

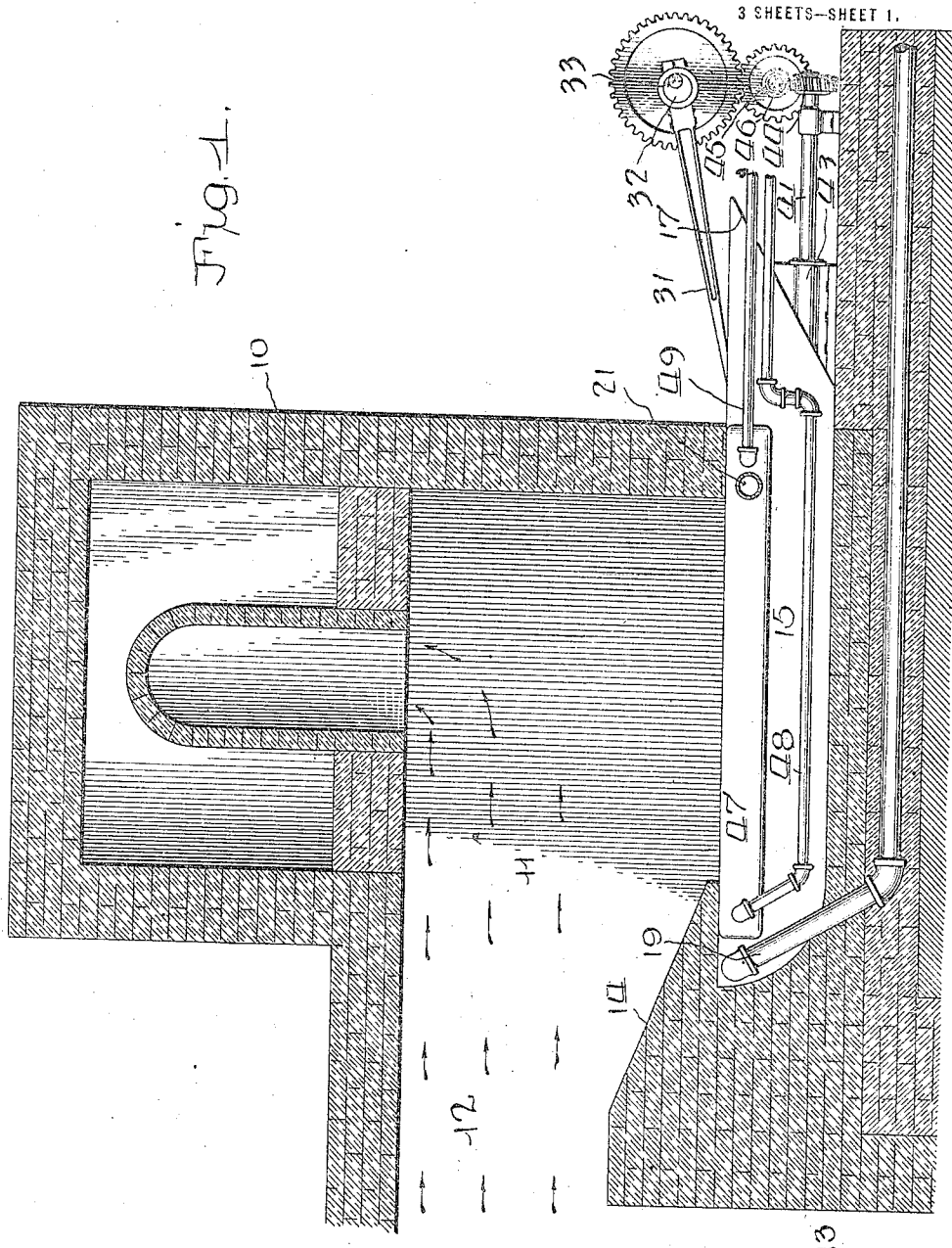
SLAG REMOVING MECHANISM FOR OPEN HEARTH FURNACES.

APPLICATION FILED MAR. 15, 1916.

Patented Aug. 28, 1917.

3 SHEETS--SHEET 1.

1,238,526.



Inventor:

Wm. Harold Eichelman and
Walter A. Kosinski
Benjamin, Rosshorn & Lundy
Attorneys.

1,238,526.

Patented Aug. 28, 1917.

