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A. DIETZEL

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PICKLING APPARATUS

Filed April 8, 1930

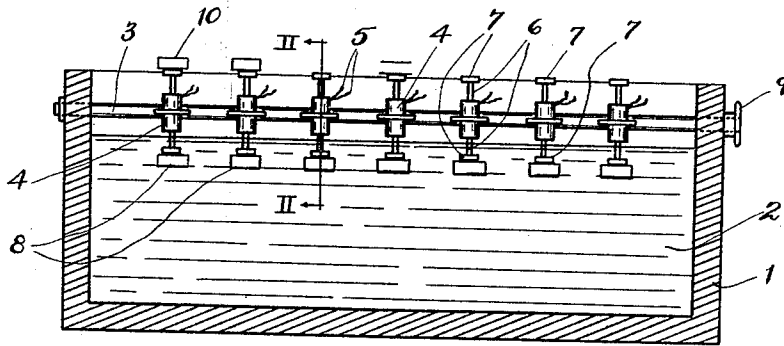


Fig. I

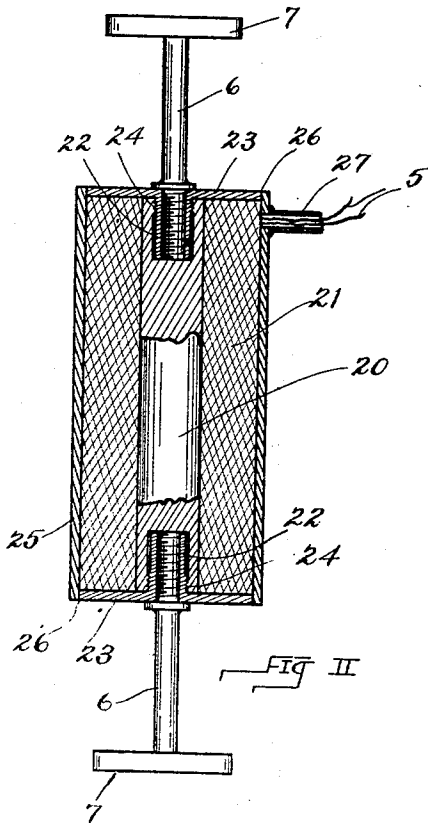
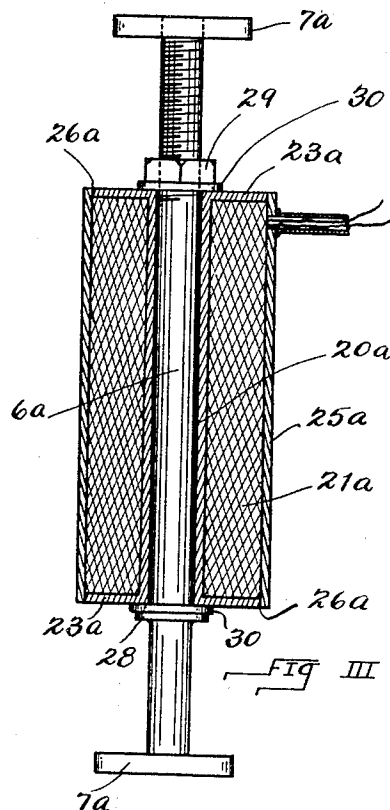


Fig. II



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PICKLING APPARATUS

Application filed April 8, 1930. Serial No. 442,498.

This invention relates to apparatus for pickling iron and steel bodies in sulphuric acid. More particularly, the invention has to do with electro-magnetic instrumentalities for suspending bodies to be pickled in a bath of sulphuric acid. Hitherto, the acid has been found to destroy in a relatively short period of time the coils which are included in such electro-magnetic instrumentalities. The object of the invention is to provide an electro-magnetic element which will withstand the deleterious action of the acid.

