

G. W. CHRISTIANS.

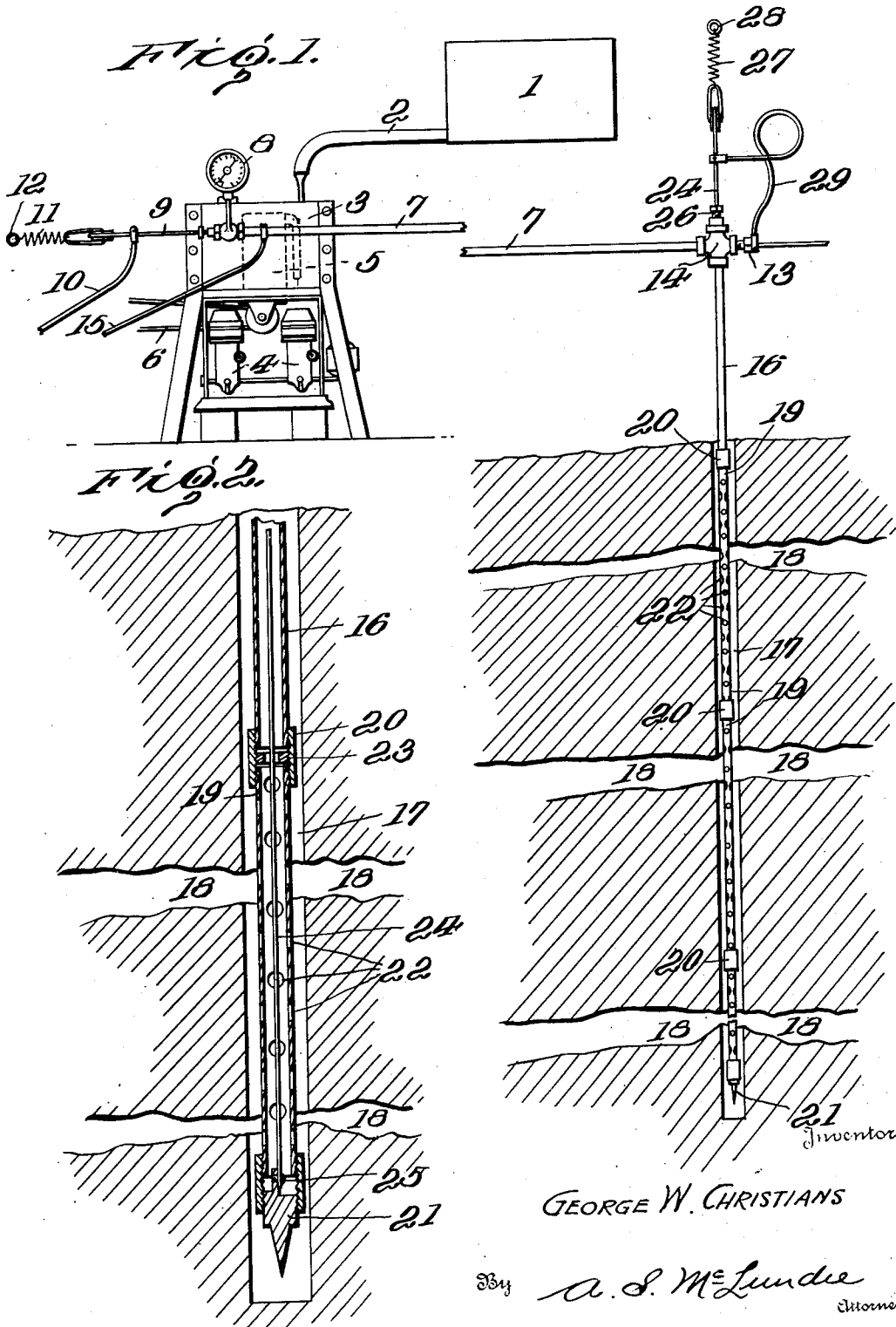
APPARATUS FOR USE IN SEALING CREVICES IN ROCK FORMATIONS.

APPLICATION FILED JUNE 9, 1919.

Patented Jan. 6, 1920.

2 SHEETS—SHEET 1.

1,327,269.



