No. 694,947. Patented Mar. 11, 1902.

S. DAVIES.

PROCESS OF SMELTING ZINC.

(Application filed June 5, 1900.)

(No Model.) 2 Sheets—Sheet 1.

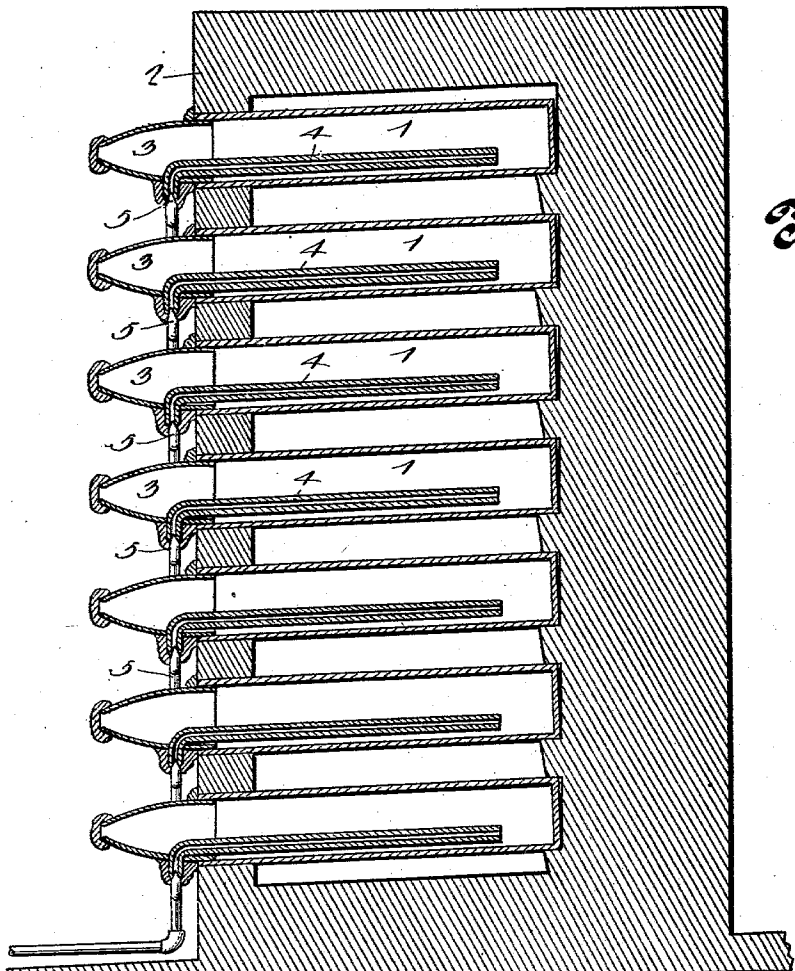


Fig. 1.

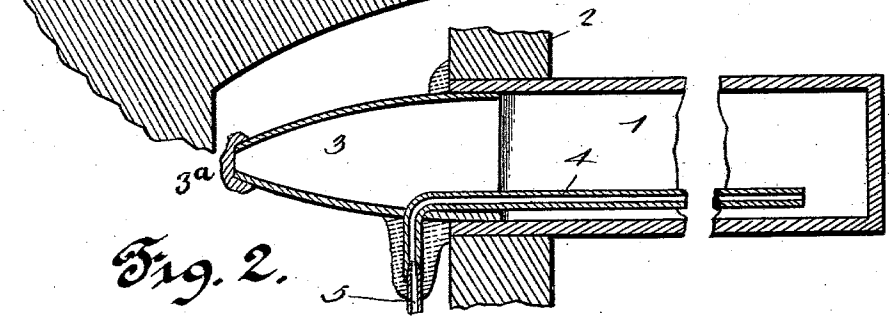


Fig. 2.

