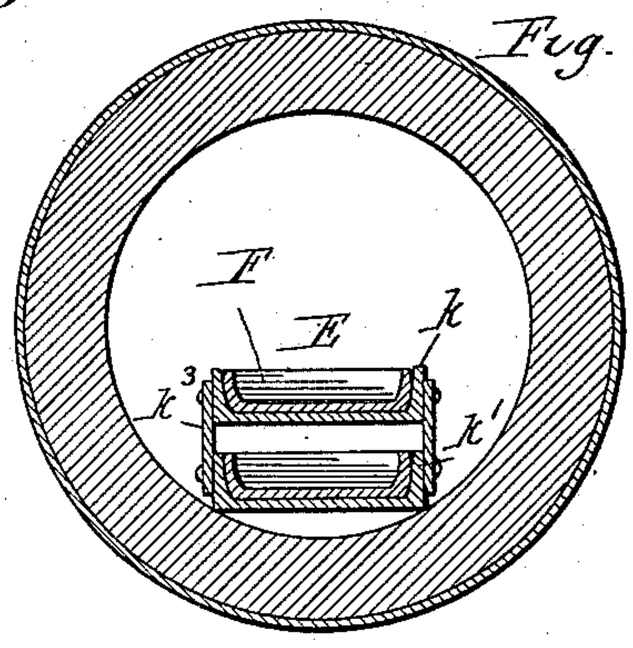


Fig. 6.

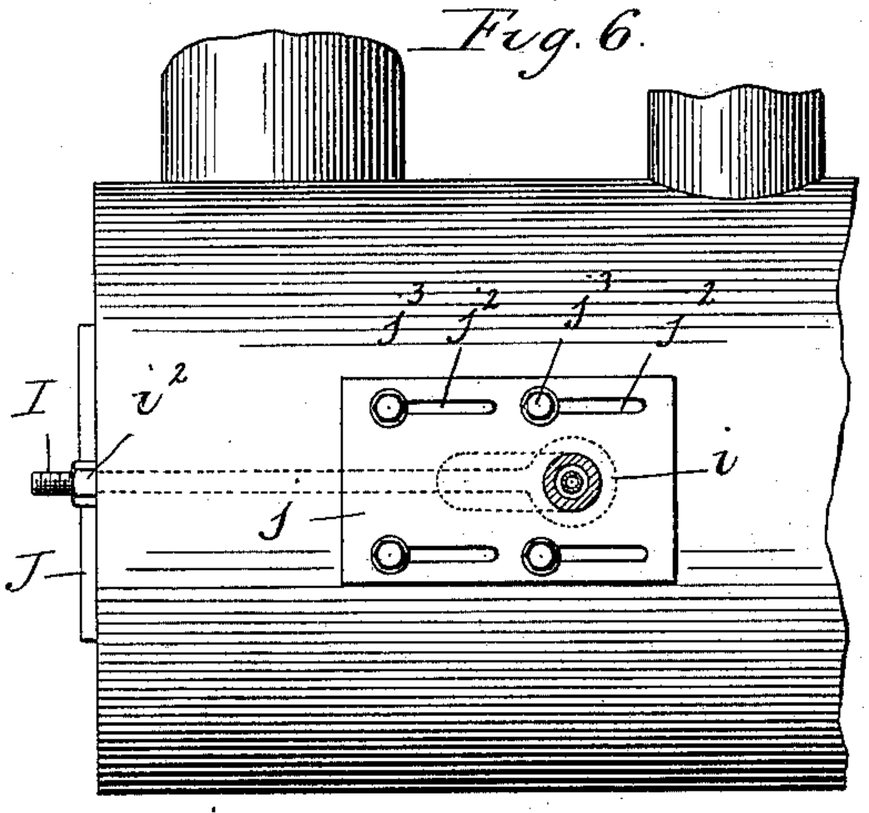


Fig. 10.

