A. PICK.

SUBTERRANEAN HEATER.

APPLICATION FILED JA.'. 2, 1913.

1,082,971.

Patented Dec. 30, 1913.

2 SHEETS—SHEET 1.

Fig. 1,

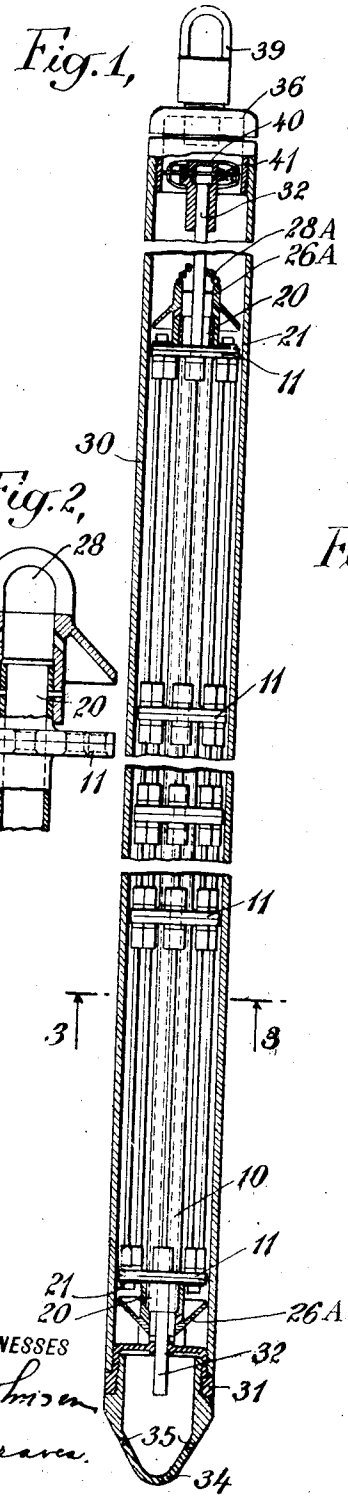


Fig. 2,

Fig. 3,

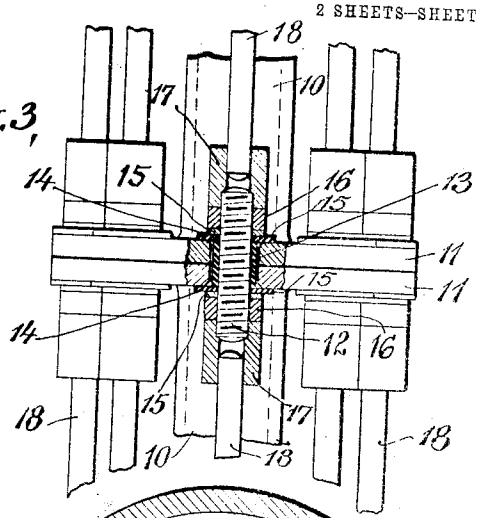


Fig. 4,

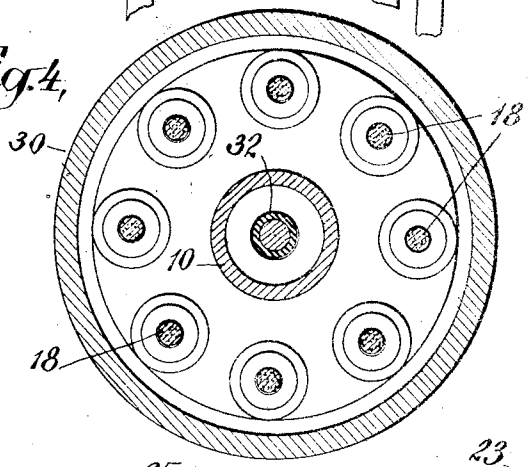
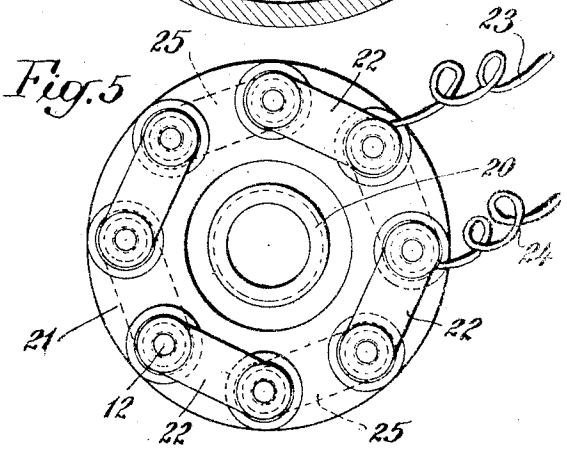


