United States Patent Office.

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Letters Patent No. 93,640, *dated August* 10, 1869.

IMPROVED MODE OF DESULPHURIZING AURIFEROUS PYRITES AND OTHER SULPHURET-ORES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, JULIO H. RÁE, of the city of Syracuse, in the county of Onondaga, State of New York, and THOMAS T. DAVIS, of the same place, have invented a new and improved Mode of Desulphurizing Auriferous Pyrites and other Sulphuret-Ores; and we do hereby declare the following to be a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same.

It is known that in the working, smelting, or reduction of ores, especially of gold and silver, combined with the sulphurets of iron or iron-pyrites, the presence of sulphur often renders the ores so refractory as greatly to impair their value, and makes the recovery of the metallic body, held in combination with it, difficult and expensive.

The process of roasting such ores has not, as generally applied, been found so effectual in removing or dissipating the sulphur held in combination as to render the mass economically tractable in the subsequent reduction of the metallic substance therein.

It is also known that peat, as ordinarily found, contains a considerable amount of glutinous or resinous and adhesive matter.

Our experiments have demonstrated that such peat, when mixed in a green or fresh condition, and properly ground, will hold in mechanical combination or cohesion about seventy per cent. or more of its own weight of the sulphurets of iron, or iron-pyrites, such as "iron-sand," so called; and that when fresh or green peat has been well mixed with the fine ore, and moulded into thin brick, or other convenient form for drying and burning in a furnace or kiln, it will retain its form while burning, the peat, after being well ignited by ordinary means, acting as a fuel, and, in its combustion, causing the disengagement of the sulphur held in combination with the ore, so that the sulphur is converted into a fuel, thus utilizing the very substance which renders the ores, when combined with it, so difficult to be reduced.

We have also discovered by our experiments that peat, similarly prepared, will also hold in like manner the ores of gold or silver, or other metals combined with sulphur, as aforesaid, reduced by grinding or crushing, in any practicable mode, into the condition of fine gravel, sand, or powder, and that when moulded into suitable form, and dried, the compound may be ignited and burned in a furnace or kiln, the draught being regulated by stops or dampers, so as to avoid or prevent the volatilization and loss of the metallic substances, disengaging the sulphur in the combustion, rendering it useful as a fuel, and so perfectly or substantially desulphurizing the ore as to leave it in a condition to be easily treated in the known and usual modes of recovering free or native gold.

In order to enable others skilled in the art to use and apply our invention, we proceed to describe the mode in which we apply it to auriferous pyrites, sulphurets of iron, and other refractory ores.

Taking the crude ores to be treated, we have them well crushed or pulverized, by means of crushers or stampers, and, where the sulphurets hold in combination any considerable amount of fine gold, or gold freed in the process of crushing, we subject it to the process of amalgamation, in any approved mode, but work it most advantageously in Rae's patent electrical amalgamator, patented October 13, 1868.

Having, as in the case last above described, taken up such gold as can readily be amalgamated, we concentrate the sulphurets in any of the known modes, so as to leave them free as may be from other substances, and mix these sulphurets as uniformly as practicable with green peat, by means of a peat-machine or press, or by any other suitable mode, so as to cut and crush the roots and fibres therein, in the ratio of about seventy pounds of sulphurets to about one hundred and thirty pounds of green peat; but we do not confine ourselves to these exact proportions in mixing them, as the condition of pyrites may vary in different localities.

The green peat will be reduced in weight by drying, from one hundred and thirty pounds to about thirty pounds, so that the green mixture of peat and sulphurets, in the above proportions, will yield when dried a mass of about one hundred pounds' weight. The mixture may be made in any mode, and is readily made by a peat-machine, with a hopper, into which the peat and sulphurets may be fed. This mass we mould or form into thin bricks, about an inch or an inch and a half in thickness, by five or six inches in width, and about eight inches long, which can be readily accomplished by the form of the discharge-pipe of the peat-machine or press, or as the mass is being discharged therefrom; or it may be done in any other suitable mechanical mode.

It is desirable that the bricks or pieces be small enough to allow free access of air to every particle. These bricks are then dried, and are next placed in a furnace or kiln, or the same may be burned in the open air if necessary.

We take the dried brick and place them in the body of a furnace or kiln, prepared in any suitable form, leaving suitable air-passages between the bricks, and then start a fire with charcoal, pure peat, or other fuel, and thus ignite the peat-brick containing the sulphurets. We regulate the intensity of the fire by means of stops or dampers in the doors and flues of the furnace or kiln, producing a slow combustion, and preventing the fusion of the partially-decomposed sulphurets, and also preventing the volatilization of the gold or silver or other metal. The burning peat in imme-

diate contact with the sulphurets ignites the sulphur, which is thus converted into and utilized as a fuel, while arsenic and antimony, if present in the sulphurets, will be disengaged, and pass off in vapor. The auriferous or argentiferous substances, or other metals, will remain in the ash or cinders, freed from the above-named impurities, or may, where the peat contains lime or other matter forming a flux, be found in part in a "matt" or clinker of protoxide of iron, and in any form may be readily reduced by known processes. The mixture retains its form during the operation of burning, and can afterward be readily crushed to powder, and be reduced to any degree of fineness for amalgamation or other purposes.

It is obvious, that where peat or other suitable fuel is not found in convenient vicinity to the mines, the concentrated sulphurets may be profitably transported where peat or other suitable fuel may be obtained.

It is further obvious that other metallic ores may be freed from sulphur and other impurities by the same process.

Instead of using peat, we can use charcoal or any other fuel that can be brought to a fine condition, but in that case it is necessary to combine with such fuel some suitable glutinous or resinous or adhesive matter which will have the quality of causing the particles of the fuel to cohere, and to form a matrix or cement for the ore. But we prefer peat, which in a green or fresh condition will hold in mechanical mixture or combination a large amount of such ore, the gluten or resinous matter in the peat, acting as a cement in the combination, and enabling the mixture to be readily moulded and retained in shape while being dried and handled during the process.

We can, by our process, desulphurize the ores previous to their being worked in any other way to obtain the gold therefrom; and it is not necessary, for the success of our process, that the ores be reduced to a very fine condition, but only that their condition be fine enough to enable the operator to mix and incorporate them with the peat or other fuel.

What we claim as new, and desire to secure by Letters Patent, is—

1. Desulphurizing auriferous pyrites, and other sulphuret-ores, by means of peat, or other equivalent fuel, in the mode substantially as above described.

2. Mixing the ores of metals combined with sulphur, arsenic, antimony, or other refractory matter, with wet or green peat, or equivalent fuel, and afterward drying and burning the mixture, substantially as and for the purpose described.

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Witnesses:
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