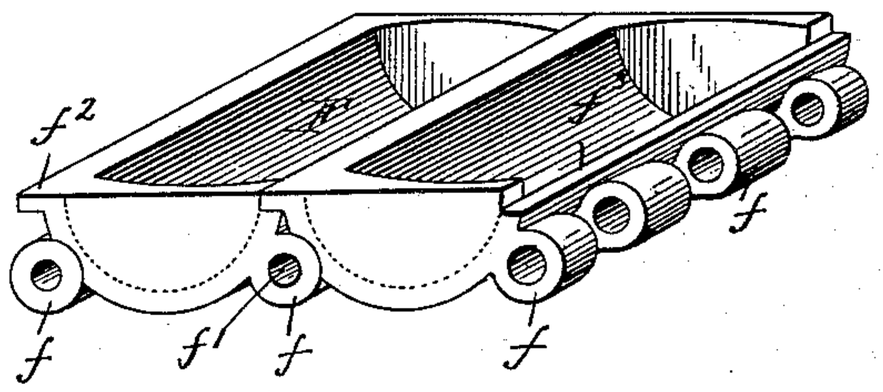


Fig. 8.

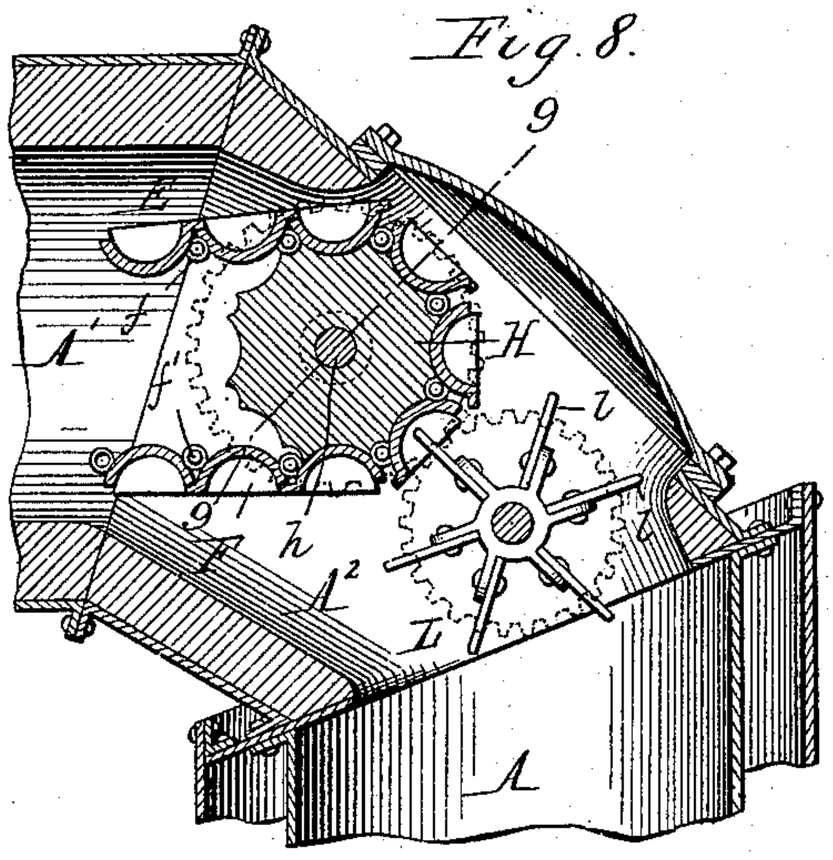


Fig. 9.

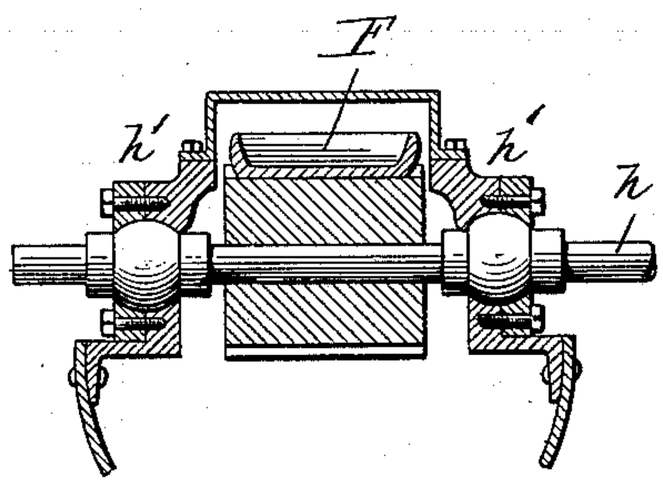
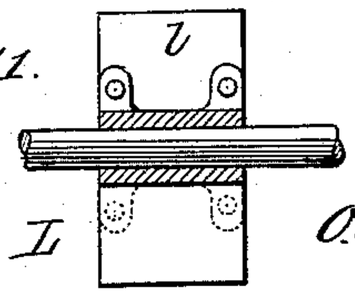


Fig. 11.



