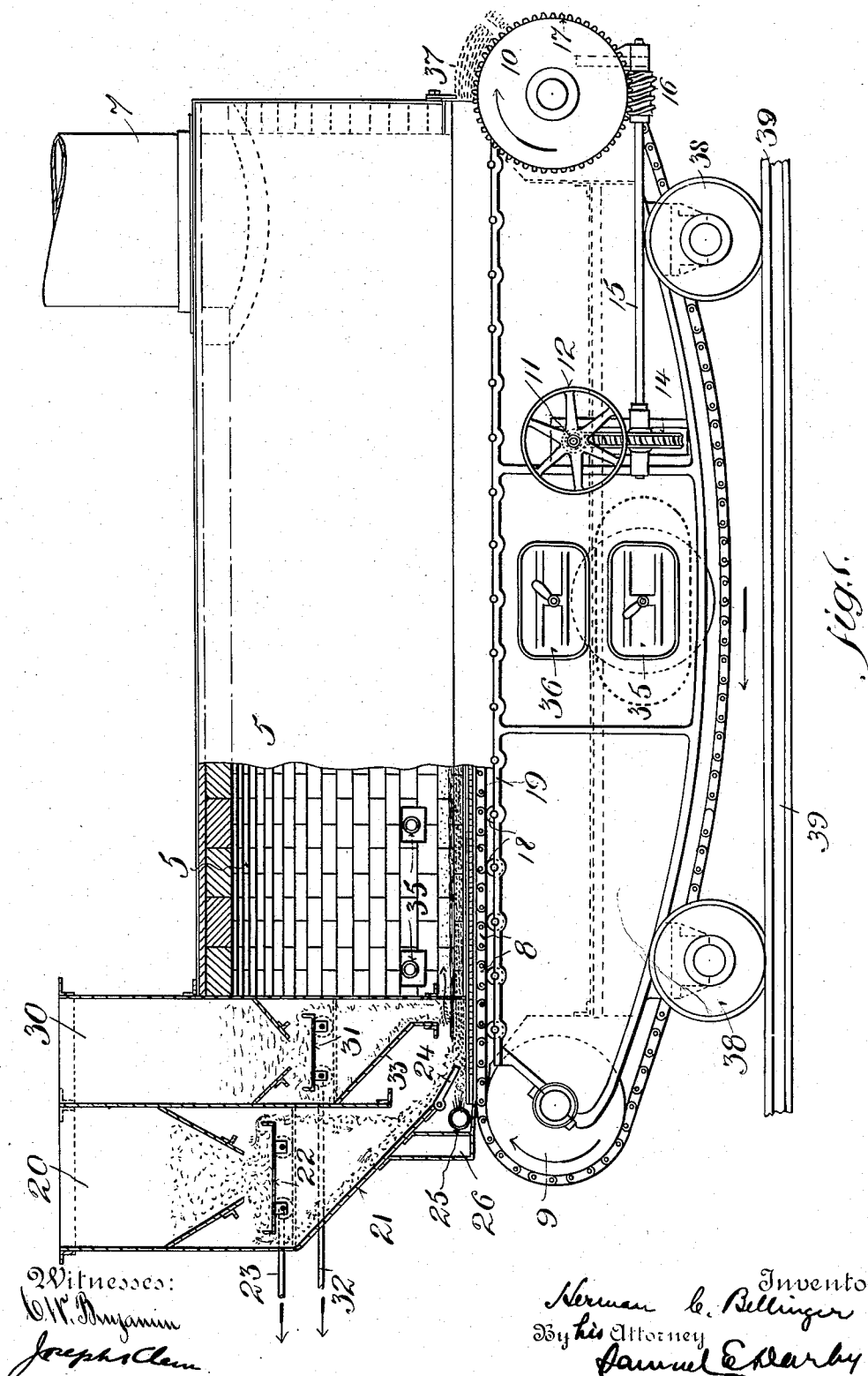


H. C. BELLINGER.
FURNACE FOR TREATING ORES.
APPLICATION FILED JUNE 16, 1908.

942,052.