Fig. 5



WITNESSES

B. Johnson

F. Graves.

INVENTOR

Alfred Pick

BY

E. W. Marshall

ATTORNEY

A. PICK.

SUBTERRANEAN HEATER.

APPLICATION FILED JAN. 2, 1913.

1,082,971.

Patented Dec. 30, 1913.

2 SHEETS—SHEET 2.

Fig. 6,

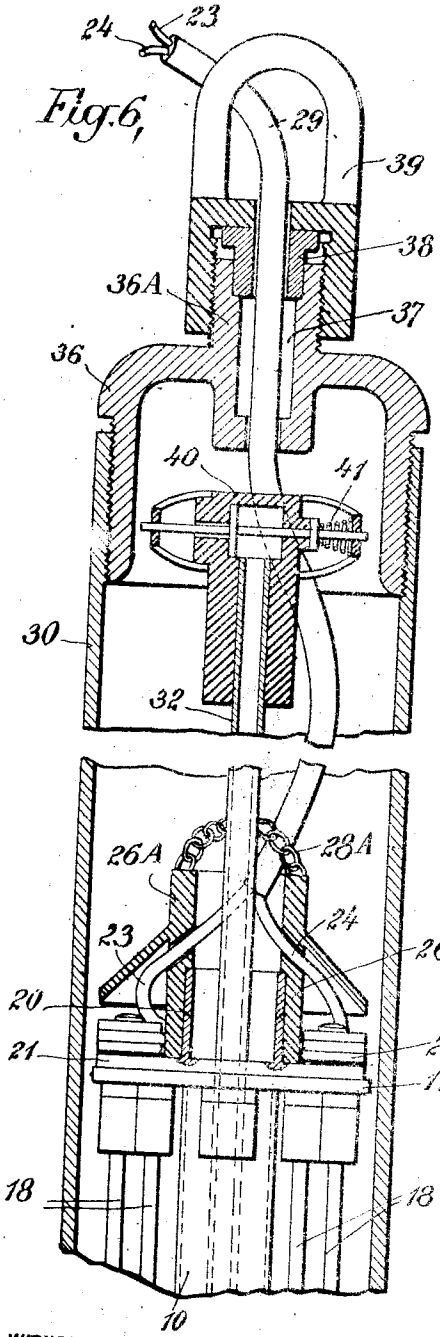
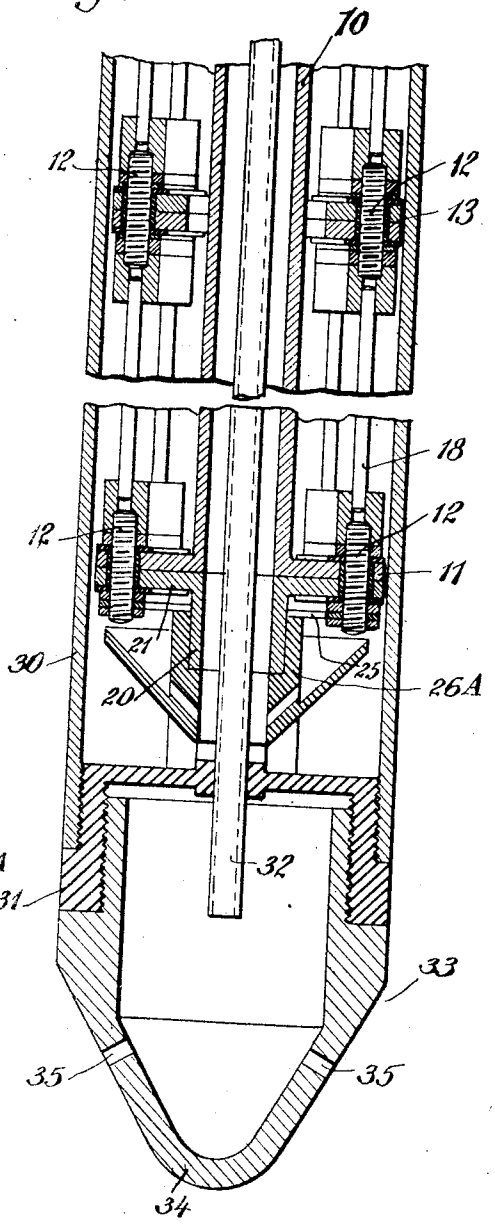


