

# UNITED STATES PATENT OFFICE.

JAMES D. WHELPLEY AND JACOB J. STORER, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN ROASTING, DESULPHURIZING, AND SMELTING ORES.

Specification forming part of Letters Patent No. 58,012, dated September 11, 1866.

*To all whom it may concern:*

Be it known that we, JAMES D. WHELPLEY and JACOB J. STORER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Method for Using Auxiliary Chemicals in Metallurgic and other Chemical Processes; and we do hereby declare that the following full, clear, and exact description of the construction and operation of the same is sufficient to enable others skilled in the arts to use and practice our invention without other experiment and discovery.

In metallurgic operations, when it is necessary to use fluxes or auxiliary chemicals, as in the smelting of iron, it is important that every particle of the ore should be brought into contact with a particle of the auxiliary chemicals in an atmosphere of heat. We do this by introducing into the flame used in the metallurgic process the auxiliary chemicals in a finely-pulverized state, either blowing them by the blast of the furnace, fanning them into the operating-chamber, or dropping them among the ores while highly heated, either in contact with carbon or its products when burned, or otherwise. By this method of using our chemicals as auxiliary to aerial combustion we have developed some remarkable results. For instance, in the treatment of sulphurets by roasting, when sulphurous acid is formed, said acid is converted into sulphuric acid if exhibited to certain forms of oxide of iron or copper or other protoxides in presence of heat, and the oxide is also reduced; and by using a slight excess of oxide the complete conversion of the sulphurous acid may be effected.

By controlling the supply of finely-divided carbon thus introduced we produce an oxidizing or a reducing flame at pleasure, and by use of nitrate of soda or potassa as auxiliary chemicals, blown into the flame, we produce the most perfect oxidation possible.

Sulphur and phosphorus, silicon, and other foreign elements can be completely removed from metals by roasting ores in a finely-divided state in an air-blast bearing fine coal in aerial combustion and powdered fluxes either of the alkalis or alkaline earths; and by the addition of such finely-powdered fluxes to floated coal in aerial combustion contaminated with such impurities it is rendered as

valuable for metallurgic purposes as the best of coal.

Results such as we have described may be obtained measurably in a reverberatory furnace by passing the reducing-flame, laden with finely-powdered fluxes, over masses of ore, but are better obtained when the ore and auxiliary chemicals are together introduced in a pulverized state into a blast laden with finely-pulverized burning coal, as in our furnace and a process of our own recently patented.

These fluxes or auxiliary chemicals may be introduced into the blast bearing coal in aerial combustion by the aid of steam, and this will sometimes be necessary when hydrogen is desirable as a reducing agent; but as Jacob J. Storer's patents for the carrying of fluxes by steam for other uses are still extant we disclaim such lading of the steam with fluxes except when they are finely powdered and introduced as auxiliaries to metallurgic processes conducted by the aerial combustion of finely-powdered coal.

We believe that such introduction of auxiliary chemicals may become valuable in other chemical processes than metallurgic, but do not designate such processes at present, save the manufacture of sulphuric acid.

The word "flux" assumes that the reduction of an ore to metal is the sole object sought for; but as in a furnace working this process the reduction of the ore frequently becomes only an incident, and the production of sulphuric acid or saline product or oxide a main result, we consider the expression "auxiliary chemicals" to include all extraneous material except fuel used in the resolution of earths, ores, and natural chemical compounds into salable products by the aid of heat; and

We claim as our invention, and desire to secure by Letters Patent—

The introduction of finely-powdered chemical reagents floated on an air or steam blast into an atmosphere of heat containing coal in aerial or air-borne combustion, substantially as and for the purpose described.

JAMES D. WHELPLEY.  
JACOB J. STORER.

Witnesses:

THOS. WM. CLARKE,  
CHARLES BATEMAN.