In the accompanying drawings, I show means which are particularly effective to this end. Fig. I is a vertical sectional view of a pickling tank with which there is associated several of the magnetic devices of my invention; Fig. II is a sectional view, taken on the plane II—II of Fig. I, showing to larger scale the structure of one of the electro-magnetic elements; and Fig. III is a sectional view, similar to the sectional view of Fig. II, showing an electro-magnetic element of modified structure.

Referring to the drawings the reference numeral 1 indicates a pickling tank which includes a bath of sulphuric acid 2. Secured to the tank, above the acid, and adapted for rotation, is a shaft 3 and to the shaft 3 there is secured a plurality of electro-magnetic elements 4. Each magnetic element 4 includes, according to usual construction, a coil of wire which is suitably connected by means of leads 5 to a source of electrical energy. Projecting from the top and bottom of each element 4 is an iron shank 6 of iron or steel, which shank is centrally located within the coil, and is adapted to be magnetized by the electrical energy. I do not illustrate a source of electrical energy, nor the complete electrical circuits which, of course, are essential to the operation of the electro-magnetic elements. It may be remarked, however, that a battery of dry cells or any other convenient source of electrical energy may be utilized to effect the magnetization of the shanks 6. The shanks 6 terminate each in a head 7, and the iron or steel bodies 10 which are to be pickled are placed upon the upper row of heads 7, while the lower row of heads 7

project into the acid, therein suspending the bodies 8 for pickling.

When the bodies 8 have been subjected sufficiently to the action of the acid, the shaft 3 is rotated, conveniently by a handle 9, through 180 degrees. This revolution of the shaft 3 moves the members 8 into the position in which the bodies 10 are illustrated in Fig. I, and, manifestly, the bodies 10 are then immersed in the acid. The pickled bodies 8 are now pulled from their magnetic supports, and new bodies for pickling substituted in their place. So—the operation continues.

In such pickling operation the acid splashes and drips on the shaft 3 and electro-magnetic devices 4. The shaft is conveniently formed of acid-resisting bronze, to withstand the acid, but the devices 4 would soon be destroyed if it were not for the protection against acid which my device affords the coils. In Fig. II, I have illustrated in detail one of the electro-magnetic elements which is efficient to withstand the corrosive action of the acid. It comprises a core 20 of iron or steel, around which a coil 21 of electrical-conducting wire is wound. Each end of the core 20 is recessed for the reception of the tubular stud 22 of a collar member 23. The collar members 23 are formed of lead or other material which is neutral to sulphuric acid. Conveniently, the tubular studs 22 are externally threaded at 24 for threaded engagement with the core 20, and for securing the collars 23 to the core. An outer jacket 25 of lead—a piece of lead tubing of appropriate diameter and length will serve—is fitted over the coil 21 and collars 23, and “burned” around the peripheries 26 of the collars, making a liquid-tight lead housing for the coil 21. A tube 27 of lead is soldered or burned to the jacket 25, serving as a protecting outlet for the leads 5 of the coil 21. The shanks 6 with the heads 7, which are to be magnetized for supporting the bodies to be pickled, are secured in threaded engagement with the tubular studs 22. It should be noted that the shanks 6 are adapted to be readily removed, and new shanks 6 may, as in use the acid destroys the shanks, be easily substituted. I have shown

the shanks 6 as extending only a short distance into the iron core 20; of course, they and the core may be constructed to permit the shanks to extend entirely through device, somewhat in the manner that the shank 6a extends through the modified device which is shown in Fig. III.