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By

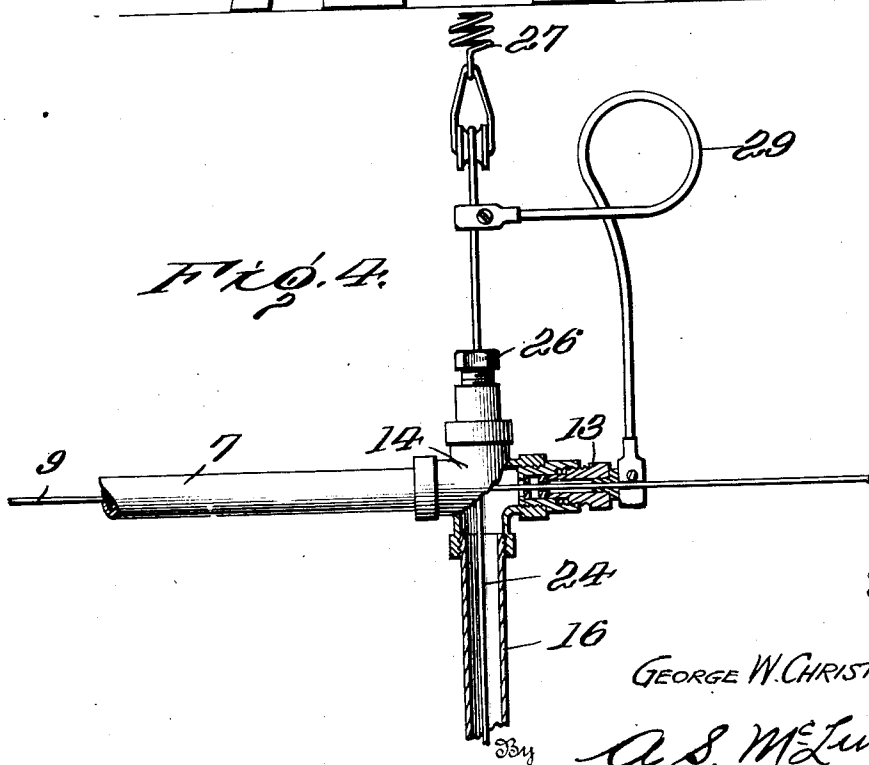
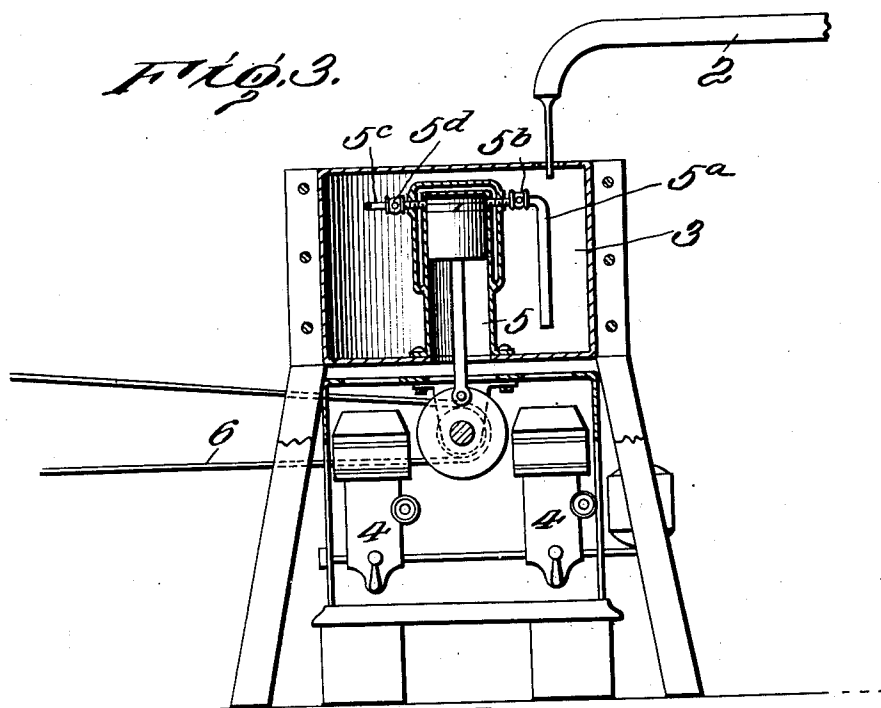
A. S. McLundie

Attorney

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Inventor

GEORGE W. CHRISTIANS

By *A. S. McLundie*  
 Attorney

# UNITED STATES PATENT OFFICE.

GEORGE W. CHRISTIANS, OF CHATTANOOGA, TENNESSEE.

APPARATUS FOR USE IN SEALING CREVICES IN ROCK FORMATIONS.