3 SHEETS—SHEET 2.



Witness:
Wm. David Eichelman

Inventor:

Walter A. Kosinski

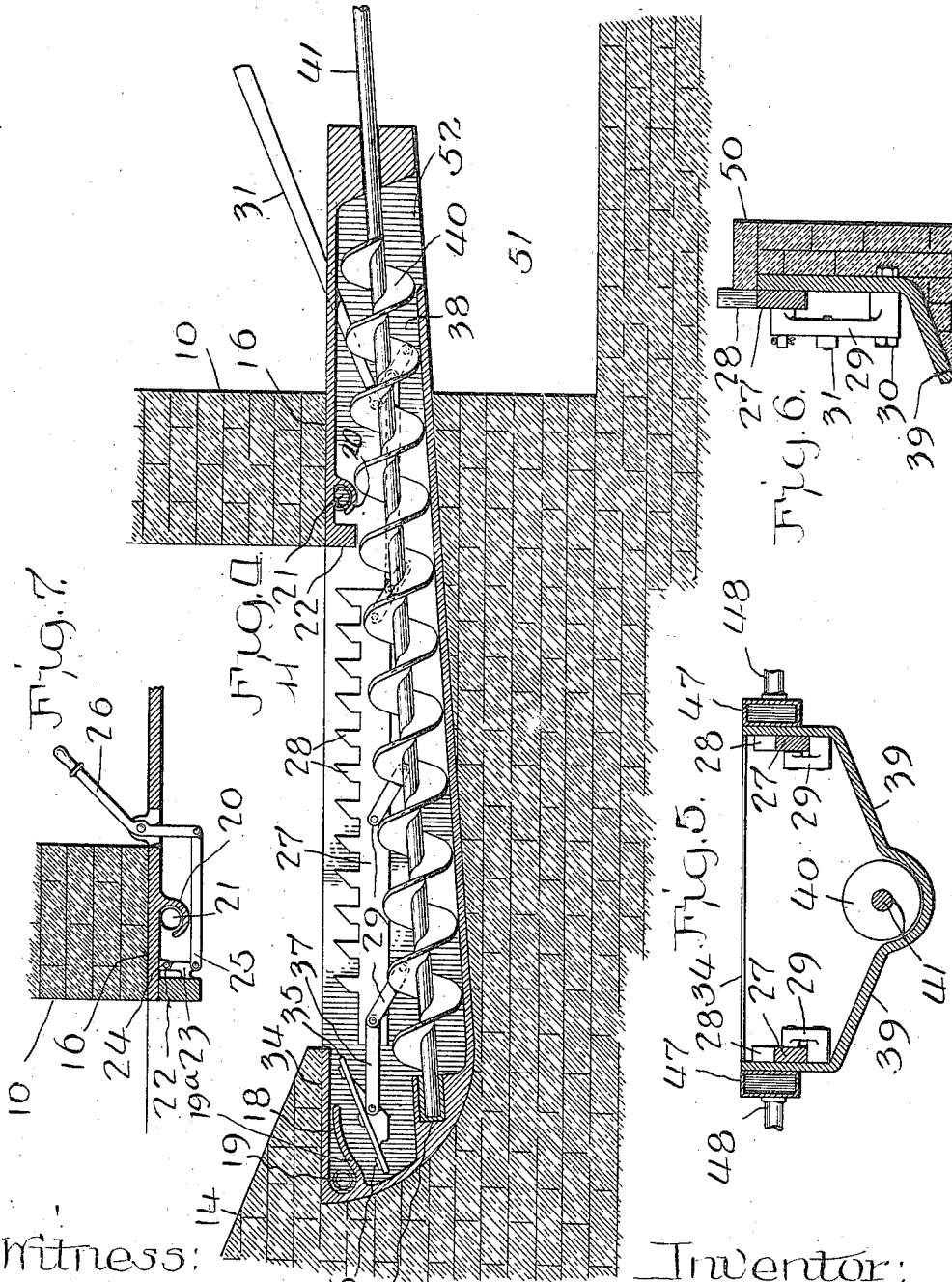
Benjamin, Prochman & Hendy
Attorneys

W. A. KOSINSKI.
SLAG REMOVING MECHANISM FOR OPEN HEARTH FURNACES.
APPLICATION FILED MAR. 15, 1916.

1,238,526.

Patented Aug. 28, 1917.

3 SHEETS—SHEET 3.



Witness:

Wm. Carol Eichelmann

Inventor:

Walter A. Kosinski

Benjamin, Rodhouse & Lundy
Attorneys

UNITED STATES PATENT OFFICE.

WALTER A. KOSINSKI, OF CHICAGO, ILLINOIS.

SLAG-REMOVING MECHANISM FOR OPEN-HEARTH FURNACES.

1,238,526.

Specification of Letters Patent. Patented Aug. 28, 1917.

Application filed March 15, 1916. Serial No. 84,272.

