Jan. 5, 1937. C. E. BENNETT 2,066,321

ELECTRIC CABLE SYSTEM

Filed Dec. 7, 1935 2 Sheets-Sheet 1

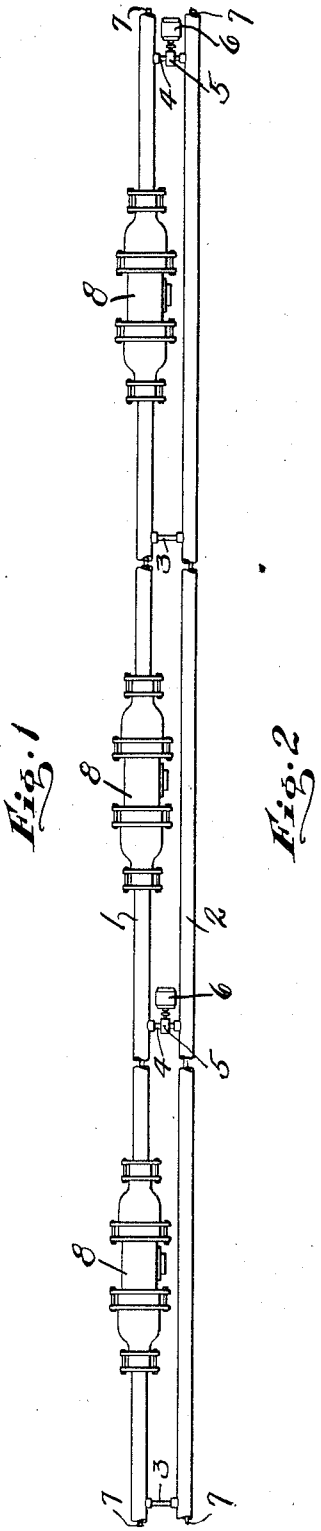


Fig. 1

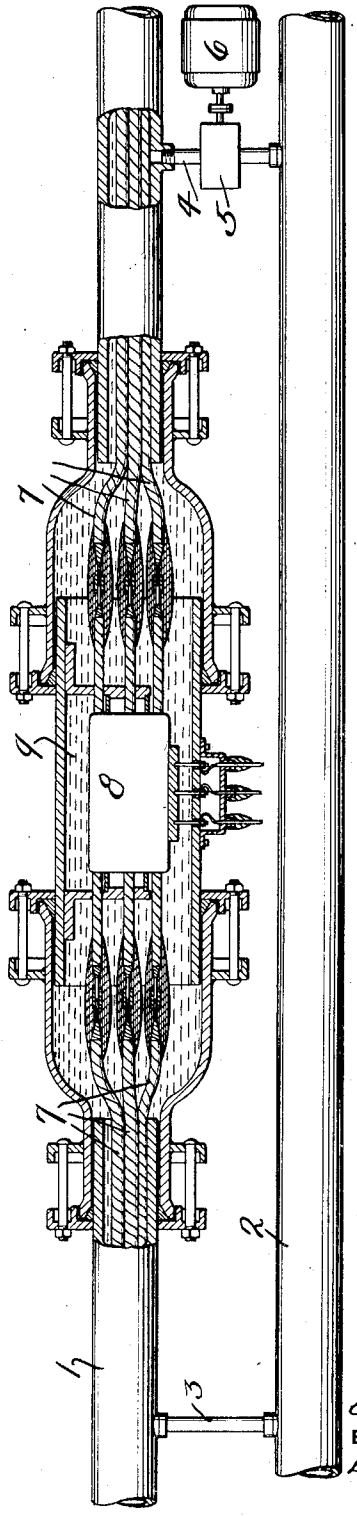


Fig. 2

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Filed Dec. 7, 1935 2 Sheets-Sheet 2

