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S. THAYER

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APPARATUS FOR PROTECTING PIPE LINES FROM ELECTROLYSIS

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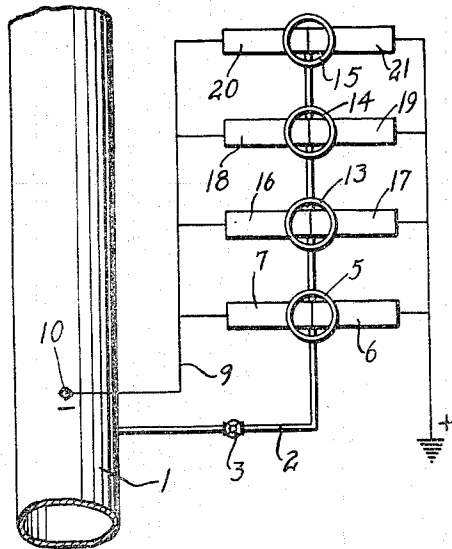


Fig. 3.

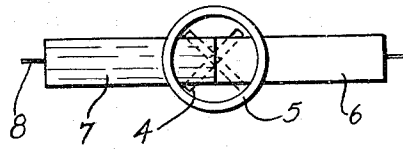


Fig. 2.

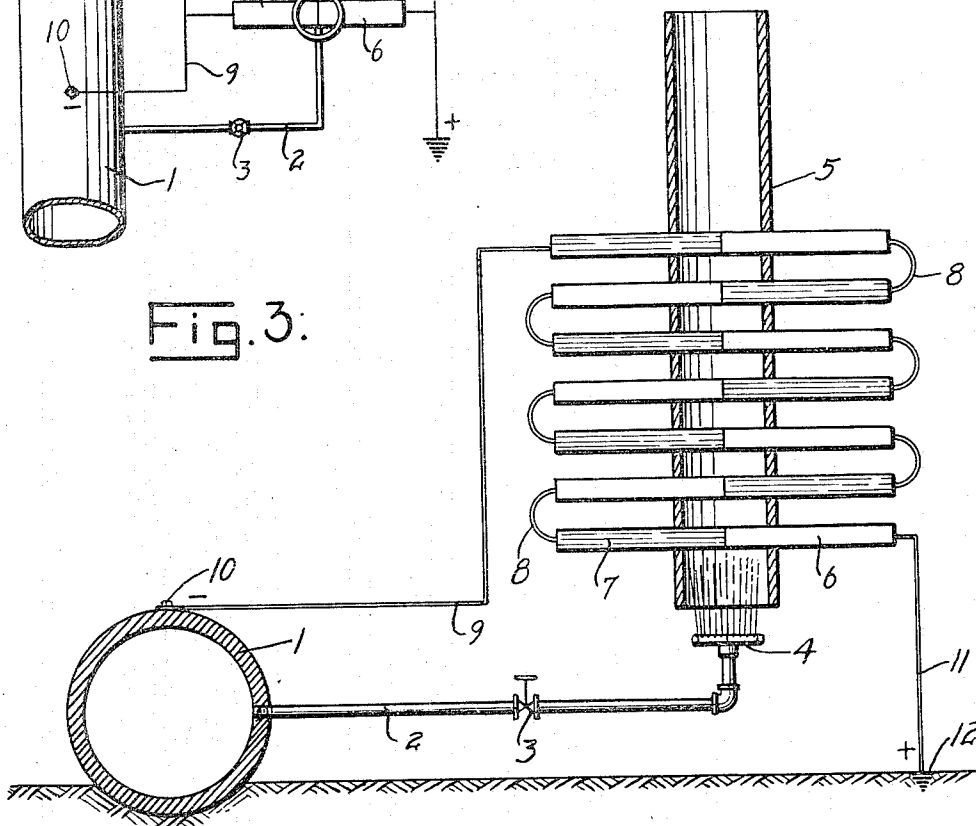


Fig. 1.

Starr Thayer
Inventor

By

J. Vincent Martin
and
Ralph R. Browning
Attorneys

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APPARATUS FOR PROTECTING PIPE LINES
FROM ELECTROLYSIS

Starr Thayer, Houston, Tex.

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3 Claims. (Cl. 204—1)

This invention relates to an apparatus for protecting buried pipe lines against soil corrosion or electrolysis.

Where metal pipes are buried in the ground, there is, over a period of time, under ordinary circumstances, a loss of metal from the pipes caused by electrical currents that are generated in the pipe itself or between the pipe and the surrounding soil, the elements of the pipe and the soil, together with the moisture in the soil acting as a battery in the production of this electric current. As this current is generated, it leaves the pipe wall and passes into the surrounding soil, returning to the pipe wall again at some other spot. These currents may be, and generally are, very small, but constant flow over a period of years will eventually cause a breakdown of the pipe wall, necessitating replacement or repair.

It has been discovered heretofore that these currents so generated in the pipe and between the pipe and surrounding soil, can be prevented from leaving the pipe and that corrosion and loss of metal can likewise be prevented by imposing on the pipe a sufficient potential to overcome the potential of any currents generated within the pipe and prevent the flow of current from the pipe.

In the actual operation of this method, a source of direct current must be available. The negative terminal of this source is attached to the pipe to be protected. The positive terminal is attached to an anode which is grounded in the soil at some distance from the pipe. When the current is turned on, it is discharged from the anode into the soil. It then passes through the soil and to the pipe wall, from which point it is returned to the source of supply. In order to be effective, this current must be of sufficient density to counteract the currents that have a tendency to leave the pipe, and if they are of such density, the corrosion will no longer take place.