To all whom it may concern:

Be it known that I, WALTER A. KOSINSKI, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Slag-Removing Mechanism for Open-Hearth Furnaces, of which the following is a specification.

My invention relates to furnaces of a type commonly known as "open hearth" furnaces for the manufacture of steel, and more particularly to mechanism for the purpose of removing the slag therefrom. Under the intense heat, usually from 3,000 to 3,500 degrees Fahrenheit, the bricks comprising the walls of the flues and chambers of open hearth furnaces collect slag which drips into the slag pockets disposed below the furnaces and this dripping runs down the walls and forms in a large mass around the slag pockets so that it is necessary to periodically shut down the furnace for the purpose of cleaning the walls of the flues and chambers and for removing the accumulations of slag therefrom. Various methods have been employed to do this work and the apparatus I have designed is for the purpose of removing the slag as fast as it accumulates in the pockets so that the furnace need not be shut down for the purpose. One of the objects of my invention is the provision of suitable mechanism that is adapted to break off and disengage the lower strata of slag, thereby causing the same to fall into a box from which it may be easily removed without the necessity of shutting down the furnace for this purpose. Another object of my invention is the provision in a slag-box of means for maintaining a constantly changing supply of water whereby the material of the box is protected from excessively high temperatures and the slag is rendered extremely brittle and easily broken up and removed when received therein. Another object is to cover the water in the slag-box with soot or other finely divided floating material which will be interposed between the water and the blast. Still another object of my invention is the provision of means whereby the accumulation of soot and other substances of lighter specific gravity than water, which float upon the surface of the water in the box, will be prevented from entering the drain pipes leading therefrom. Other objects of my invention will be obvious to per-

sons skilled in the art to which the same pertains, and I desire to accomplish the divers objects thereof by the means and in the manner hereinafter fully described and as more particularly pointed out in the claims, reference being had to the accompanying drawings forming a part of this specification, in which,

Figure 1 is a longitudinal vertical section of a fragmentary portion of a furnace showing a longitudinal side elevation of my invention applied thereto.

Fig. 2 is a longitudinal section of the lower portion of a slag pocket showing my invention in central section and drawn to a larger scale.

Fig. 3 is a top plan of my invention illustrating the relative disposition of the elements therein.

Fig. 4 is a vertical longitudinal section similar to Fig. 2, of a slightly modified form of my invention.

Fig. 5 is a transverse vertical section taken on line 5—5, Fig. 3 and looking in the direction indicated by the arrows.

Fig. 6 is a transverse fragmentary section of a modified construction of the side wall of the slag-box.

Fig. 7 is a fragmentary section illustrating the manner of removing carbon deposits from the face of the dam plate of the drain.

Referring to the drawings, wherein similar reference characters have been employed to designate the same parts throughout the figures, it will be observed that 10 indicates a steel furnace of the type commonly known as the "open hearth furnace" and may be of any construction desirable, and 11 is the slag pocket located immediately below the same and having open communication at its rear by means of a flue, 12, with the "checkers," 13, of the furnace. The bottom wall of the slag pocket is preferably inclined at one end, as shown at 14, and immediately below the furnace proper the wall is cut away and the same is provided with a suitable slag-box, 15.

The slag-box, just referred to, is of an elongated, substantially rectangular shape and constructed of heavy sheet metal, having a transverse bridge, 16, below and aligning with the front wall of the furnace, and at its forward end has an incline-way, or chute, 17, that extends exteriorly of the furnace. The slag-box, 15, is so disposed

as to receive the accumulation of slag, soot, and the like, from the furnace and is preferably kept filled with water through the medium of a suitable nozzle, 18, that extends transversely across the inner end portion thereof and receives its supply of water through pipes, 19. Immediately above the nozzle, 18, the slag-box is provided with a relatively wide bridge-plate, 34, and from below the pipes, 19, is extended a shorter plate, 19^a, which with said upper plate forms the nozzle, 18, heretofore referred to. The water is drained from the slag-box, preferably below the front wall of the furnace, through a suitable drain or gutter, 20, from which the drainage is carried off through outlet pipes, 21. On account of the fact that the slag-box is provided with and will receive a considerable quantity of soot and other refuse material of lighter specific gravity than the water, the former will float upon the surface of the latter, and in order to prevent this refuse from escaping by entering the drain gutter, I have constructed a transversely disposed dam, 22, extending the length of the gutter. This dam, 22, is preferably provided on its face nearest the drain gutter with hinge-brackets, 23, that are pivotally mounted upon and carried by suitable lugs, 24, depending from the bridge, 16, and the said brackets are connected at their lower ends by means of a link, 25, with an irregularly shaped lever, 26, which has its lower end portion extended into the slag-box and has its upper outer portion provided with a handle whereby the mechanism may be operated by reciprocating the latter. The purpose of making the dam, 22, movable is to break away accumulations of slag and the like, from the front thereof whenever it is found necessary.