Fig. 3

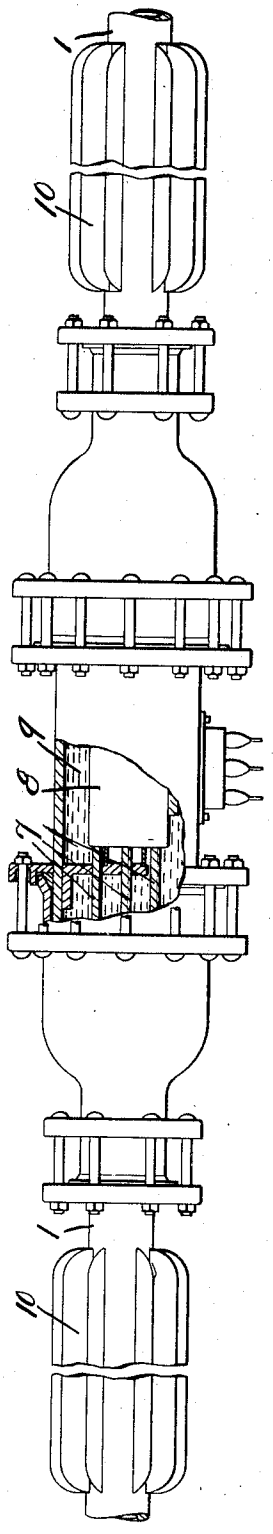
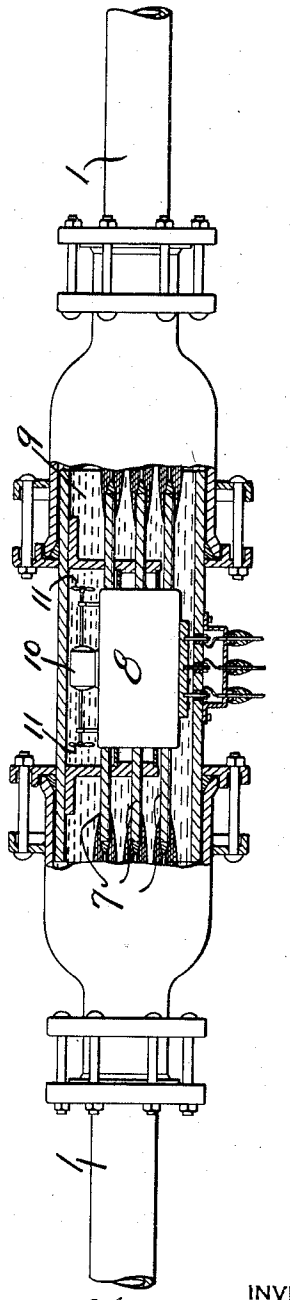


Fig. 4



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2,066,321

ELECTRIC CABLE SYSTEM

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Application December 7, 1935, Serial No. 53,343

6 Claims. (Cl. 247—3)

This invention relates to electric distribution systems particularly adapted for use in connection with the distribution of power for street lighting, house lighting and other domestic or commercial loads, and, generally speaking, the present invention provides a construction wherein overhead lines are dispensed with, the feeder lines and transformers for the system being installed underground in a pipe line, the pipe line being filled with a fluid in which the insulated conductors and transformers are immersed, the construction making provision for dissipating the heat generated in the system, thereby insuring best operating conditions at all times.

In the drawings accompanying the present application:

Fig. 1 shows one embodiment of my invention;

Fig. 2 is a view of a modification;

Fig. 3 is a part sectional view of a further modification; while

Fig. 4 is a part sectional view of a still further modified embodiment of my invention.

Referring to the drawings in detail, the improved system of Fig. 1 is shown as a two circuit system and comprises pipe lines 1 and 2 disposed adjacent to each other in parallel relation. At intervals these pipe lines are provided with cross connections 3 and with cross connections 4, the latter being equipped with pumps 5 driven by motors 6 receiving their energy from any suitable source of power.

Drawn into the pipe lines are the cable conductors designated 7. These conductors are suitably insulated as for example with paper insulation similar to the disclosure of my copending application Serial No. 666,032, filed April 13, 1933. These conductors are connected to any suitable source of available power as will be understood. At any desired interval along the pipe lines transformers are installed within the pipe line as shown diagrammatically at 8. These transformers, as will be understood, are electrically connected to the conductors 7, the specific construction of the transformers and mode of installing the same in the pipe line being shown in detail in my copending application Serial No. 46,064, filed October 22, 1935.

The pipe lines 1 and 2 are kept filled with a suitable fluid, such as oil, for example, preferably maintained under sufficiently high pressure to increase its dielectric strength, a minimum pressure of around five atmospheres, for example, and the conductors and transformers are immersed at all times in this fluid.

As mentioned at the outset of this description, the entire system is buried in the earth, and when the system is in operation the pumps 5 are employed for circulating the oil in the pipe lines 1 and 2 to dissipate the heat generated by the losses in the transformers which otherwise might be localized.

It will be understood that the cross connections 3 and 4 between the pipes 1 and 2 may be located wherever desired but preferably there will be in my improved system a cross connection 3 at one side of each transformer and a cross connection 4 at the other side so as to insure circulation of the oil in contact with the transformers to dissipate and carry away the heat generated by electrical losses in the transformer.

In the embodiment of my invention illustrated in Fig. 2 I have shown a pipe line 1. Here I have shown a single circuit system, as distinguished from the two-circuit system of Fig. 1, the system of Fig. 2 comprising pipe lines 1 and 2 with insulated conductors 7 in the pipe line 1 only. The pipe line 2 parallels the pipe line 1 as before and the two are connected by connections 3 and 4, cross connections 4 being provided with electrically driven pump 5 receiving its power from any suitable source. Both lines 1 and 2 are filled with oil 9 at a sufficiently high pressure to increase its dielectric strength, the cable conductors 7 and the transformers 8 which are installed in the pipe line 1 at desired intervals being immersed in the oil 9 contained in the pipe line.

