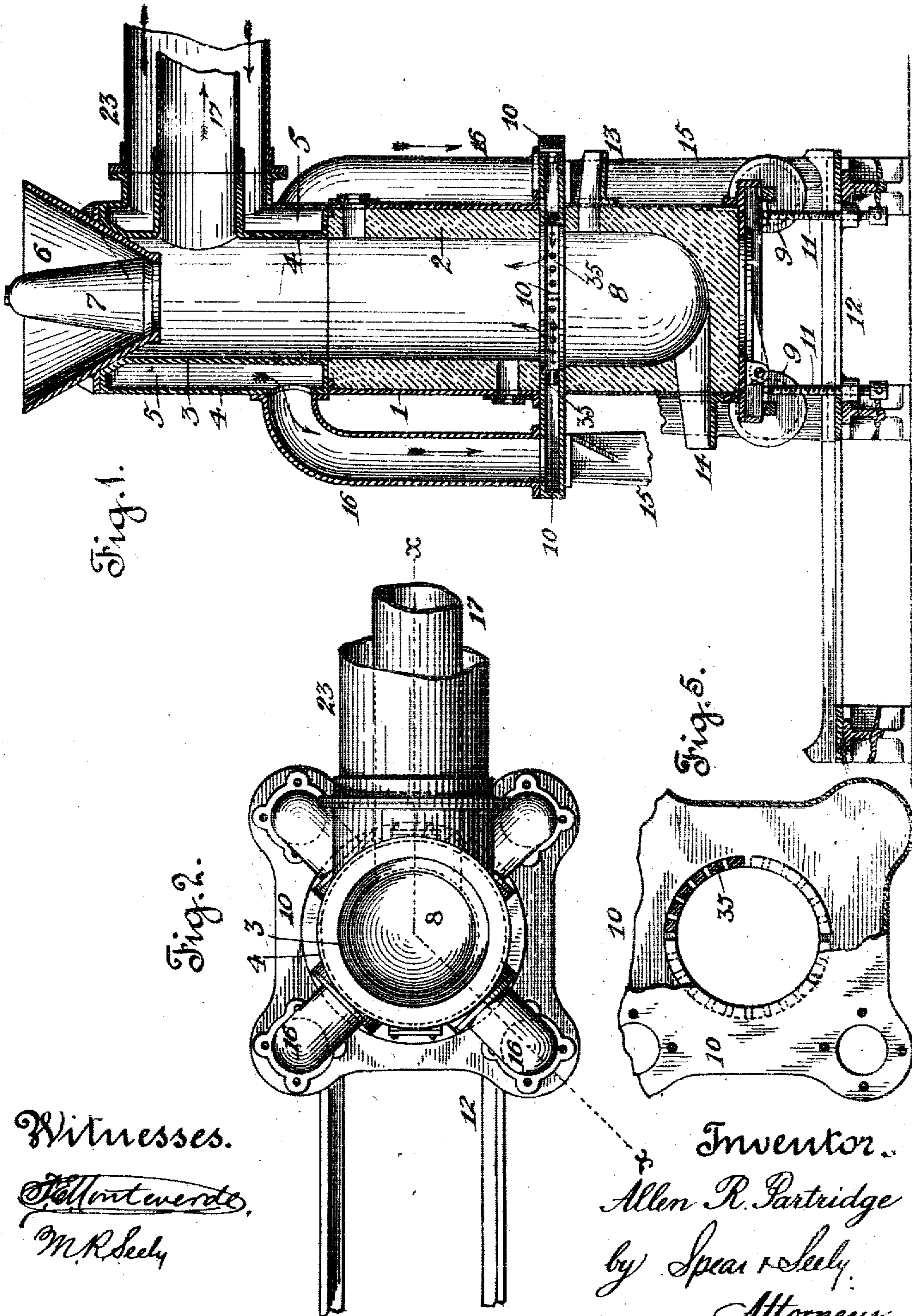


A. R. PARTRIDGE.
SMELTING FURNACE.
APPLICATION FILED OCT. 26, 1904.

3 SHEETS-SHEET 1.



Witnesses.
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No. 812,083.

