KEYES *ET AL. V.* PUEBLO SMELTING & REFINING CO.

Circuit Court, D. Colorado. June 7, 1888.

PATENTS FOR INVENTIONS—ANTICIPATION—SMELTING ORES.

Keyes & Arents' patent, relating to the art of smelting metallic ores, consisting of a tube inserted at the base of the furnace, through which the pure metal, being heaviest, runs out, and is conducted into a basin, leaving the matte and slag behind, is not anticipated by the device described in volume 5, p. 135, of Karsten's work on Smelting and Mines, by means of which the pure metal at the bottom of the furnace is permitted to empty itself into a "fore-hearth," or little projection from the bottom of the furnace out into the open air; as it is not pretended that by his device the matte is separated at this fore-hearth from the pure metal.

In Equity. Bill for infringement of patent. On final hearing.

R. E. Foot, for complainants.

C. E. Gast and Thomas Macon, for defendant.

Before MILLER, Justice.

MILLER, Justice. Two questions are made in the case by the defendants in opposition to the claim of the plaintiffs, and the first is that they deny that they have infringed the patent of the plaintiffs. The patent itself has relation to the art of smelting metallic ores, and is a very clear statement of a mode of withdrawing the pure metal after it has been separated by heat and the usual appliances of smelting furnaces from the other matter found in the ores in their native condition. And the mode by which this is done, as explained by the patentees, is a simple reliance upon some of the principles of natural physical science. They say, and that is undoubtedly true, that the metal—any metal which is sought to be extracted from these ores—is heavier than the other particles of ore, than the other matter found in the ore. The art of smelting, itself, consists in the processes by which, through the use of heat and other substances called "fluxes," this mixture of the ore with calcareous matter, with some other metals, is separated, and the pure metal is in this manner disintegrated from, and in some shape brought to a separation from, the other more useless and less valuable parts of the ore. It is not necessary to inquire whether the ore of lead or of gold or silver or copper is merely a mechanical mixture,—as it mostly is,—or is in some cases a chemical mixture; the great result to be sought for in smelting is to separate them. Lead is perhaps the easiest of all the ores to separate from the surrounding materials found connected with it. The mechanical principle to which I allude is that, these ores being mixed in a large furnace or cylinder without other materials which offer attraction to some of its elements, they are separated; It is by means of the heat secured through a blast-furnace. It is all melted, all dissolved, all turned into one fluid mass within the furnace, and precipitated from the upper part of the furnace, where they are mixed together, into the base of the furnace. In this process of separation and precipitation, or falling down, the metal being the heaviest,

the pure metal gets to the bottom. I read a sentence or two in the work of Mr. Karsten, which will be referred to hereafter. This is a translation from Karsten's work on Smelting and Mines, on which the defendants are relying. He says, in the translation handed to me from volume 5, p. 135, of his work:

"The products resulting from the smelting of lead ores, regardless of how the ores were previously treated, or what fluxes were added, are in variably—*First,* lead; *second,* matte; *third,* waste products. The matte is always tapped together with lead into a tap-hearth, in which the specifically lighter matte separates from the lead. It congeals much sooner than the lead, is taken off, and the lead is then ladled into moulds. The matte is never so poor as to be worthless. Generally matte is re-treated, and in a similar manner as the lead ores."

Now, the usual mode of separating the "slag," as it is called, which is the largest product of this smelting operation, and which is the lightest, is to make orifices in the cylinder or furnace, and that, being tapped in the liquid state, it flows off and is in various ways conducted away from the further operations of the smelter. The matte and the pure lead are then left, with an inclination in the pure lead to get to the bottom and the matte to the top; but this does not seem to be so readily separated, and so clearly marked, as the slag which runs off from the eye or holes in the furnace. The mode adopted by the plaintiffs in this case was to insert a tube precisely at the base of the furnace, which tube necessarily communicated with the pure lead alone; all the impurities, the matte and the slag, being at the top. The patentee of this invention does not seem to have concerned himself about what became of the slag nor of the matte, because, inserting his withdrawal tube at the base, the lower end of the cylinder, he gets nothing but pure metal; and, as you will see by one of those plats there, or diagrams, his tube then bore an upward direction, and carried this pure lead to a bowl or basin. In this way, by the pressure of gravity in the furnace constantly forcing that lead out through the tube, and the slag and the matte not being able to mingle with it, but being used as a mere pressure with other lead that came down, working its way through, the pure lead was conveyed off, and separated from the matte and slag, and carried into the basin, from which it was ladled out, in the old-fashioned way, or perhaps carried out by another tube into moulds, and placed where they wanted it. But the thing to be done—the separation of the pure lead or any other metal from the impurities with which it was originally mingled in the ore—has been achieved, and the patent is for the mode of separating these materials, of carrying away the pure silver from these other materials, of smelting after it has been melted and after they have settled, the ore being still liquid, each having its place by virtue of gravity. That is his patent. He claims that he was the first man that ever did this in a way that did not require constant attention on the part of the smelter; that others made holes to let the metal run

off, and then had to open and watch them; that others run off the slag, and left the metal at the bottom, and, after the slag was all run off, that the matte and the metal

went out together, and was not then in a pure state. He claims that his discovery of this mode of inserting a tube which, either directly or indirectly, with an inclination upwards, brought out the pure metal from the bottom to a place where it was distinctly separated, and could be dealt with as pure metal, was the first invention of that kind. Now, this invention, I have no question myself, was one that was used by the defendants. They did not exactly make a tube with an angle of 45 degrees; but you will observe that that tube, which may be made of any suitable material, is inserted in an additional or side wall built up alongside of the furnace; and the defendants, while they do not take a particular tube or piece of metal and make a round cylinder out of it, make a cylinder inside of that wall, lined with something, I suppose, to keep it from destroying the wall; but it is an orifice or opening answering exactly the purpose, and of the same nature of that tube, at an angle used by the plaintiff, bringing the pure metal from the bottom of the crucible, where it is lying after having been reduced, and taking it up through a rather circuitous but perpetually ascending, tube, Until it gets up to a basin like that of plaintiff. I think there is no question but what it is doing the same thing through the same instrumentality, and by the same principle and the same means.