The slag will frequently accumulate above the slag-box and it is necessary to break away the same in order to clear the slag pocket of this accumulation. I prefer to do this by means of suitable racks or combs, 27, that are disposed along the longitudinal sides of the slag-box and preferably comprise elongated bars of cast metal, the upper surfaces whereof are provided with a plurality of pointed teeth, 28, substantially as shown. These combs or rack bars are disposed parallel to each other and are adapted to be raised upwardly and at the same time moved forwardly in order to have their teeth, 28, extend above the horizontal plane of the top of the box and to cut into the lower portion of the mass of slag accumulation. I prefer to do this by mounting the combs upon suitable pivoted links, 29, that are constructed substantially in the manner shown in Fig. 6 of drawings, wherein it will be seen that said links have their lower bearing bosses mounted upon suitable

bolts or spindles, 30, projecting inwardly from the side walls of the slag-box, and have their upper portions provided with bearing bosses to engage stubs projecting laterally from the side of the combs. A suitable pitman, 31, is connected at its lower end to the forward one of the links, 29, and from thence extends through the outer open portion of the slag-box where its outer end is mounted upon an eccentric cam, 32, disposed upon a rotatable shaft, 33, whereby said pitman is given a reciprocatory motion that is transmitted to the combs through the links, 29.

In order to break away the slag accumulation from the end of the bridge-plate, 34, I prefer to mount a suitable sliding plate, 35, between several pairs of oppositely disposed guide lugs, 36, and the said plate, 35, is maintained by its guides in an inclined plane so that, when it is moved forwardly, its front edge will be raised to an extent sufficient to break away the slag accumulation on the end of the overhanging plate, 34, and from the inclined wall, 14, of the slag pocket. This plate, 35, is connected by means of a pivoted link, 37, preferably with the combs 27, so that the reciprocation of the combs will simultaneously move the said inclined plate, 35. If desired the link 37 may be connected with another adjacent movable element for the purpose of actuating sliding plate 35.

The bottom of the slag-box is preferably provided with an elongated trough or gutter, 38, that extends from substantially the rear end to the front end of the box, and the portions, 39, of the bottom of the box disposed upon each side of the trough are inclined upwardly and outwardly, substantially as shown in Fig. 5 of the drawings, so that the portion of slag that has been broken away from the mass in the slag pocket will gravitate or fall into the said trough, 38, where it is conveyed forwardly by means of a screw-conveyer, 40. This screw-conveyer is of a diameter substantially corresponding with the diameter of the trough, 38, and has the inner end of its shaft, 41, journaled in suitable bearings, 42, in the rear of the slag-box. The forward or front end of said shaft extends through a suitable bushing or stuffing box, 43, in the inclineway, 17, and its extended end is provided with a worm gear, 44. This worm gear is driven by a suitable worm, 45, mounted upon and rotated by the shaft, 46, and driven in any suitable manner, the same being geared up with the shaft, 33, that is employed for actuating the pitman and combs.

From the above it will be observed that the mechanism for removing the slag may be operated in a continuous manner, so that it will not be necessary to shut down the furnace periodically, as is now the case, when

it is desired to clear out the slag accumulations. It will likewise be observed that the combs, when brought to their raised position and moved forward, will cut into and break away a large portion of the slag, causing the same to fall into the slag-box, where, upon being moistened by the water, it becomes very brittle and the constant rotation of the screw will disintegrate it into small bits, at the same time forcing it forwardly and out of the box onto the incline-way, 17, where it may be removed by shovels or other implements. Owing to the intense heat, which is frequently between 3,000 and 3,500 degrees Fahrenheit, I have found it desirable to insulate the side walls of the box by means of suitable water tanks or jackets, 47, through which water is kept circulating by means of inlet pipes, 48, and drain pipes, 49. If desired, these insulating jackets may be dispensed with and the side walls of the box protected by fire brick, 50, as shown in Fig. 6 of the drawings.

It may be found expedient to dispose the screw conveyer, 40, so that it will entirely remove the slag from the box, and for this purpose I have designed the structure shown in Fig. 4 of the drawings, wherein a suitable pit, 51, is constructed in front of the front wall of the furnace and below the outer extended wall of the box and the bottom of the slag-box is inclined upwardly and outwardly. The gutter or trough, 38, is in this instance inclined, as shown, and a suitable opening or passageway, 52, is made in the bottom of the outer end thereof adjacent the outer end of the screw conveyer. The other elements of the structure correspond in construction and operation with those shown in the other form of my invention above described.