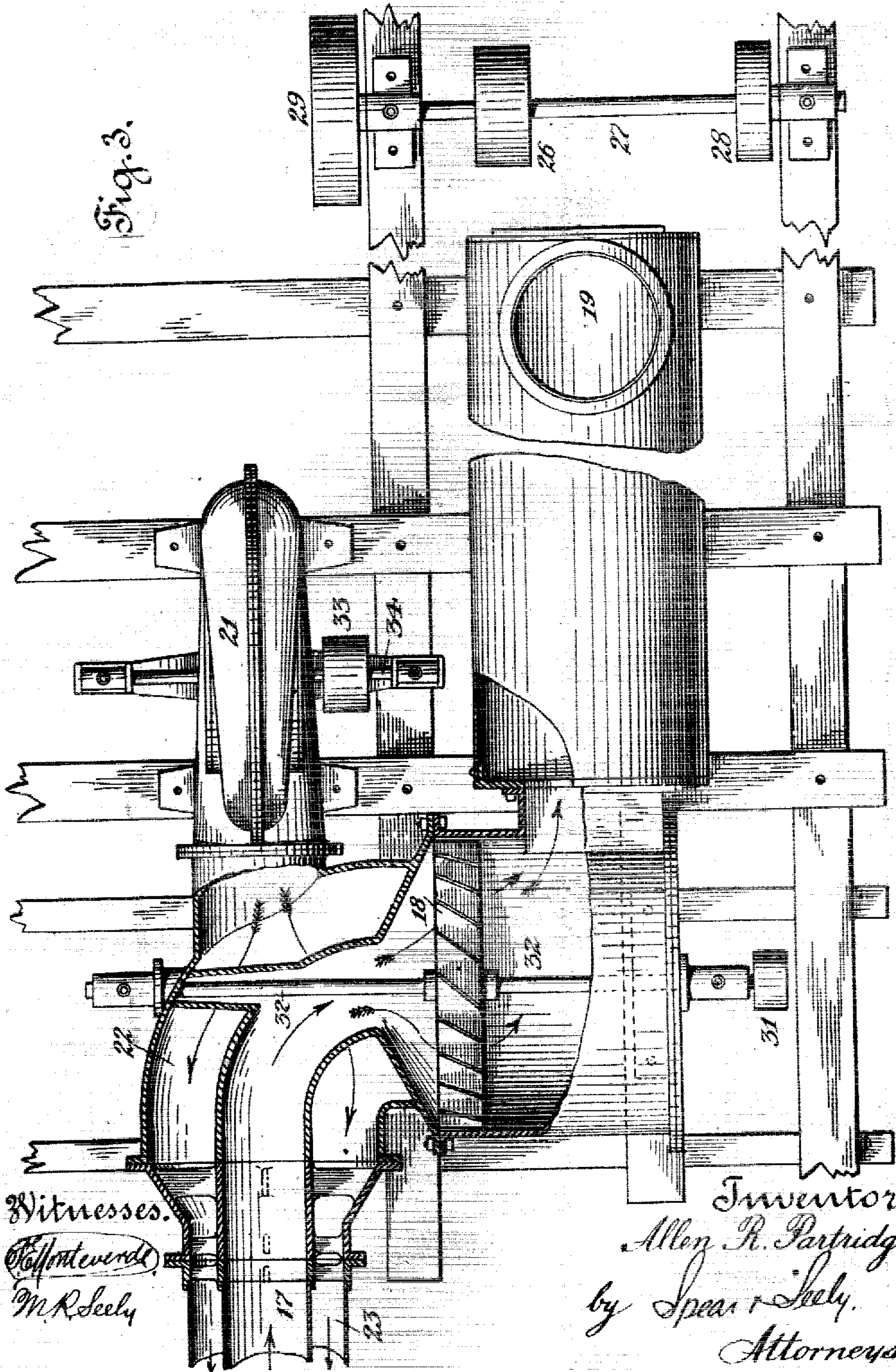
PATENTED FEB. 6, 1906.

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3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