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WITNESSES.

UNITED STATES PATENT OFFICE.

OLIVER S. GARRETSON, OF BUFFALO, NEW YORK.

HOT-BLAST APPARATUS.

SPECIFICATION forming part of Letters Patent No. 596,494, dated January 4, 1898.

Application filed October 29, 1896. Serial No. 610,403. (No model.)

To all whom it may concern:

Be it known that I, OLIVER S. GARRETSON, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Hot-Blast Apparatus, of which the following is a specification.

This invention has for its objects to utilize the heat which is contained in the molten slag for heating the blast, and to construct the apparatus in such manner that the molten slag is automatically conveyed through the blast-conduit for imparting its heat to the blast, the congealed slag is automatically discharged from the apparatus, and the molten slag is supplied to the apparatus and the congealed slag removed therefrom without allowing the blast to escape at the points where the slag is supplied and discharged.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of my improved hot-blast apparatus. Fig. 2 is a cross-section, on an enlarged scale, in line 2 2, Fig. 1. Fig. 3 is an end elevation of the head of the blast-conduit. Fig. 4 is a horizontal cross-section in line 4 4, Fig. 1. Fig. 5 is a longitudinal vertical section, on an enlarged scale, of the feed end of the slag-conveyer and head portion of the blast-conduit. Fig. 6 is a side elevation thereof. Fig. 7 is a vertical cross-section in line 6 6, Fig. 1. Fig. 8 is a longitudinal vertical section of the tail end of the slag-conveyer and adjacent parts. Fig. 9 is a cross-section in line 9 9, Fig. 8. Fig. 10 is a perspective view of two of the buckets of the slag-conveyer. Fig. 11 is a sectional elevation of the rotating cleaner at the delivery end of the slag-conveyer.

Like letters of reference refer to like parts in the several figures.

The blast-conduit, as shown in the drawings, consists of an ascending inlet portion A, a horizontal main portion A′, and an oblique connecting or elbow portion A^2. The inlet portion A is surrounded by a descending blast-pipe B, which receives the blast at its upper end from pipes *b*, several or one, as preferred, and which communicates with the lower end of the inlet portion A. The bottom portion B′ of the pipe B forms a receiving-chamber for the congealed slag.

The end of the horizontal main portion of the blast-conduit which is farthest removed from the inlet portion is provided with one or more outlet-pipes C, through which the heated blast escapes and from which it passes to the furnace. D represents the pipe which receives the molten slag from the furnace and through which the slag enters the apparatus. This pipe is provided with a return-bend or trap *d*, which remains filled with molten slag and whereby the blast is prevented from escaping upwardly through said pipe or interfering with the flow of the slag through the same.

E represents a slag-conveyer which is arranged in the horizontal main portion of the blast-conduit, with its head portion underneath the feed-pipe D and with its tail end over the ascending inlet portion A. This conveyer receives the molten slag from the feed-pipe and conveys it slowly toward the inlet of the blast-conduit. In passing through the horizontal portion of the blast-conduit the molten slag parts with its heat to the enveloping blast and becomes congealed, and is in that condition discharged from the tail end of the conveyer and descends through the ascending inlet portion of the conduit into the receiving-chamber at the foot thereof.

As shown in the drawings, the slag-conveyer is composed of an endless system of buckets F, which are pivotally connected with each other by interlocking perforated ears *f* and pivot-bolts *f′*, passing through the same. These buckets are rectangular at the top or open side and their concavity is preferably semicircular, as shown. Each bucket is provided along one of its transverse edges with a lip f^2, which fits into a transverse recess f^3 along the edge of the adjacent bucket, so that the buckets present an unbroken surface in passing underneath the slag-feed spout and receive the slag therefrom without allowing slag to pass between the buckets.