Patented Dec. 7, 1909.

3 SHEETS—SHEET 1.



Witnesses:
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Herman C. Bellinger
By his Attorney
Samuel E. Darby

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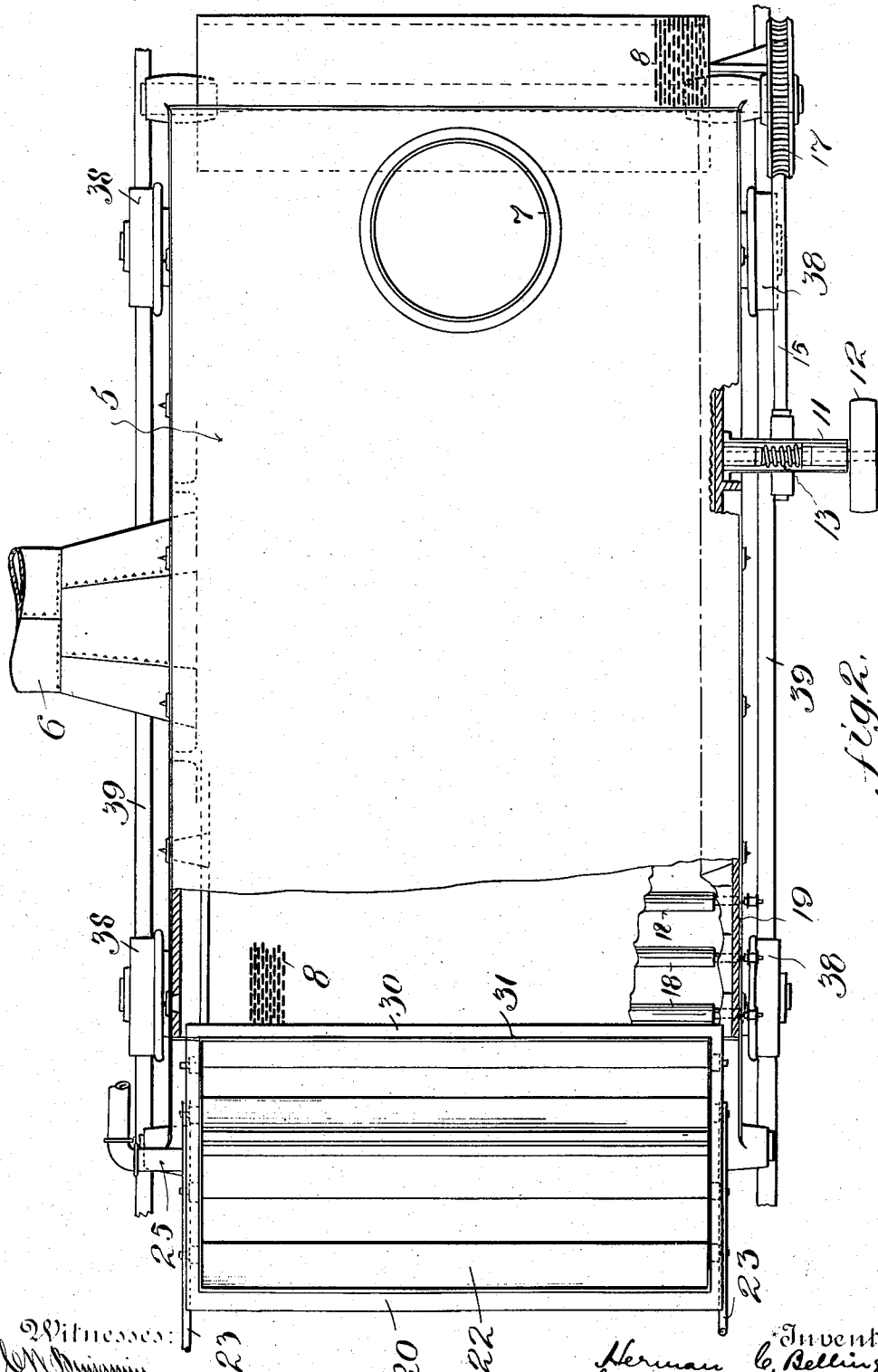


fig. 2.