1,327,269.

Specification of Letters Patent.

Patented Jan. 6, 1920.

Application filed June 9, 1919. Serial No. 302,796.

*To all whom it may concern:*

Be it known that I, GEORGE W. CHRISTIANS, a citizen of the United States, residing at Chattanooga, in the county of Hamilton and State of Tennessee, have invented certain new and useful Improvements in Apparatus for Use in Sealing Crevices in Rock Formations, of which the following is a specification.

10 This invention relates to improvements in means for introducing a substance which is fluid when heated and nearly solid when cool, into the crevices or cracks in fissured rock.

15 The main object of the invention is to provide a novel mechanism for carrying out the process set forth in my co-pending application filed of even date herewith, and bearing Serial No. 302,795. Another object  
20 of the invention is to provide improved means for forcing fluid material beneath the surface of the earth and into the interstices of fissured rock and this means includes a heating arrangement for maintaining the  
25 fluid in heated condition during its travel.

Still another object is to provide a novel electric wiring arrangement and devices for maintaining the wires in taut condition.

30 With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, my invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings and more particularly  
35 pointed out in the appended claims.

In the drawings;

Figure 1 represents, more or less diagrammatically my entire apparatus and a section of fissured rock into which heated fluid  
40 is being pumped.

Fig. 2 is a detail sectional view of a portion of the material feeding pipe.

Fig. 3 is a detail view partly in section, showing the means for pumping and heat-  
45 ing the material.

Fig. 4 is a detail view, partly in section, of one of the joints used in changing the course of the material.

Referring to the drawings, 1 designates  
50 a supply tank or reservoir in which the hot sealing material is stored and this tank is connected by a feeding pipe 2, to a chamber 3. This chamber is maintained in heated condition by suitable means, such as gaseous  
55 or liquid fuel burners 4, and located in said chamber is a pump 5, which will be en-

tirely submerged in the heated liquid which occupies said chamber. The pump 5 is driven from any suitable source of power through the medium of a belt 6 and said  
60 pump is provided with an inlet pipe 5<sup>a</sup> having a check valve 5<sup>b</sup> which opens inwardly. The pump is connected by a pipe 5<sup>c</sup> with a material feeding pipe 7 and the pipe 5<sup>c</sup> is provided with an outwardly opening check  
65 valve 5<sup>d</sup>.

The pipe 7 is provided with a suitable pressure gage 8 and extending through said pipe is an electric heating wire 9 connected to a supply line wire 10. One end of the  
70 wire 9 is secured to a coiled spring 11 that has its other end secured to a fixed support 12 and the opposite end of the wire passes through and is fixed to an insulated connection 13, carried by a cross-shaped pipe fitting.  
75 14. The spring 11 tends to maintain the wire 9 in taut condition and prevents the same from contacting with the wall of the pipe 7. A supply line wire 15 is also secured in electrical connection with the  
80 pipe 7.

Extending downwardly from the fitting 14 and having its upper end connected thereto, is a material feeding pipe 16, which is inserted in a previously prepared hole  
85 17 that communicates with the crevices 18 which are to be sealed by the material passing through said pipes. The pipe 16 consists of a number of sections 19 having their adjacent ends connected together by couplings  
90 20 and located in each of said couplings, between the adjacent ends of the pipe sections, are insulated washers 23, which are preferably, though not necessarily, formed of lava. The sections of the pipe 16 that  
95 21 occupy positions adjacent to the crevices 18, are provided with series of apertures 22 through which the material passes in its travel from the interior of the pipe 16 to said crevices. A heating wire 24 has its  
100 25 lower end connected at 25 to a point 21 that places said wire in electrical connection with the pipe 16 and this wire 24 extends upwardly through the pipe 16 and its upper  
105 26 portion, passed through an insulated nipple 26 while its upper extremity is connected to the lower end of a coiled spring 27 which has its upper end secured to a fixed or stationary support 28. The wire 24 passes  
110 29 through the member 26 with a free fit so that the spring 27 will draw the wire upwardly and maintain the same in taut condi-

tion. A wire 29 has its ends connected to the wires 24 and 9, so that current passing through the wires 10, 9, 29 and 24 in the order named, will reach the point 21 at the lower end of the pipe 16 and will then travel upwardly through the pipe 16, the fitting 14, then over the pipe 7 and out of the wire 15 back to the line. With this construction, the electric current will maintain the wires 9 and 24 in heated condition and the fluid which is heated in the chamber 3, will be maintained in heated condition by the wires during its travel through the pipes 7 and 16.