G represents the head-pulley of the slag-conveyer, and H the tail-pulley thereof. The head-pulley is mounted upon a transverse arbor *g*, which is supported in the outlet portion of the blast-conduit. The inner end of this arbor is supported in a shoe *g′*, fitted against the inner side of the conduit, and the outer portion of the arbor projects through

an opening in the opposite wall of the conduit, which is provided with an adjustable bearing g^2 for the support of the arbor. The latter is preferably made hollow and provided with an internal pipe g^3, through which water is supplied to the interior of the arbor for cooling the same, the water returning through the space between the pipe and the arbor and escaping from the outer end of the latter. The pulley G turns upon this arbor, and anti-friction-rollers h, mounted in rings h', are preferably interposed between the pulley and the arbor. The head-pulley G can be adjusted for tightening the conveyer by means of longitudinal screw-rods I, which are arranged on opposite sides of the head-pulley and have at their rear ends eyes i, through which the arbor passes. These bolts extend with their front portions through the front plate i' of the blast-conduit and are provided on the outer side thereof with screw-nuts i^2. The shoe g' at the inner end of the arbor and the bearing g^2 at the outer end of the arbor are longitudinally movable on the blast-conduit, so as to permit the arbor to be moved toward and from the end of the conduit. The bearing g^2 is provided with a flange or plate j, which fits against a boss or enlargement j' on the outer side of the conduit, Figs. 2 and 6. This enlargement is provided with a horizontal slot, through which the arbor passes, (shown in dotted lines in Fig. 6,) and the plate j is provided with horizontal slots j^2, through which the screws j^3 pass, by which the bearing is secured to the boss j'. Upon releasing these screws the head-pulley can be adjusted. The front plate i' of the conduit is provided with a door J for affording access to the interior of the conduit.

The tail-pulley H is secured to a transverse shaft h, which is journaled in bearings h', formed in the side walls of the oblique or elbow portion A^2 of the conduit. This pulley is driven in any suitable manner—for instance, by a belt-pulley h^2, pinion h^3, and gear-wheel h^4.

The upper and lower portions of the slag-conveyer are respectfully supported between the head and tail pulleys by channel-irons k k', which are arranged with their flanges upwardly. The buckets run between the flanges of the channel-irons, as indicated in Fig. 7. The horizontal main portion and the oblique portion of the blast-conduit are preferably provided with a lining k^2 of fire-brick, clay, or other suitable material. The lower channel-iron k' rests on the lining and the upper channel-iron k is supported above the lower iron by longitudinal plates k^3. The upper channel-iron or conveyer-support is arranged somewhat below the horizontal line drawn through the uppermost portion of the conveyer-pulleys, so that the upper portion of the conveyer sags between the pulleys, whereby the air-space above the upper portion of the conveyer on which the slag is carried is increased.

L represents a rotating clearer which is arranged adjacent to the delivery end of the conveyer and which has the purpose to detach from the buckets any congealed slag which tends to adhere to the same. This clearer is driven from the shaft of the tail-pulley by suitable gear-wheels or in any suitable manner and is provided with arms or wings l, one of which enters each bucket as the latter passes around the tail-pulley.

M represents an elevator by which the congealed slag is removed from the apparatus. This elevator is arranged with its foot in the receiving-chamber B' below the ascending inlet portion of the blast-conduit and extends upwardly through an inclined discharge-conduit M', which communicates at its lower end with said chamber. This ascending discharge-conduit is made so high that it will hold a water column of sufficient height to resist the blast which is delivered into the blast-conduit. The receiving-chamber B' and the discharge-conduit M' are supplied with water, and when the apparatus is in operation the water will stand higher in the discharge-conduit than in the chamber in accordance with the pressure of the blast which acts upon the water-level in the chamber. This water seal prevents the blast from escaping through the discharge-conduit. The slag-discharge elevator M may be composed of buckets m, which are constructed and connected like those of the slag-conveyer, but which are perforated, so that they do not remove the water to any considerable extent. The buckets are also preferably provided with lips n for picking up the material in the lower portion of the receiving-chamber.

O represents the head-pulley of the elevator, which is driven in any suitable manner—for instance, by a belt-pulley O', pinion O^2, and gear-wheel O^3.

P represents the foot-pulley of the elevator, which is arranged in the receiving-chamber B'. The upper portion of the elevator is supported between the pulleys on a channel-plate p and the lower portion on the inclined bottom of the discharge-conduit.

Q Q' Q^2 represent inclined deflecting-plates which are arranged, respectively, in the lower portion of the ascending portion A of the blast-conduit, in the lower portion of the surrounding pipe B, and in the receiving-chamber B' for the purpose of breaking the fall of the congealed slag and directing the same upon the elevator and reducing the pressure of the slag upon the elevator. The receiving-chamber is preferably provided with a door r, through which access may be had to the chamber for clearing the same.