Fig. 7



WITNESSES

B. Johnsen

F. Graves

INVENTOR

Alfred Pick

BY

E. W. Marshall

ATTORNEY

UNITED STATES PATENT OFFICE.

ALFRED PICK, OF NEW YORK, N. Y., ASSIGNOR TO EDWARD NICKLAS BREITUNG, OF MARQUETTE, MICHIGAN.

SUBTERRANEAN HEATER.

1,082,971. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed January 2, 1913. Serial No. 739,697.

To all whom it may concern:

Be it known that I, ALFRED PICK, a subject of the Emperor of Austria-Hungary, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Subterranean Heaters, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to electric heating apparatus and especially to such as is adapted for use in oil wells and other subterranean cavities. Its object is to provide a simple and durable device of the aforesaid character that shall embody a plurality of rigidly supported resistance elements which are readily removable and replaceable which are so protected that the device may be used in difficult places and also to provide an arrangement whereby the heat generated by such elements may be utilized to great advantage.

Other objects of my invention will be set forth hereinafter.

I will describe my invention in the following specification and point out the novel features thereof in appended claims.

Referring to the drawings, Figure 1 is a side elevation largely in longitudinal section of a heater constructed in accordance with my invention, certain sections being broken away to reduce its length. Fig. 2 shows in section one of the end supporting members and its protective head. A portion of the heater without the casing is shown in Fig. 3 one of the connections between pairs of heating elements being shown in section. Fig. 4 is an enlarged transverse section on the line 3—3 of Fig. 1. Fig. 5 is an end elevation on a larger scale of the heater with the casing and end cap removed. Figs. 6 and 7 are enlarged longitudinal sections of the respective ends of the device shown in Fig. 1.

Like characters of reference designate corresponding parts in all the figures.

The heater here shown is built up of a plurality of tubular supporting members 10 having abutting end flanges 11 and assembled end to end. Spaced about the tube are holes through the flanges through which are passed screw-threaded metallic studs 12 which are insulated from the flanges by insulating bushings 13.

14, 14 designate washers of insulating material, over which are metallic washers 15. Nuts 16 screwed onto the studs clamp the adjacent supporting members together.

Outside of the nuts hollow metallic sockets 17 are screwed onto the studs. These serve to hold the ends of carbon rods 18 which form the resistance elements. Thus the heater is built up in sections with a set of spaced carbon rods in alinement with each other, electrically connected together but insulated from the supporting members. By this construction the rods are held rigidly but their supports are such as to allow for expansion and to make them easily and independently removable and replaceable.

The end sections of the supporting members are designated by 20 and their flanges by 21. Studs like 12 extend through them and between adjacent studs are metallic connectors 22. The wires 23 and 24 of an electric cable are connected respectively with two of the unconnected studs. One of these end flanges is shown in Fig. 5 and it is to be understood that on the other end flange there are connectors 25 between the studs which are opposite the ends of the carbon rods not connected by the connectors 22. This arrangement connects the resistance rods in series but it is obvious that by other arrangements well within the knowledge of one skilled in the art, they may be connected in parallel or in series parallel. To these end sections are secured protective heads such as 26 (Fig. 2) which are made with conical flanges 27 and with bails 28.