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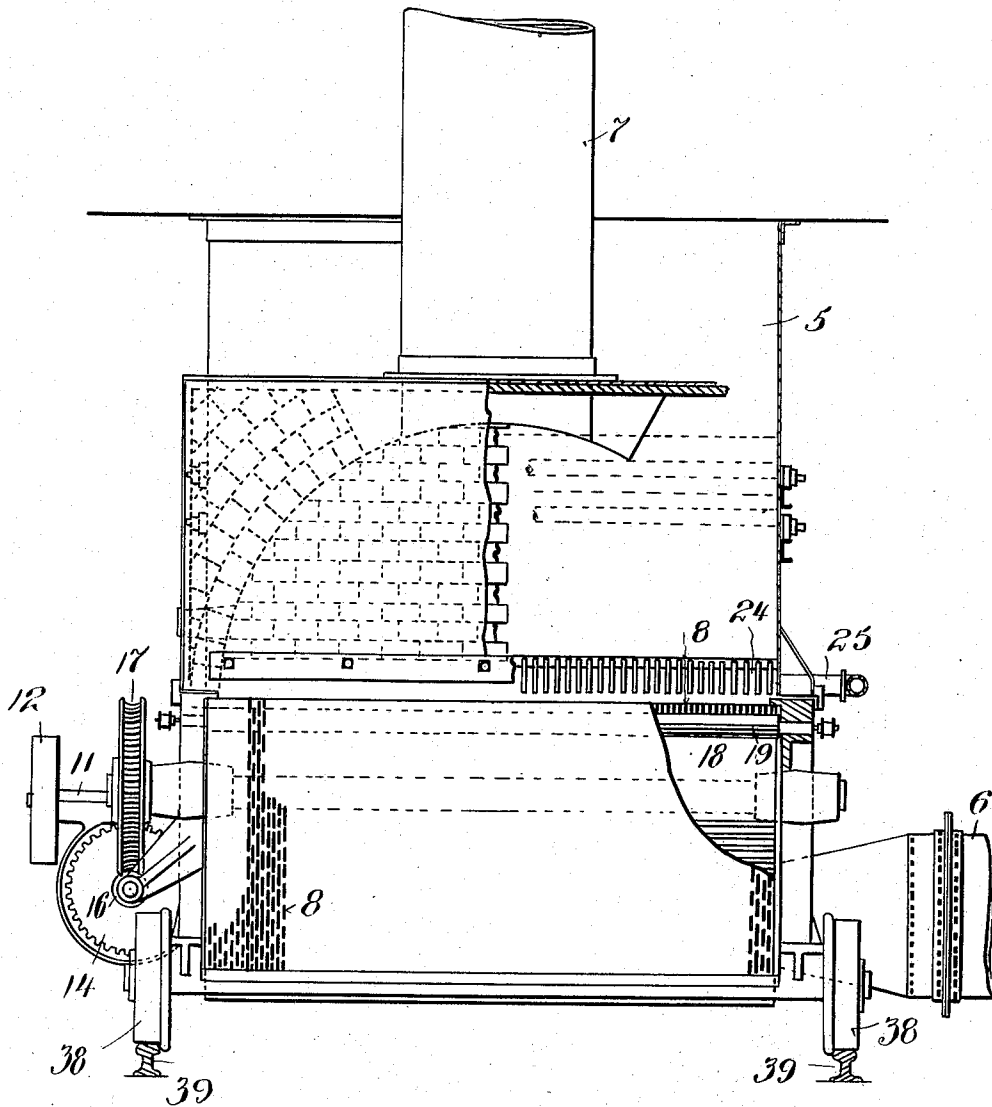


fig. 3.

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UNITED STATES PATENT OFFICE.