In either of the structures hereinbefore described, it is desirable to float upon the surface of the water in the slag-box, a suitable amorphous carbon or carbon by-product. The purpose of having a surface of this kind upon the water is to assist in insulating the latter from the intense heat of the furnace and I have found, after considerable experimentation, that this operates in a very successful manner.

While I have illustrated and described certain specific means for carrying out my invention, it, of course, will be obvious to others skilled in the art to which my invention pertains, that divers modifications or refinements thereof are possible without materially departing from the spirit of my invention. I desire it understood, therefore, that all such changes and alterations are contemplated within the scope of my invention as expressed in the appended claims.

What I claim is:

1. In a furnace a slag-box, reciprocable combs provided with upwardly projecting

teeth disposed adjacent the side walls of said slag-box and adapted to be reciprocated longitudinally and upwardly above the plane of the top of said slag-box, means for reciprocating said combs, a conveyer within said slag-box, and devices for actuating said conveyer.

2. In a furnace a slag-box, reciprocable combs provided with upwardly projecting teeth disposed adjacent the side walls of said slag-box and adapted to be reciprocated longitudinally and upwardly above the plane of the top of said slag-box, means for reciprocating said combs, a rotatable screw conveyer within said slag-box, and devices for actuating said conveyer.

3. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, elongated slag-dislodging combs pivotally mounted upon the side walls of said box and provided with teeth adapted to be raised above the horizontal plane of the top of said side walls, means for actuating said combs, and a continuously operable conveyer disposed in the lowermost portion of the bottom of said box.

4. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, links pivotally mounted upon the side walls of said box, slag-dislodging combs carried by the free ends of said links, means adapted to oscillate said combs and move the same upwardly and longitudinally, and a conveyer disposed in the lowermost portion of the bottom of said box.

5. In a furnace a slag-box of substantially rectangular shape, and provided with a tapered bottom, slag-dislodging combs pivotally mounted upon the side walls of said box and provided with teeth adapted to be raised above the horizontal plane of the top of said side walls, means for actuating said combs, a gutter in the lowermost portion of said box, and a conveyer operable in said gutter.

6. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, slag-dislodging combs pivotally mounted upon the side walls of said box and provided with teeth adapted to be raised above the horizontal plane of the top of said side walls, means for actuating said combs, a gutter in the lowermost portion of said box, a continuously rotatable screw journaled in said gutter, and means for rotating said screw.

7. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, slag-dislodging combs pivotally mounted upon the side walls of said box and provided with teeth adapted to be raised above the horizontal plane of the top of said side walls, elongated pitmen extending into said box and pivotally connected to the combs for actuating said combs,

and a continuously operable conveyer disposed in the lowermost portion of the bottom of said box.

8. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, links pivotally mounted upon the side walls of said box, slag-dislodging combs carried by the free ends of said links, means adapted to oscillate said combs and move the same upwardly and longitudinally, a gutter in the lowermost portion of said box, and a conveyer operable in said gutter.

9. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, links pivotally mounted upon the side walls of said box, slag-dislodging combs carried by the free ends of said links, means adapted to oscillate said combs and move the same upwardly and longitudinally, a gutter in the lowermost portion of said box, a continuously rotatable screw journaled in said gutter, and means for rotating said screw.

10. In a furnace a slag-box of substantially rectangular shape and provided with a tapered bottom, links pivotally mounted upon the side walls of said box, slag dislodging combs carried by the free ends of said links, elongated pitmen extending into

said box and pivotally connected to a link upon each side wall and adapted to oscillate said combs and move the same upwardly and longitudinally, and a conveyer disposed in the lowermost portion of the bottom of said box.

11. In a furnace a slag-box of substantially rectangular shape, a fluid inlet nozzle extended across one end portion of said box, a transverse bridging wall overhanging said nozzle, a transverse outlet drain gutter adjacent the opposite end of said box and a depending dam in front of said gutter.

12. In a furnace a slag-box of substantially rectangular shape, a fluid inlet nozzle extended across one end portion of said box, a transverse bridging wall overhanging said nozzle, a transverse outlet drain gutter adjacent the opposite end of said box, a plate bridging said gutter, and a vertically disposed dam depending from said plate in front of said gutter.

Signed at Chicago, county of Cook and State of Illinois, this 3rd day of March, 1916.

WALTER A. KOSINSKI.

Witnesses:

E. K. LUNDY, Jr.,

WM. HAROLD EICHELMAN.