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L. I. BLAKE.

PROTECTING UNDERGROUND METALLIC STRUCTURES FROM EFFECTS OF ELECTROLYSIS.

(No Model.) (Application filed Aug. 9, 1900.)

Fig. 1

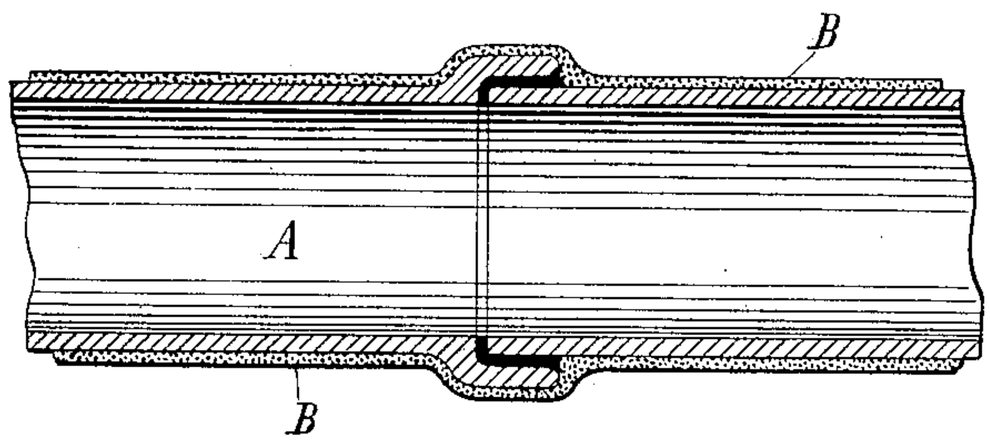
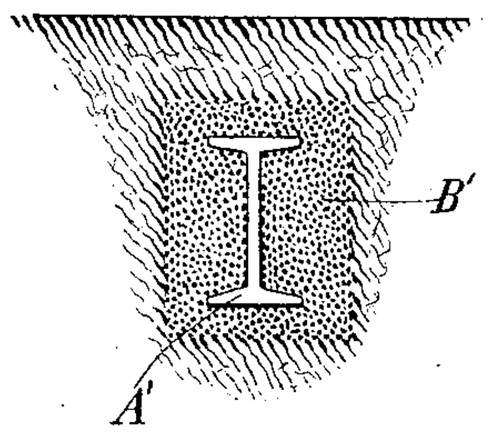


Fig. 2



Witnesses:
Raphael Netter
Benjamin Miller

Inventor
Lucien I. Blake
by Rowe, Page & Cooper, Atty's

UNITED STATES PATENT OFFICE.

LUCIEN I. BLAKE, OF LAWRENCE, KANSAS.

PROTECTING UNDERGROUND METALLIC STRUCTURES FROM EFFECTS OF ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 661,165, dated November 6, 1900.

Application filed August 9, 1900. Serial No. 26,436. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN I. BLAKE, a citizen of the United States, residing at Lawrence, in the county of Douglas and State of Kansas, have invented certain new and useful Improvements in Protecting Underground Metallic Structures from Electrolytic Corrosion, of which the following is a specification.

It is well known that underground piping—such, for example, as is extensively used for carrying water, gas, steam, &c.—and other metallic structures embedded in the soil are subject to destructive corrosion resulting from the electrolytic action of direct electric currents which, traversing such structures, leak off from the same into the surrounding earth. Attempts have been made heretofore to prevent these destructive effects of electrolysis by covering the exposed metallic surfaces with insulating material, so that the currents may be confined to the structures and not escape directly into the earth, or by connecting metallic conductors at intervals to the structures and establishing good connections therefrom to provide easier paths than the earth for the currents to follow; but with the present great development of electrical systems, particularly railroads, the problem of protecting underground pipes and other structures from electrolytic corrosion due to leakage or stray currents has become so serious that it has even been proposed to make water and gas pipes of glass, porcelain, or other insulating material. In all cases, however, the remedy proposed has involved either the insulation of the structures or the use of special conductors for leading the currents from the structures to earth or back to their sources, and so far as I am aware these provisions have been only partially successful.

