To all whom it may concern:

Be it known that I, SHERARD OSBORN COWPER-COLES, a subject of the King of Great Britain, residing at 1 and 2 Old Pye street, Westminster, London, England, have invented and useful Improvements in the Deposition of Iron; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the deposition of iron and has for its object an improved process which can find application either as a method of refining or for the production of a very pure iron in the form of sheets or articles such as tubes, ingots and wire direct from crude or scrap metal or the ore.

As is well known one of the chief difficulties which are met with in the commercial electro-deposition of iron is the exfoliation and brittleness found in the deposit and which are due to the occlusion of hydrogen. It is found that the amount of hydrogen generated is largely dependent on the acidity of the solution, so that it becomes necessary to keep this acidity as low as possible.

In the specification of my prior British Patent No. 10655 of 1908, I proposed the use in conjunction with a main iron depositing cell, of a small auxiliary cell having anodes of iron or steel and a revolving metal or carbon cathode, the density of the current employed being sufficiently high to insure that the iron is deposited in a loose flocculent, easily removable, form in the auxiliary cell, such iron being added to and circulated with the electrolyte used for the main cell.

Now according to the present invention I add to the electrolyte iron sponge which I maintain in suspension in and distributed throughout the electrolyte, for example, by vigorous stirring or agitation such iron sponge advantageously being prepared by roasting a sulfid or other iron ore, recovering the sulfur, and reducing the iron oxid, in a reducing atmosphere.

Practice has demonstrated that it is not sufficient to employ spongy iron anodes or iron sponge suspended in the electrolyte in frames or cages, as the said iron sponge must be freely distributed and maintained distributed throughout the electrolyte by vigorous stirring or agitation which may be effectively accomplished when using a rotating cathode by a propeller attached to the bottom of the latter.

The electrolyte may be obtained from any suitable solvent of iron which forms a good electrolyte, such for example, as sulfurous or hydrochloric acid. Good results have been obtained by using an electrolyte consisting of a solution of ferrous sulfate which is supersaturated in the cold, one liter containing 1500 grams of ferrous sulfate. This solution is maintained at a temperature a few degrees below the boiling point, at which temperature it is saturated, and I find that by using an electrolyte of a high density in combination with the iron sponge I obviate the defects of exfoliation and brittleness of deposit above alluded to, and I am also enabled to employ a high current density say 40 amperes per square foot and to obtain a smooth deposit. The electrolyzing cell is advantageously provided with rotating cathodes on which the iron is deposited in the form of tubes or sheets.

In the accompanying diagrammatic drawing, which represents a vertical section of a cell for depositing iron according to the invention, a is the containing vessel and b a pair of soluble or insoluble anodes, and c the rotating cathode, all of which are immersed in the electrolyte contained within the vessel a.

\[ d \] is the propeller at the lower end of the cathode for stirring or agitation of the electrolyte as the said cathode is rotated.

Claim:

The process for electrodeposition of iron, which consists in adding iron sponge to the electrolyte and maintaining said iron sponge in suspension and distributing it throughout the electrolyte by agitation of the active electrolyte bath, whereby the acid which is formed, is neutralized as quickly as possible.

SHERARD OSBORN COWPER-COLES.

Witnesses:

JOHN E. BOUSFIELD,
C. G. REDFERN.