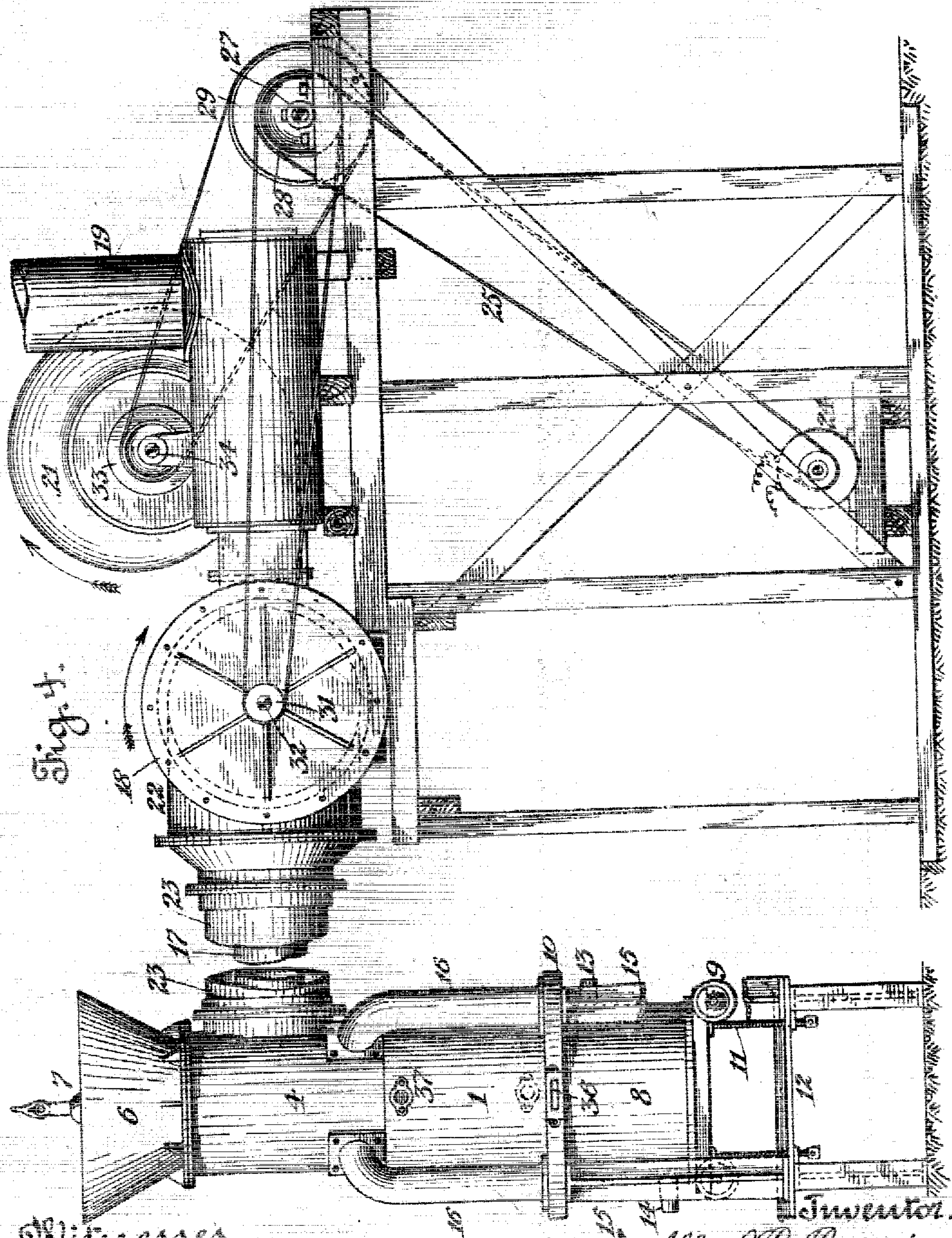


Fig. 4.

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UNITED STATES PATENT OFFICE.

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SMELTING-FURNACE.

No. 812,083.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed October 26, 1904. Serial No. 250,079.

To all whom it may concern:

Be it known that I, ALLEN R. PARTRIDGE, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Smelting-Furnaces, of which the following is a specification.

My invention relates to smelters; and my object is to provide a smelting-furnace in which by a very effective arrangement of draft-producing devices I have been able to smelt ores in their crude state without roasting. I am also able to smelt copper ores into bullion or copper mattes into bullion without converting or puddling.

Another object of my invention is to save the entire expense of the heating apparatus generally employed to heat the air admitted to support combustion, as well as the entire cost of the fuel, operation, and maintenance of such apparatus. On the contrary, I do away with such apparatus entirely and provide instead simple and effective means for causing the escaping products of combustion to heat the incoming fresh air.

An embodiment of my invention is shown in the accompanying drawings, in which—

Figure 1 is a vertical section of the smelter on the line $x x$ of Fig. 2. Fig. 2 is a top plan. Fig. 3 is a plan, partly broken, to show horizontal sections of the exhausting, forcing, and air-heating means. Fig. 4 is an assembled side elevation of the smelter in its relation to said exhausting, forcing, and air-heating means. Fig. 5 is a horizontal section to show a modification.