Electrolytic corrosion of an underground pipe or other structure is confined to those points where the electric currents leave the metallic surfaces and pass into and through the surrounding earthy material. The effects of the escaping currents are manifested by a transporting away of the metallic material into the earth and the formation of metallic compounds, both of which actions injuriously affect the metal structure. This so-called "electrolytic corrosion," however, is not a primary effect of the escaping current, but due to a secondary action chemical in its nature.

It is well known that when a direct current passes through a solution a portion of the latter is decomposed, and the products which severally appear at the electrodes by which the current enters and leaves the solution are capable of chemically combining with the material of the electrodes if that material is susceptible to such combination. These chemical combinations, therefore, are secondary effects of the current.

In cases where electrolytic corrosion of underground metallic structures has occurred I have proved by investigation and direct experiment that the current has decomposed solutions present in the soil, notably the chlorids and sulfates, and that the products thus set free have attacked the metal surfaces and produced the well-known electrolytic effects.

It is well known that a current which leaves a metallic surface by a conducting-path which is non-ionizable or not chemically decomposible will produce no electrolytic effect on that surface, and I have taken advantage of this fact in carrying out my plan of protecting underground metallic structures against electrolytic corrosion by interposing between the metallic surfaces and the surrounding soil an electrically-conducting medium which is non-ionizable and which will prevent access to such surfaces of the products of electrodecomposition of any solutions which may be present in the soil. The protective medium may be composed of one or more of a large number of materials and may be applied in many ways. I may, for example, employ carbon in any suitable form, preferably a mixture of graphite with some binding material by means of which it may be applied and fixed to the surface of the metallic structure which it is designed to protect. I have found, for example, that a conductive mixture of graphite and paraffin is well adapted for this purpose.

It is not essential that the substance of the protective medium should be itself a conductor of electricity, provided only it permit the passage through it when applied for use of the current while preventing the access to the metal surface of the products of decomposi-

tion. Such substances are now well known and have been employed as non-porous electrolytic diaphragms in galvanic batteries and electrodecomposition-cells. Among such substances may be mentioned precipitated chalk, pulverized anthracite coal, gelatinized compounds of silica, and the like, which when used in layers of sufficient thickness and moistened, if by nature they are dry, permit the ready passage of a current, but prevent the recombination of the products of electrodecomposition.

The protective medium may be applied to the metallic structures in any convenient manner. It may be applied in a thin layer with brushes or suitable tools, or it may be deposited in larger amounts in a trench and the metal structure embedded in it.

The coating of metallic structures where exposed to the soil with a conducting substance will enormously increase the drainage of any electric currents from these structures by providing innumerable points of exit, thereby relieving these structures of currents which are harmful particularly at the joints. Such use of a conducting-coating, moreover, is clearly the direct opposite in its nature to the means heretofore employed for similar purposes.

In the accompanying drawings, Figure 1 represents in longitudinal section a water or gas main A with a protective coating B. Fig. 2 represents in cross-section an iron beam A′ embedded in a protective main B′.

Having now described my invention, what I claim is—

1. As a means of protecting an underground metallic structure from corrosion resulting from electrolytic action, a conducting-coating applied thereto, which is unaffected by electrolytic action and impervious to the products of such action, as set forth.

2. The combination with an underground metallic structure of an electrically-conducting medium surrounding the same, which is unaffected by electrolytic action and impervious to the products of such action.

3. The combination with an underground metallic structure of a coating composed of a non-ionizable conductor and a binding material impervious to fluids, as set forth.

4. The combination with an underground metallic structure of a conductive-coating compound of powdered graphite and paraffin, as set forth.

LUCIEN I. BLAKE.

Witnesses:
J. CONVERSE GRAY,
H. W. BIGELOW.