My improved mechanism operates as follows: A suitable substance, which is liquid when heated and nearly hard or solid when cool (such as sulfur, asphalt or pitch) is placed in the reservoir 1 where it is heated and from which it is passed by the pipe 2 into the chamber 3. The material in said chamber 3 is kept heated by the means 4 and is drawn from said chamber by the heated pump 5, which is kept at the same temperature as the material by being submerged in said material. The pump 5 forces the material under pressure into the pipe 7 and down the pipe 16, from which it passes through the apertures 22 into the crevices which are to be sealed.

Owing to the material being maintained in heated condition during its passage through the pipes, it will pass through the apertures 22 in fluid and heated condition and the exterior of the ejected material will be formed, by the cooling of the water or the like in the crevice, into a thick skin, which will act as a container for the material which is forced through the apertures 22. After this skin or sack is formed, the interior of said skin or sack will be kept in fluid and heated condition by the hot material passing from the pipe 16 into said sack and the sack will be thus expanded until it entirely fills the crevice which it is to seal.

While I have shown and described one embodiment of my invention, it will be apparent to those skilled in the art, that various changes and modifications may be made therein without departing from my idea or mode of operation and I am aware that various changes may be made, without departing from the spirit of the invention as set forth in the following claims.

What I claim and desire to secure by Letters Patent is:—

1. An apparatus designed for forcing heated fluid material beneath the surface of the earth, comprising a conduit for conducting said material, means in the conduit for maintaining the interior of said conduit in heated condition while the heated material is passing through the same and means for forcing material into said conduit.

2. An apparatus of the class described including a pipe adapted to be inserted into

the earth and provided with a series of apertures, means in the pipe for maintaining the interior of said pipe in heated condition while sealing material is passing through the same, and means for forcing material into said pipe.

3. An apparatus of the kind defined by claim 1, in which the material forcing means consists of a pump.

4. An apparatus of the kind defined by claim 1, in which the means for maintaining the conduit in heated condition includes an electrically heated element.

5. An apparatus of the class described including a conduit adapted to be inserted into the earth, means in the conduit for maintaining the interior of said conduit in heated condition while sealing material is passing through the same, a heating chamber for the material which is conducted through said conduit, a pump for forcing the material from the chamber into said conduit and means for heating said chamber.

6. An apparatus of the class described comprising a pipe having a series of apertures, an electric conducting and heating wire extending through said pipe and connected to one end of the same, a line wire connected to the conducting wire, another line wire connected to said pipe, and means for introducing material into said pipe.

7. An apparatus of the class described including a pipe made up of a series of sections some of which are perforated, insulating means located in said pipe, an electric heating and conducting wire extending through the pipe and in electrical connection with one end of the same, said insulating means aiding in spacing the wire from said pipe, resilient means for drawing the wire in taut condition, and means for introducing material into said pipe.

8. An apparatus of the class described including a pipe of metallic material made up of a series of sections, some of which are perforated, insulating washers located between the adjacent ends of the pipe section, couplings connecting said pipe sections, an electric heating and conducting wire extending through said pipe and having one of its ends in electrical connection with one end of the pipe, resilient means connected to the other end of the wire and tending to maintain the same in taut condition in said pipe, a line wire in connection with the conducting wire, a second line wire in electrical connection with said pipe, and means for introducing material into said pipe.

9. An apparatus of the kind defined by claim 8, in which the material introducing means consists of a forcing pump.

10. An apparatus of the class described comprising a chamber adapted to contain a material which is fluid when heated and

nearly solid when cool, means for heating said chamber, a pump, a conduit receiving the material forced by said pump for conducting said material to a suitable location  
5 in fissured rock, said conduit being provided with apertures adjacent the crevices which are to be sealed, and means permanently fixed in said conduit for maintaining the material in heated condition during its  
10 travel through said conduit.

11. An apparatus for sealing crevices beneath the surface of the earth with a material which is fluid when heated and nearly solid when cool, comprising a chamber

adapted to contain the material while in heated condition, a conduit extending to the crevice to be sealed and adapted to conduct the sealing material, a pump for forcing the material from the chamber through said conduit, an electric heating element located  
20 within the conduit and extending the full length of the same, and electric conducting means for conveying heating current to said heating element.

In testimony whereof I have hereunto af- 25  
fixed my signature.

GEORGE W. CHRISTIANS.