The modified electro-magnetic device comprises an inner tube 20a of lead which is flared or formed with flanges 23a at each end. On the tube 20a the coil 21a of wire is wound, and thereover the jacket 25a is placed and "burned" to the collars 23a, at their peripheries 26a. The iron or steel shank 6a extends through the tube 20a, and in effect is the core of the magnetic coil 21a, as well as comprising the projecting supports for the heads 7a. A collar 28 is integral with the lower portion of the shank 6a, and the upper end of the shank is threaded. A nut 29 is employed on the threaded portion of the shank to draw the collar 28 tightly against the lower end of the device, and to secure firmly the parts in their illustrated position. Washers 30 of lead may be inserted between the nut 29 and collar 28, as shown. The upper head 7a, as well as the nut 29, is removable from the threaded shank 6a to permit interchangeability of the shank, as in use it is destroyed by the acid and replacement becomes necessary. Throughout the specification I have described the particular utility of my invention in pickling apparatus. It will be understood, however, that my device may be employed to support bodies for galvanizing, chromium plating or nickel plating. In general, the invention finds utility in any apparatus employing electro-magnetic coils which are subject to the deleterious action of acid, liquid metal, or the like.

It will be noted in Fig. II that the core 20 forms a central body upon which the wire of coil 21 may be wound in the manufacture of the device. At each end of the body or core 20 the collars 23, which are there secured, serve as end stops and supports for the wire during the winding of core. That is to say, in addition to their afore-mentioned utility as elements of the coil-protecting jacket, the collars 23 afford in conjunction with the core or body 20 a spool upon which the coil 21 may be readily wound. In the modified structure of Fig. III, the tube 20a serves as the body (in the manner in which the core 20 serves) upon which the wire or coil 21a may be wound, and the collars 23a serve as the end flanges for the purpose above mentioned. Thus the manufacture of the device is facilitated, and this is due to the fact that the lead cover elements 23 (or 20a and 23a) have a double utility—a distinct utility during manufacture, and the utility, after manufacture, as elements of the acid-resisting jacket for the coil.

I claim:

1. In pickling apparatus including a tank containing a bath of acid, the combination of an electro-magnetic device for supporting work in said acid, which device includes an electric coil upon a central body, said central body having an acid-resisting flange at each end, an acid-resisting sleeve covering said coil along its length, which sleeve at each end is burned into liquid-tight engagement with one of said flanges, opposed magnetizable shanks extending one from each end of said coil and projecting from its acid-resisting covering, which shanks at their outer ends are provided each with a work-supporting head, and means for supporting said electro-magnetic device over said bath of acid, which last-named means are revoluble to effect movement of said device from one to another of several operative positions.

2. In an electro-magnetic device which includes an electric coil upon a central body having an acid-resisting flange at its either end, the combination of an acid-resisting sleeve covering said coil along its length, which sleeve at each end is burned into liquid-tight engagement with one of said flanges, whereby an integral, sealed covering capable of resisting hot acid is provided for said coil, a magnetizable shank positioned to be under the electrical influence of said coil and to project from the acid-resisting covering therefor, means rigidly securing said shank in such position and for insuring a liquid-tight joint where said shank extends from said covering, and said shank at its outer end being provided with a work-supporting head.

3. In an electro-magnetic device which includes an electric coil upon a central body, the combination of an acid-resisting covering for said coil, which covering includes an acid-resisting flange member at one end of said coil, which covering also includes an acid-resisting sleeve extending along the face of the coil and burned into liquid-tight engagement with said flange member, whereby an integral, sealed covering capable of resisting hot acid is provided for said coil, a magnetizable shank arranged in such position that it is under the electrical influence of said coil and projects from the acid-resisting covering therefor, means for rigidly securing said shank in such position, which means admit of interchangeability of said rigidly secured shank without impairing the liquid-tight acid-resisting characteristics of said magnetic device.

4. In an electro-magnetic device, the combination of a solenoid of electric wire, an acid-resisting casing assembled and burned in place over said solenoid, whereby an integral, sealed, acid-resisting covering is provided for the solenoid, a magnetizable shank extending through and projecting from the wall of said covering, said shank being rigid-

ly positioned under the electrical influence of said solenoid, means for securing said shank in such position, which means admit of interchangeability of said rigidly secured
5 shank without impairing the liquid-tight, acid-resisting characteristics of said magnetic device.

In testimony whereof I have hereunto set my hand.

10 ALBERT DIETZEL.

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