The only difference between the systems of Figs. 1 and 2 is that Fig. 1 is a two-circuit system, while Fig. 2 is a single circuit system.

In Fig. 3 I have shown a further modification of my invention in which the cable conductors and transformers are enclosed in a pipe line filled with oil, the pipe line at each side of the transformer location being provided with radiating fins 10. In all other respects the embodiment of my invention as illustrated in Fig. 3 is the same as that of Figs. 1 and 2. In other words, the system illustrated in Fig. 3 may be a two-circuit system such as illustrated in Fig. 1 or a single-circuit system such as illustrated in Fig. 2, the fins 10 of Fig. 3 providing additional radiation surface as will be understood.

In the embodiment of my invention as illustrated in Fig. 4 I employ a pipe line 1 containing the cable conductors 7 and transformers 8, these transformers, as will be understood, being electrically connected to the cable conductors. The pipe line is filled with oil 9 in which the cable conductors and transformers are at all times immersed. Each transformer is provided with

an electric motor 10 which may be mounted externally of the magnetic circuit of the transformer or made a part of it. The ends of the armature shaft of this motor are extended and each is equipped with a small propeller 11 adapted to drive the oil 9 away from the transformers, thereby effecting circulation of the oil longitudinally and dissipation of the heat generated by losses in the transformers and which otherwise might be localized at the transformers.

As mentioned above, this construction is applicable to a single-circuit pipe line construction but obviously if desired the same is applicable to the systems of Figs. 1 and 2.

It will be seen from all of the foregoing that the present invention provides a distribution system in which the conductors of the system and transformers are all installed inside a pipe line and the entire system buried in the earth, the conductors and transformers being immersed at all times in a fluid such as oil under static pressure with which the pipe line is filled, means being provided whereby this fluid is circulated for the purpose of dissipating the heat generated particularly by losses in the transformers and which otherwise might be localized at the transformers.

What I claim is:—

1. A buried electric distribution system comprising in combination a pipe line, insulated conductors within the pipe line, a transformer within said pipe line and electrically connected to said conductors, a body of fluid under superatmospheric static pressure in said pipe line surrounding said conductors and transformer and in which said conductors and transformer are immersed, a pipe line paralleling the first-mentioned pipe line, cross connections between said pipe lines, and means for effecting circulation of said fluid through said pipe lines and cross connections for cooling said transformer.

2. A buried electric distribution system comprising in combination a pipe line, insulated conductors in the pipe line, a transformer within said pipe line electrically connected to said conductors, a body of fluid under static pressure in said pipe line surrounding said conductors and transformer and in which said conductors and transformer are immersed, a pipe line paralleling the first-mentioned pipe line, a cross connection between said pipe lines at each side of said transformer for the circulation of said fluid past said transformer to cool the same.

3. A buried electric distribution system comprising in combination a pipe line, insulated conductors in the pipe line, a transformer within said pipe line electrically connected to said conductors, a body of fluid under superatmospheric static pressure in said pipe line surrounding said conductors and transformer and in which said conductors and transformer are immersed, a pipe line paralleling the first-mentioned pipe line, a cross connection between said pipe lines at each side of said transformer, and a pump in one of said cross connections for the circulation of said fluid past said transformer to dissipate heat generated by the same.

4. A buried electric distribution system comprising in combination a pipe line, insulated conductors in said pipe line, a transformer within said pipe line electrically connected to said conductors, a body of oil under superatmospheric static pressure in said pipe line surrounding said conductors and transformer and in which said conductors and transformer are immersed, a pipe line paralleling the first-mentioned pipe line, cross-connections between said pipe lines, one at each side of said transformer, and a pump for circulating the oil through said pipe lines and cross connections past the said transformer to dissipate heat generated by said transformer.

5. A two-circuit buried electric distribution system comprising in combination two pipe lines disposed parallel to each other, insulated conductors in said pipe lines, transformers in one of said pipe lines electrically connected to the conductors therein, a body of insulating fluid under superatmospheric pressure in said pipe lines surrounding said conductors and transformers and in which the said conductors and transformers are immersed, cross connections between said pipe lines at each side of said transformers, and means for circulating said insulating fluid through said pipe lines and cross connections past said transformers to dissipate heat generated thereby.

6. A buried electric distribution system comprising in combination a pipe line, insulated conductors within said pipe line, a transformer within said pipe line and electrically connected to said conductors, a body of insulating fluid in said pipe line surrounding said conductors and transformer and in which the conductors and transformer are immersed, and radiating fins on the pipe line adjacent said transformer for dissipating heat generated by the transformer.

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