In carrying out the foregoing, several means in the past have been resorted to for the purpose of supplying the necessary direct current to the location needed. Where a commercial or other power source is already present in the neighborhood, it is, of course, feasible to tap such source and to utilize the current therefrom, using rectifiers, if need be, in order to transform alternating current of the current supply into the direct current required for the pipe line protection. In cases where no source of electric power is available, but where wind power is

fairly constant, windmills have been set up for the purpose of supplying the needed electrical energy for pipe line protection purposes. Where the windmills have not been feasible because of the lack of favorable winds, it has been necessary to utilize gas engine driven generators, involving, as they do, the problem of servicing the engine and keeping it in good running order.

It is an object of this invention to provide a method of protecting fuel pipe lines from electrolysis by utilizing a portion of the fuel in the pipe lines.

It is a further object to provide such a method without any steps requiring the exercise of mechanical force.

It is an object of this invention to provide a means for supplying current for pipe line protection, which means will not require frequent servicing in order to keep it operating.

It is also an object of this invention to provide a device as above set forth which will be relatively inexpensive to manufacture, to install and operate.

One other object of this invention is to provide a device which will utilize fuel being conducted through a pipe line for the purpose of supplying electrical energy to protect the pipe line from corrosion.

With the above and other objects in view, this invention consists of the various parts and combinations set forth in the following description and the accompanying drawing and claimed in the appended claims. It is to be understood, however, that said description and drawing are by way of illustration and example only and are not to be taken by way of limitation.

In the drawing:

Fig. 1 is a view partly in vertical cross-section illustrating diagrammatically a device constructed in accordance with this invention.

Fig. 2 is a top plan view of the electrical generator element illustrated in Fig. 1.

Fig. 3 is a plan view of a device such as shown in Fig. 1, but illustrating a number of electrical generator elements connected together in series parallel.

In carrying out this invention a portion of the fuel is drawn from the pipe line, where the same contains fuel, and is burned to produce heat. The heat thus produced is then converted directly into electricity by applying it to a thermopile, and this electricity is applied to the ground at a distance from the pipe line to cause current to flow from the ground to the pipe line.

Referring now more in detail to the drawing,

the numeral 1 illustrates a pipe line which, it will be assumed for the purposes of this description, is being utilized for the conduction of fuel, such as gas or oil. Leading from this pipe line is a supply pipe 2 having a valve 3 therein and leading to a burner 4. The burner 4 is located at the lower end of a flue or oven 5, and extending through this oven transversely there are disposed a number of thermocouples. Each of these thermocouples consists of a length 6 of one kind of metal, welded within the oven itself to the end of a length 7 of a different kind of metal. These series of thermocouples extending through the oven 5 are connected, with the thermocouples in series.

It is well known that when a welded joint between two unlike metals is heated and the opposite ends of the metals cooled or kept cooler than the welded joints, a current of electricity will be set up by virtue of the application of heat to the welded joints. The thermocouples illustrated in Fig. 1 are connected in series by means of connectors 8 so as to form the thermopile illustrated. One end of this thermopile is connected by means of a conductor 9 to the pipe line 1 at 10, this end being the end which is commonly termed the negative end of the thermopile. The conductor 11 connects the opposite end to the ground as shown at 12.

It will readily be seen that when the burner 4 beneath the flue 5 is lighted, the heat applied to the welded joints of the thermopile will cause a current flow to be set up in the thermopile, thus applying a potential to the pipe line and preventing the flow of destructive electric currents from the pipe line in the manner above described.

In the event it is found that a single thermopile, such as shown in Fig. 1, will not supply the necessary current to prevent the corrosion of pipe line, additional flues 13, 14 and 15, as many as may be required, may be set up, and thermocouples consisting of elements 16 and 17, 18 and 19, 20 and 21, positioned therein in the same manner as the elements 6 and 7 are positioned in the flue 5. The various thermopiles thus provided may be connected either in series or parallel as shown in Fig. 3, depending upon whether more current or more voltage is desired for the purpose of properly protecting the pipe line.

It will be seen from the foregoing that a means has been provided for carrying out all of the ob-

jects and advantages of this invention. It will further be appreciated that while not limited to use on a pipe line carrying fuel, because the fuel supply may be separately provided, this device is particularly adapted to use with a pipe line which does carry fuel. It will further be appreciated that the device described will be relatively inexpensive to manufacture, install and operate and will require substantially no service once it is put in place.

Having described my invention, I claim:

1. Apparatus for protecting buried pipe line against soil corrosion and electrolysis comprising in combination with the pipe line, a thermopile, a flue surrounding the portions of said thermopile adapted to be heated, means for supplying heat to the lower end of said flue below said thermopile, said thermopile being located adjacent the pipe line and means for electrically connecting the negative end of said thermopile to said pipe line and the positive end thereof to the ground.

2. Apparatus for protecting buried pipe line against soil corrosion and electrolysis comprising in combination with the pipe line having fuel therein, burner means connected to said pipe line for burning a portion of the fuel passing there-through, a flue for receiving heat from said burner, a plurality of thermocouples extending transversely through said flue and having their joined ends within said flue, means for connecting said thermocouples in series to form a thermopile, said thermopile being located adjacent the pipe line, and means for electrically connecting the negative end of said thermopile to said pipe line and the positive end thereof to the ground.

3. Apparatus for protecting buried pipe line against soil corrosion and electrolysis comprising in combination with the pipe line having fuel therein, burner means connected to said pipe line for burning a portion of the fuel passing there-through, a plurality of flues for receiving heat from said burner means, a plurality of thermopiles having their joints within said flues, respectively, means for connecting said thermopiles in parallel, said thermopiles being located adjacent the pipe line, and means for electrically connecting all of the negative ends of said thermopiles to said pipe line and all of the positive ends thereof to the ground.

STARR THAYER.