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FURNACE FOR TREATING ORES.

942,052.

Specification of Letters Patent.

Patented Dec. 7, 1909.

Application filed June 16, 1908. Serial No. 438,694.

To all whom it may concern:

Be it known that I, HERMAN C. BELLINGER, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake, State of Utah, have made a certain new and useful Invention in Furnaces for Treating Ores, of which the following is a specification.

The invention relates to furnaces for treating ores.

The object of the invention is to provide a sintering furnace for ores and other purposes which is simple in construction and efficient in operation.

A further object of the invention is to provide a furnace for the treatment of ore and of a special advantage in treating or handling fine ores, in such manner as to sinter or agglomerate such fines or fine ores, preparatory to the smelting operation.

A further object of the invention is to provide a furnace of the character referred to which is continuous in its operation.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference signs appearing thereon,—Figure 1 is a view in side elevation, partly in vertical central longitudinal section, of a furnace constructed in accordance with the principles of my invention. Fig. 2 is a view in top plan of the same, parts broken out and parts in horizontal section. Fig. 3 is a view in rear end elevation, parts broken out and parts in vertical transverse section.

The same part is designated by the same reference sign wherever it occurs throughout the several views.

In the art of treating copper sulfid ores, a number of methods are in vogue,—the more common being the shaft or blast furnace method, and the Welsh or roasting reverberatory process. The latter is primarily intended for the smelting of fine ores, and under certain conditions has a

number of drawbacks which are lacking in the shaft or blast furnace practice. The latter method, however, is handicapped by the difficulties encountered in the treating of fine material without preliminary agglomeration. The reduction in capacity; the excessive quantities of flue dust made; and other difficulties, are all too well known to require explanation.

It is among the special purposes of my present invention to provide a machine which is simple in construction and efficient in operation, and designed for the preparation of fine ores, concentrates, etc., for treatment in the blast furnace by sintering or agglomerating such fine materials, thereby eliminating the difficulties above mentioned.

In accordance with the principles of my invention the ore to be sintered or agglomerated is automatically, steadily and continuously fed over a grizzly to permit the finer particles to drop through the spaces of the grizzly onto a traveling carrier or grate where such finer particles are ignited to form a combustion bed of material or a priming bed, such as heated calcines, can be discharged onto the traveling grate in any suitable manner, onto which the larger and coarser particles of ore from the grizzly are deposited. On top of this bed and to serve the purposes of a blanket, and other uses, lime, coarse ore, or other suitable material, is also continuously fed. This blanket serves to minimize the amount of flue-dust which might be created by reason of a forced draft passing through the bed of material. The traveling grate or carrier operates through a blast chamber and in the course of travel of the material through such chamber sufficient combustion is attained to efficiently agglomerate or sinter the material, so that the material discharged from the traveling grate or carrier, after passing through the blast chamber, is in condition for use in the smelting furnace.

It is obvious that many specifically different constructions and arrangements may be employed for carrying this general operation into practical effect. While, therefore, I have shown, and will now describe, one construction of machine suitable for the

purpose, I do not desire to be limited or restricted to the specific details thereof.

In the drawings, reference sign 5, designates a blast chamber having a blast connection 6, delivering thereto, and a waste gas flue 7, delivering therefrom. Through this chamber from end to end operates an endless belt or chain operating over rollers or drums 9, 10, respectively journaled at opposite ends of the blast chamber. The traveling grate or carrier 8, may be operated by any suitable or convenient arrangement of drive mechanism. I have shown a simple arrangement wherein a drive shaft 11, is driven through a belt pulley 12, from any convenient source, said shaft 11, carrying a worm 13, engaging with and driving a worm wheel 14, on a shaft 15, which, through intermeshing worm 16, and worm wheel 17, drives one of the carrier drums as 10. In order to efficiently support the traveling grate between the drums 9, and 10, with its load of ore, I arrange said traveling grate to be supported upon rollers or other suitable supports 18, suitably journaled in side frames 19, of the blast chamber.