The blast enters the upper portion of the pipe B and in passing downwardly through said pipe absorbs the heat which is radiated through the wall of the ascending portion A of the conduit, which latter may be filled to a greater or less extent with fragments of congealed slag. This surrounding pipe B may

extend along a greater or less portion of the blast-conduit, as may be found most suitable. The blast then enters the lower end of the ascending portion A of the conduit and passes upwardly through the same and the slag contained therein and through the oblique portion A^2 and horizontal portion A′ of the conduit, and so becomes heated by contact with the slag until it finally escapes through the outlet-pipes C. The slag enters the apparatus from the furnace in a molten state and gradually parts with its heat in passing through the apparatus and is finally discharged upon the dump after having given off its heat to the blast, the whole operation being continuous and automatic.

It is obvious that my improved hot-blast apparatus may be modified in many respects without departing from my invention, and I therefore do not wish to limit myself to the specific embodiment of the invention which is described and shown.

I claim as my invention—

1. The combination with a blast-conduit having an inlet for the cold air at one end and an outlet for the heated air at the opposite end, of an endless slag-conveyer arranged lengthwise within the same, said conduit entirely closing said conveyer, a device for supplying the fluid slag to the conveyer arranged near the outlet of the blast-conduit, and means whereby the congealed slag is discharged at the inlet of the blast-conduit, substantially as set forth.

2. In a hot-blast apparatus, the combination with a blast-conduit having an inlet for the cold air and an outlet for the heated air, of a slag-conveyer arranged within said conduit, and a trapped supply-pipe whereby the molten slag is supplied to said conveyer, substantially as set forth.

3. In a hot-blast apparatus, the combination with a blast-conduit having an inlet for the cold air and an outlet for the heated air, of a slag-conveyer arranged within said conduit, and a trapped slag-discharge connected with said conduit, substantially as set forth.

4. In a hot-blast apparatus, the combination with a blast-conduit having an inlet for the cold air and an outlet for the heated air, of a slag-conveyer arranged within said conduit, a trapped supply-pipe whereby the molten slag is supplied to said conveyer, and a trapped slag-discharge connected with said conduit, substantially as set forth.

5. In a hot-blast apparatus, the combination with a blast-conduit containing an ascending inlet portion and a horizontal main portion having an outlet for the heated air, of a slag-conveyer arranged within said main portion and having its delivery end arranged over said inlet portion and its slag-supply pipe arranged near said air-outlet, substantially as set forth.

6. The combination with a blast-conduit having an ascending inlet portion and a horizontal main portion provided with an outlet for the heated air, and a slag-conveyer arranged within said main portion and having its delivery end arranged over said inlet portion, of a descending air-inlet pipe surrounding the ascending inlet portion and communicating with the lower end thereof, and a blast-pipe delivering the blast to the upper portion of said descending inlet-pipe, substantially as set forth.

7. In a hot-blast apparatus, the combination with a blast-conduit provided with an inlet for the cold air and an outlet for the heated air, of a slag-conveyer arranged within said conduit, a receiving-chamber for the congealed slag arranged below the delivery end of said conveyer, an ascending discharge-conduit connected with said chamber and forming a water-trap therewith, and an elevator whereby the congealed slag is removed from said chamber, substantially as set forth.

8. In a hot-blast apparatus, the combination with a blast-conduit composed of an ascending inlet portion and a horizontal main portion having an outlet for the heated air, of a slag-conveyer arranged within said main portion with its delivery end over said inlet portion, a receiving-chamber for the congealed slag arranged at the lower end of said inlet portion, an ascending discharge-conduit connected with said chamber and forming a water-trap therewith, and a slag-elevator arranged in said chamber and discharge-conduit, substantially as set forth.

9. The combination with a blast-conduit having an inlet for the cold air and an outlet for the heated air at opposite ends, of an endless slag-conveyer arranged within said conduit and provided with buckets which receive the molten slag, and a rotating clearer arranged at the delivery end of the conveyer and facing the descending portion thereof, substantially as set forth.

Witness my hand this 27th day of October, 1896.

O. S. GARRETSON.

Witnesses:
JNO. J. BONNER,
KATHRYN ELMORE.