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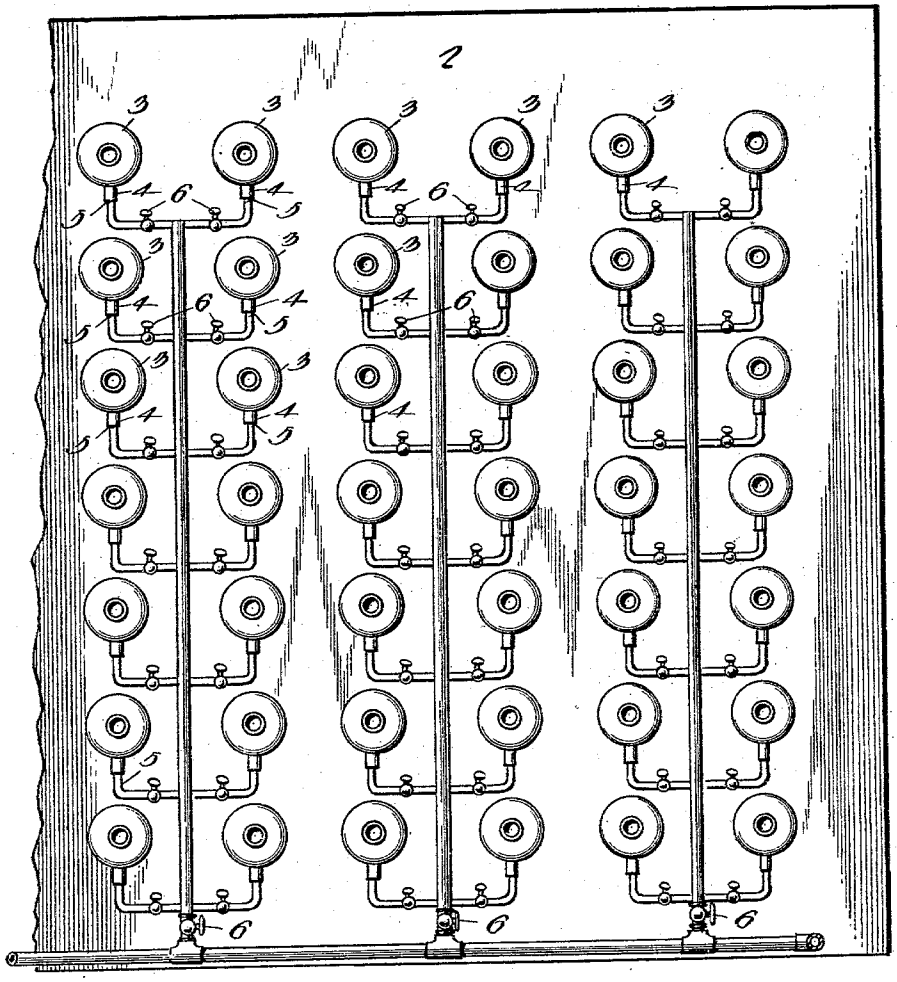


Fig. 3.

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UNITED STATES PATENT OFFICE.

SAMUEL DAVIES, OF IOLA, KANSAS.

PROCESS OF SMELTING ZINC.

SPECIFICATION forming part of Letters Patent No. 694,947, dated March 11, 1902.

Application filed June 5, 1900 Serial No. 19,161. (No specimens.)

To all whom it may concern:

Be it known that I, SAMUEL DAVIES, a subject of the Queen of Great Britain, residing at Iola, in the county of Allen and State of Kansas, have invented a new and useful Process of Smelting Zinc, of which the following is a specification.

This invention relates to a process of smelting zinc; and it consists in placing a mixture of zinc oxid and particles or pieces of non-refractory substances within a retort or the like, externally heating the latter, passing hydrocarbon gas through the charge, whereby the reduction is effected, the gas combining with the oxygen of the ore and setting free the metal, conducting the gas through a condenser to cause a deposition of the metallic zinc, and then allowing the gas to escape.

In the accompanying drawings, Figure 1 is a sectional view of a "Belgian" furnace modified as required to adapt the same for smelting zinc by the improved process. Fig. 2 is a detail sectional view, on a larger scale, taken through one of the retorts, one of the condensers, and through the pipes for conducting gas to the interior of the retort. Fig. 3 is a front elevation of a Belgian furnace as modified in accordance with the requirements of the improved process.