The smelter is shown in section in Fig. 1 as consisting of a stack 1 of generally cylindrical form and having a refractory inner lining 2, which is a non-conductor of heat. An upper section of the stack is made, preferably, of cast-iron and is formed with a double wall 3 4, having an intermediate space 5. At the upper end of the stack is a feeding-hopper 6, within which is a bell 7, which acts as a valve in feeding or cutting off the supply of material. The charge is fed into the hopper around the bell, and upon the lifting of the latter such charge is allowed to escape either suddenly or gradually into the smelter. The bottom of the stack is entirely open. Beneath the stack is a crucible 8, comprising a

shell suitably lined and having wheels 9. By means of screws 11 the crucible can be adjusted up toward the furnace or lowered away from it, so that its wheels rest upon the track 12. Thus the crucible can be removed from the smelter and another one run in under the stack, if desired. The crucible has a slag-spout 13 and a main outlet 14 at a lower level.

To the bottom of the furnace is bolted an air-box 10, which surrounds and closes the space between the furnace and crucible. This air-box is of the general rectangular shape shown in Fig. 2, so as to afford plenty of room for the supporting columns or standards 15 below and for connection to such box of the air-pipe 16 from above. Four of such pipes are shown leading downwardly from the air-space 5.

Connected near the upper end of the smelter is the outlet-pipe 17, through which the products of combustion, gases, &c., escape. This pipe is connected to the inlet of an exhaust-fan 18, whose casing is mounted upon any suitable support convenient to the smelter, but preferably at some little distance, so that there shall be a considerable length of pipe between the smelter and the exhaust-fan. The further disposition of the products of combustion depends upon the nature of the material under treatment. If the gases have a commercial value, the outlet from the exhaust-fan can be carried to a condenser, precipitation-chamber, or other means of treating them. If the gases are waste and worthless, they can be led into and discharged from a smoke-stack 19, and I have illustrated this arrangement in the drawings, as in Figs. 3 and 4.

Mounted upon the same structure as the exhaust-fan is a fan-blower casing 21, whose outlet is connected to a chamber 22, surrounding the inlet to the exhaust-fan. From such chamber a pipe 23 extends to the smelter and communicates with the air-space 5. The pipe 23 thus surrounds and incloses the outlet-pipe throughout the extent of the latter, which, as before stated, should be considerable.

Any suitable means can be employed for driving the fans. I have shown an electric motor 24, driving, by means of a belt 25 and pulley 26, a shaft 27, having two other pul-

leys 28 29. A belt from pulley 28 to a pulley 31 drives the shaft 32 of the exhaust-fan. A belt from pulley 29 to a pulley 33 drives the shaft 34 of the fan-blower. It is my intention to run the exhaust at a considerably higher speed than the blower, and I have in the drawings shown the belt-pulleys in such proportions as to produce that result. This is because it is essential to successful smelting that the gases be removed with the utmost celerity, and hence I have produced the main part of the draft by means of the exhaust-fan, and while the fan-blower undoubtedly assists the draft its principal purpose is to supply for combustion a large volume of air at low pressure and in heated condition, for as the pipe 23, which leads from the fan-blower, surrounds the outlet-pipe 17, which carries the intensely-hot products of combustion, the fresh air is heated and enters the space 5 at a high temperature. In this space it becomes still hotter and is immediately drawn through the pipes 16 and into the air-box, whence it enters the smelter in the desired heated condition in large volume and under low pressure.

Where high oxidation is required, as in making steel, I leave the space between the crucible and smelter entirely open within the air-box; but under some circumstances, as in smelting lead or sulfid ores, when low oxida-

tion is requisite I have provided means for obstructing and breaking up the supply of oxygen at its entrance to the smelter. The very simple device designed by me for this purpose consists of a perforated ring 35 in the air-box close to the draft-inlet to the smelter. As a matter of convenience in placing and removing this ring I prefer to make it in several sections, as shown in Fig. 5.

It should be stated that the air-box, as well as the smelter, is provided with any suitable number of peep-holes, such as are shown at 36 and 37.

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

In combination with a smelter, having a double wall near its upper end forming a hot-air space, an outlet-pipe communicating with the interior of the stack, an inlet-pipe concentric therewith and communicating with the hot-air space, an exhaust-fan in connection with the outlet-pipe, and a fan-blower in connection with the inlet-pipe.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 18th day of August, 1904.

ALLEN R. PARTRIDGE.

Witnesses:

L. W. SEELY,
GEO. T. KNOX.