The ore to be treated is delivered in any suitable or convenient manner into a hopper 20, from which such ore is distributed down an inclined chute 21. In order to secure an equalized distribution of the ore and a continuous feed thereof from the hopper 20, I employ a distributor pan or device 22, arranged to be reciprocated back and forth with hopper 20, in any suitable manner as, for instance, through an eccentric rod 23, operated from any convenient source, not shown. At its lower end the inclined chute 21, carries a grizzly 24. Beneath the grizzly is arranged a burner 25, designed to ignite the finer particles of ore falling through the spaces of the grizzly, and behind this burner, and below the chute 21, and grizzly, is located a portion 26, of the blast chamber. The fine particles of ore falling from the grizzly are received upon the traveling carrier or grate 8, and being ignited from the burner 25, forms a combustion bed upon which the larger and coarser particles of ore fall from the grizzly 24. This forms a heated combustion bed of the ore which is carried along by the traveling grate or carrier, and into the blast chamber where such bed is subjected to the action of the blast delivered to such chamber through the blast connection 6. In order to prevent the blast delivered through the traveling bed of material being treated, from carrying off fine particles of ore in the form of dust or fines, a blanket bed is delivered onto the ignited bed of ore. A convenient arrangement for accomplishing this result is shown wherein lime or other suitable material is continuously de-

livered upon such bed of ignited ore from a hopper 30, in which operates a distributor 31, similar to the distributor 22, and operated by an eccentric (not shown) or otherwise, through a rod 32. The material delivered from the distributor 31, is directed by an inclined chute 33, onto the bed of ore carried by the traveling grate at a point somewhat in advance of the delivery end of the ore grizzly 24, as clearly shown in the drawing. In practice instead of employing lime for the blanket, coarse ore, or other suitable material may be employed. The waste gases from the traveling bed of ore under treatment, escapes through the waste gas connection 7, and any dust, fines or the like carried from the bed of ore is collected in the upper part of the blast chamber 5, which, for this purpose, serves as a dust chamber.

If desired, sight holes 35, may be provided through the wall of the blast chamber so that the action of the combustion may be observed. The blast chamber may also be provided with man-holes 36, by which access is gained to the interior parts thereof.

The sintered or agglomerated product indicated at 37, is delivered from the traveling grate or carrier after having passed through the blast chamber, and is in condition ready to be received in the mixing bins, or delivered direct to the blast furnace for smelting.

In practice the bed of material on the traveling grate or carrier, should lie to a depth of approximately 4 to 6 inches. The combustion of the sulfur contained in the ore will ordinarily furnish sufficient heat to effect the agglomeration or sintering of the material. If desired, and in order to afford convenient means for transporting the machine, I may mount the same upon wheels 38, for operation upon track rails 39.

From the foregoing description, it will be seen that I provide a simple machine for agglomerating or sintering fine ores, fines, ore-dust and the like in preparation of the same for treatment in a blast furnace. It will also be seen that the operation is continuous and under conditions of uniformity which results in a sintered or agglomerated product in proper condition for use in the blast furnace without incurring danger of waste of values when treated in the blast furnace. The presence of the blanket bed of lime, ore, or the like, on top of the combustion bed serves to minimize the percentage of dust required to be collected in the dust chamber.

It will be seen that by the operation of a machine embodying my invention, I am enabled to secure uniformity of sintered product.

The burner 25, may be an oil or gas burner,

or it may be any other suitable device capable of easily igniting the material to be sintered, while the overlying portion of the bed of ore will be ignited directly from the ignited portion lying underneath the same. The use of a blast of cold air delivered from beneath through the bed of material being treated, as such bed progresses or is carried through the blast chamber, insures freedom from corrosion or clogging of the grates resulting from fusion of the material being treated. The use of the blanket formed by a layer of finely crushed lime, coal, coke or other suitable material, delivered on top of the bed of material to be sintered, serves as a filter to separate dust from the products of combustion. By employing an endless traveling flexible grate, particles of material being sintered are prevented from lodging between the grate bars, thereby insuring at all times free passage of air from the blast furnace through the bed of ore being treated. The sintered product is delivered evenly, uniformly and continuously from the machine.