In carrying out the improved process of smelting zinc the ore, which is zinc oxid, is first prepared in the usual manner by pulverizing the same. The ore particles are admixed with particles of non-combustible non-metallic refractory material, as pieces of old retorts, fire-clay, and the like, reduced to about the size of a pea, the whole being thoroughly commingled. The ore thus prepared is placed in a retort 1 in a suitable furnace 2, the retort being adapted to be highly heated from its exterior, closed to the outer air, and in communication at its outer end with a receiver or condenser 3, of the usual form, the exterior surfaces of which are cooled by contact with the outer air.

In charging or placing the ore in the retort the inner end of the latter is covered with the ore to a suitable depth. A pipe 4, made of fire-clay or other suitable refractory non-metallic substance, is then placed in the retort on the ore and the retort then completely charged, the pipe being buried in the ore. The inner end of the said pipe is open, and the outer end thereof is downturned and communicates with a gas-pipe, as at 5, for conducting hydrocarbon gas, as natural gas, to said pipe 4, the said pipe 5 having suitable cocks 6 to control the passage of the gas therethrough. In placing the condenser on the outer end of the retort to close the same the downturned outer end of the pipe 4 is passed through an opening in the lower side of the condenser, as shown. The joint between the condenser and the retort is then cemented, and the opening in the condenser through which the downturned end of the pipe 4 passes is also cemented, thus preventing leakage, and the cement also securing the pipes 4 and 5 together, as shown. The retort, as is well known in funraces of this class, must be thoroughly cleaned out at the completion of the smelting of each charge. Hence the fire-clay pipe 4 is adapted to be quickly removed from the retort with the condenser. The mouth of the condenser is partially closed, as at 3^a, with some porous substance, such as screened residues or ashes from former charges, to prevent the escape of any metallic zinc that may accumulate in excess before being drawn from the condenser; but the mouth of the condenser must never be so closed as to prevent gases or vapors from escaping therefrom.

The retort is highly heated exteriorly, and when the temperature reaches the requisite degree the hydrocarbon gas is introduced into and through the body of the ore in the retort. Owing to the relatively refractory particles which are commingled with the ore particles the gas penetrates the entire body of the charge, the gas combining with the oxygen of the ore, setting free and carrying the vaporized metal, the metallic vapor passing into the receiver or condenser and condensing therein as metallic zinc in a liquid state, which when poured into a mold is ready as spelter or commercial zinc for the market, the remaining gases escaping through the open mouth of the condenser into the air.

By the improved process the cost of the production of zinc is greatly lessened, especially in natural-gas regions.

Another advantage obtained by the improved process is that sulfur and other impurities are not introduced to the retort by the hydrocarbon gas, as when solid carbonaceous substances are used. Furthermore, a larger percentage of the zinc is recovered from every charge by lessening the quantity of the residuum of cinders and ashes and combined zinc. Another advantage resulting from the process is that the residues left in the retort after the smelting of each charge are uncontaminated by any foreign admixture of impurities such as are found in all solid fuels. In practice it is not possible to recover all of the zinc from the ore in a charge by a single smelting, and the residues thereof are treated over and over again until practically the entire amount of the zinc carried therein has been extracted. The residues in the improved process being free from impurities, the same may be reintroduced to the retort without producing any injurious effects, which is not true of the residues of charges treated by the ordinary process.

Having thus described the invention, what is claimed as new is—

The process of smelting zinc, consisting in placing a mixture of zinc oxid and particles of non-metallic refractory substances within a retort, exteriorly heating the latter, passing a current of hydrocarbon gas through the charge, whereby reduction is effected, conducting the gas and the vaporized metal carried thereby through a condenser to deposit the metallic zinc, and finally permitting the gas to escape.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

SAMUEL DAVIES.

Witnesses:
W. C. HAWKINS,
REX BOWLUS.