It may be generally accepted as a fact that where a report, described as conservative, has been made, it means little or nothing. An engineer comes to a decision on the facts as they are presented, or as he sees them. That decision represents in the competent engineer a true statement of the conditions, and should indicate an exact valuation for the property, the engineer making the proper and necessary deductions from the result of his examination. It is therefore absurd to describe a report as conservative. A report is either right or it is wrong. It should be neither conservative nor liberal. It is exact within the limits of our knowledge at the present time, and it may be generally stated as correct that where a company is operating without the services of competent engineers, it is not operating the mines in the interests of the investor, but in the interests of the stock market. A company that means to mine seriously is always willing and able to surround itself with competent talent, so that those engaged in its financial management shall not be called upon to explain and bear the burdens of its technical management. This can only be accomplished by employing engineers, geologists and metallurgists who have had not only the necessary training, but the necessary and varied experience that fits them to be competent associates and guides to the financiers who are responsible to the stockholders.

A NEW ELECTRIC ARC PROCESS FOR PRODUCING AND REFINING STEEL

By Frank C. Perkins.

The accompanying drawings indicate the construction and arrangement of electric ladles or furnaces with or without covers and composite electrodes for operating an improved process of producing and refining a high grade of steel low in phosphorus to analysis desired. It consists in electrically treating molten iron from a blast furnace or while cold, or low grade molten steel as taken from a Bessemer converter or open-hearth furnace with electric heat produced by an arc or arcs formed between the slag of the bath and specially designed electrodes. Several forms of composite electrodes are indicated in the drawings, one consisting of a cored carbon or a mixture of carbon, and lime and oxide of iron or other slag producing materials in the form of a pencil. Another shows the slag materials packed in an iron or steel tube, and still another surrounding a carbon or iron rod or rods with or without projections for supporting the slag materials with a binder, such as tar.

The use of the composite or combination electrode, instead of the usual carbon electrode or an electrode of pure iron, introduces the fresh and additional refining slag materials to the bath fused and in a highly fluid state at the hottest points which are at the arcs or at the points of contact of the electrodes and the layer of slag floating on the bath of molten steel.

When two of these electrodes are used in an electric furnace of the double pole type, the current passes from one electrode into the slag and through the slag as a resistance and out the other electrode, the two arcs operating at about 100 volts pressure. One electrode may extend into the slag or down into the molten steel below the slag, a single arc only being employed at this time formed at the other electrode, with a pressure of approximately 50 volts.

The double pole electric furnace is well adapted for practising this composite electrode process similar to the Heroult method, because when the two electrodes are introduced into the refining slag, the latter acts as the resistance and forms one or two arcs according as to whether one or both electrodes are out of contact with the bath and producing the arc or arcs. If one arc is used the other electrode may be raised and lowered by electric motor driven hoist stirring the molten bath by this action.

An ordinary basic lined ladle, crucible or pot, may be used as noted in the drawings without cover, which may be supplied in the same manner as a basic lined two pole electric furnace. This ladle having received the charge of molten steel from a Bessemer converter, is electrically refined by eliminating the phosphorus and sulphur, as far as desired, and is, if necessary, deoxidized and recarburized. The steel is then poured into the ingot molds, after an electric treatment of from a few minutes to an hour or more in the electric ladle, according to the degree of refining desired.

When only one of these electrodes is used in an electric furnace, this electrode extends into the refining slag forming the arc at this point, the current being conducted through the molten bath and out through the bottom of the ladle, similar to the Girod process.

Another construction shows double arc or single arc action taking place when a ring electrode is arranged on a level with the slag. A single arc action only at centre may be employed, the outer electrode dipping into the slag or molten steel.

By this electric arc process the molten metal continually circulates, all particles of the bath coming into contact with the refining slag at the arc or arcs and elsewhere and being rapidly refined, remaining at the highest temperature only a short time, then replaced by other particles of molten steel reaching the slag near the arcs.

It is held that in the Heroult arc steel furnace the circulation in the bath is always active and the average temperature may be kept as low as any other furnace and all parts of the bath come rapidly into contact with the slag. In case a deep bath of say 10 or 12 tons or more is used in the electric ladle and additional circulation is desired, one electrode may be plunged up and down in the metal by a hoist mechanism, as previously mentioned, while the other electrode produces the arc with the slag.

By the use of these special electrodes made with slag producing materials, the highly fluid slag at the arcs causes rapid circulation to take place and the bases are removed, which are often retained in the metal and cause bad steel when poured into the ingot molds directly from the Bessemer converter without electric refining.