But the great defense relied on here is that the patent itself is not valid, because the principle on which it operates, and the description of the instrument itself, is to be found in the works of Mr. Karsten, a German, who had published a work on the subject of smelting and dealing with ores in Germany, where there are a great many mines, and where the science of mining has been, perhaps, as much considered as in any country in the world. I can hardly expect to enlighten anybody much on this subject. It does not appear that Mr. Karsten ever made or invented a furnace for smelting. It is not known, as far as I know, whether he was a practical smelter. He seems to be a man of science, who undertook, by five volumes, to consider the science and the laws of smelting ores, and especially as they were understood in Germany. In his works he undertakes to describe the different kinds of furnaces. He mentions perhaps a dozen, and their modes of operation that were then in existence in Germany; and among others he describes a class of furnaces which are shown on that central diagram there, (Litharge furnace,) by which as the ore is melted it becomes fluid. The pure metal gravitates, as in other furnaces, to the bottom, and then is permitted to empty itself out into what he calls a "fore-hearth," a little projection from the bottom of the furnace out into the open air, where the metal comes, and is dipped out by ladles, as it is in the one of the patentee's. It is said that this is the same, or such a description of the mode of smelting as is to be found in the plaintiff's patent. I have not been satisfied of that. In the first place, it is very clear from what is said here by Mr. Karsten himself, which I read, that the separation is not complete when it comes out into that fore-hearth or front. He declares that the matte, if not the slag, goes

with it; that this matte, after it comes out, forms a covering over the pure metal, and before you can dip out that pure metal you

have to in some way scrape away this matte, and get it separated after it comes out. Now, that is not any part of the patentee's claim. He drives his tap into the bottom of the pure metal, and by force of gravity it runs out through his tube, and has no matte in it. There is no reason why there should be any matte in the receptacle from which he draws the pure lead. There is at the bottom, first, pure lead; there is, then, this peculiar substance which they call "matte;" there is, then, above that, the great body of material which they call "slag." Now, with all these he has nothing to do. He says: "I take the metal at the bottom, where it is pure, where there is neither matte nor slag, because of the superior gravity of the lead, which excludes these." I have already read to you where Mr. Karsten says that in the instrument upon which they rely,—in the furnace on which they rely,—the matte comes out with the material, and is to be scraped away and got rid of afterwards. There is another very material difference between his patent and anything found in Mr. Karsten's work upon the subject. It is perfectly obvious from reading all that Karsten says upon the subject, and it is obvious from the evidence produced here about the older mode, whether they were older patents or not than the plaintiff's, that the final separation, the total disintegration, the taking apart of the pure metal from the slag and matte and other things which represent the *debris* of the ore, is conducted upon the principle of carrying of the slag and the matte first. Holes are made in all these furnaces at different places and at different points, and a good many devices for the use of those orifices or holes by which the slag, being at the top, is carried off from the top and above where the metal is. That is the principle of separation in all those. Either the slag itself, or the matte, or both of them, are carried off from an orifice in the furnace that is above the metal, and which orifice is kept open or shut up as exigencies may require. Messrs. Keyes & Arents' patent goes upon a totally different principle. It leaves the slag there if you want it; says, we have nothing to do with that; our mode is to get out the metal, first, to transfer that to another receptacle; your slag you can do with as you please; we have got no patent for it; it may be used with our invention, if you desire, or without it, but our invention is simply, after all this material is melted into a molten mass, we, by the laws of gravitation, are perfectly certain that the pure metal will be at the bottom, so many feet, so much depth, according to the quantity of metal that is there, and we take that out and leave this stuff which was originally connected with it as ore,—leave that to be dealt with in anyway you choose. Our business is to take these furnaces which are in existence, which everybody knows, and in which all this ore is reduced to a fluid state, and in which, from the laws of gravity, the pure metal—whatever it be, copper, lead, iron, silver, gold—will be at the bottom by virtue of its intrinsic gravity, and at that bottom we begin to work to get it withdrawn from the other, and not to get the other withdrawn from it. I do not think that any furnace described by Mr. Karsten—and to that they are limited, because that is all that they set

up, except that they do not infringe—operates upon that principle at all. His own extracts, which

I show you here, would further show that, after he has let this slag run out over and above,—in some way a little difficult to understand,—after he has let it run out, or as much of it as they choose to let run out, then the pure metal is brought out of the walls of the furnace into what is really a part of the furnace,—a front part excavated like a hearth in front of a chimney. But when it is done as I have read to you I he says the matter is there,—Covers it. And they make a merit of it, some of the defendants do; and this matte covering prevents it from oxidizing, and it is a good thing. Very well; if it is a good thing let them use it; let them have their matte preventing the metal from oxidation. That is not what plaintiffs profess to do. They profess to get the metal separate from matte, slag, and everything else by the process I have named. I do not think the description found in Karsten is in anticipation or describes the invention of these parties. I think their patent is a good patent, and that it is infringed by the defendants; that they are entitled to an injunction, and a reference for accounting. The plaintiff's counsel will prepare a decree.