It will be observed that the metal parts of the machine are protected from contact with the fumes of combustion, while at the same time access is rendered easy to all mechanical or moving parts.

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, what I claim as new and useful, and of my own invention, and desire to secure by Letters Patent is:—

1. In an apparatus for preparing ores for blast furnaces, a blast chamber, a traveling carrier operating therethrough, means for delivering the ore to be prepared to such carrier and means for protecting the bed of ores to be prepared from the action of the blast in the chamber.

2. In an apparatus for preparing ore for blast furnaces, a blast chamber, a traveling carrier operating therethrough, means for delivering the ore to be prepared upon said carrier, and means for delivering a protecting blanket on top of the bed of ore.

3. In an apparatus for preparing ores for smelting furnaces and other purposes, a blast chamber, means for continuously feeding the ores to be prepared through such chamber, and means for protecting the bed of ores to be prepared from the action of the blast in such chamber.

4. In a machine for preparing ores and the like for smelting furnaces or other purposes, a blast chamber, a traveling carrier operating therethrough, an ore hopper delivering to said carrier, and igniting means located below the hopper for igniting a portion of the ore adjacent the point of delivery thereof to said carrier.

5. In an apparatus for preparing ores or

the like for smelting or other purposes, a blast chamber, a carrier operating there-through, a hopper delivering to such carrier, a grizzly arranged at the delivery end of the hopper and a burner located below the grizzly.

6. In an apparatus for preparing ores or the like for smelting or other purposes, a blast chamber, a carrier operating there-through, a hopper delivering to said carrier and a distributor arranged within said hopper.

7. In an apparatus for preparing ores or the like for smelting or other purposes, a blast chamber, a carrier operating there-through, means for delivering a bed of ore to be treated to said carrier, means for igniting the lower portion of said bed, and means for distributing a protecting blanket upon the top of said bed.

8. In an apparatus for preparing ore for smelting or other purposes, a blast chamber, a carrier operating through said chamber, means for continuously delivering the ore to be prepared upon said carrier means for igniting the finer particles of the ore delivered to such carrier, and means for distributing a blanket of lime upon the top of the ore bed.

9. In an apparatus for preparing ores or the like for smelting or other purposes, a blast chamber, an endless carrier operating therethrough, means for actuating said carrier, supporting means for said carrier, means for continuously delivering a bed of ores to be treated to said carrier, and means for protecting the bed of ores from the action of the blast in the blast chamber.

10. In an apparatus for preparing ores or the like for smelting or other purposes, a blast chamber having side frames, transversely extending drums mounted in said frames at the ends thereof, an endless carrier operating over the said drums, means for actuating said carrier, supporting rollers for said carrier, said rollers mounted in said side frames, and means for delivering a bed of the ores to be treated to said carrier.

11. In an apparatus for preparing ores and the like for smelting and other purposes, a blast chamber, an endless carrier or grate operating therethrough, hoppers arranged to deliver to the receiving end of said grate, a grizzly over which one of said hoppers delivers to said grate, a burner arranged below said grizzly and between the same and said grate, and means for continuously moving said grate through said chamber, said chamber having a blast connection and a waste gas flue, the upper part of said chamber forming a dust chamber.

12. In an apparatus for preparing ores or the like for smelting or other purposes, a blast chamber, a traveling carrier operating

therethrough, means for delivering the bed
of ore to be treated upon said carrier, means
for igniting such material, means for main-
taining a blast upwardly through said bed
5 of material and means for protecting the
ores from the action of the blast.

In testimony whereof I have hereunto set

my hand in the presence of the subscribing
witnesses, on this 11th day of June A. D.
1908.

HERMAN C. BELLINGER.

Witnesses:

H. H. GREEN,

J. FRANK PFLUG.