The parts described form an operative structure and before pointing out the other parts of the apparatus illustrated in the drawings, I will describe the manner in which it is used. A rope, chain or cable is secured to the bail 28 of the upper protective head and by it the device is lowered into the cavity, for example, an oil-well. Electric current supplied through wires 23, 24 will generate heat in the rods 18 which heat may be utilized to melt deposits of such substances as paraffin which often clog up oil wells and injure their usefulness. The lower protective head guides the device as it is being lowered and holds the more delicate carbon rods away from the sides of the well. The upper protective head also guides the device and its conical flange deflects to the side any loose matter which may fall on it from above. The heater elements are main-

tained at the proper distance apart and do not sag and touch each other as helical resistance coils so often do.

In some wells there are conductive fluids such as salt-water, and in such cases it becomes necessary to cover the carbon rods. This I do by providing a tubular shell 30. Into the lower end of this shell is screwed an end head or coupling 31 which is provided with a central opening in which fits a small tube 32 which extends through the heater.

33 is a discharge head, screwed into the end head or coupling 31. The discharge head is tapered to a blunt end at 34 and is provided with a plurality of discharge orifices 35.

A cable head 36 is screwed into the upper end of the shell 30. The cable 29 in which are the wires 23, 24 passes through an opening in the central part of this head. The lower end of this opening is but slightly larger than the cable but is enlarged to form an annular chamber 37 which is filled with an elastic cement such for example as a rubber compound and closed by a cap 38. A bail 39 screws over a threaded boss 36^A which is a part of the cable head and forces the cap 38 down onto the cement to form a fluid-tight joint. The bails of the protective heads 26^A are cut off to allow the tube 32 to pass through them. A chain 28^A is provided on the upper one, by means of which the heater may be removed from the shell. To the upper end of the tube 32 is secured a relief valve 40 which is closed by a spring 41 but which permits the valve to open inwardly when it is subjected to pressure. When this form of the device is used, the inside of the shell may be filled with some non-conducting liquid such as kerosene which will not interfere with the electric heating circuits completed through the rods, and lowered into the well or cavity. The heater is then supplied with electrical energy. When the temperature and pressure of the kerosene have been sufficiently raised by the heat radiated from the electrically heated rods, the valve 40 will be automatically opened and the hot vapors released from the shell will pass down through tube 32 and be discharged through the orifices 35. The hot vapors discharged in this way are particularly effective in melting the paraffin and heavy products of petroleum which usually clog an oil well to a greater or less extent and consequently the output of a well is materially increased. The heat may be thus applied at any desired points in a much more effective way than has heretofore been possible.

What I claim is:

1. A subterranean heater comprising a plurality of supporting members having abutting end flanges and assembled end to end and a plurality of resistance rods spaced about the members between the flanges and secured thereto.

2. A subterranean heater comprising a plurality of supporting members having abutting end flanges and assembled end to end, a plurality of resistance rods spaced about the members between the flanges and secured thereto and fastening devices insulated from the flanges arranged to clamp said flanges together and to support the rods.

3. A subterranean heater comprising a plurality of supporting members having abutting end flanges assembled end to end, a plurality of screw-threaded studs extending through but insulated from the flanges, nuts on the studs clamping said members together, a plurality of resistance rods spaced around each member between the flanges and means for removably securing the resistance rods to opposite ends of the studs.

4. A subterranean heater comprising a plurality of tube-like supporting members having abutting end flanges assembled end to end, screw-threaded metallic studs extending through but insulated from said flanges, nuts on the studs for clamping the members together, sockets screwed on the ends of the studs, and a plurality of carbon resistance rods having their ends in said sockets.

5. A subterranean heater comprising a plurality of tube-like supporting members having abutting end flanges assembled end to end, screw-threaded metallic studs extending through but insulated from said flanges, nuts on the studs for clamping the members together, sockets screwed on the ends of the studs, a plurality of carbon resistance rods having their ends in said sockets and a protecting head on each end of the heater.

6. A subterranean heater comprising a shell and closed heads, a tube extending longitudinally through the shell and beyond one of the heads, a valve for establishing a communication between one end of the tube and the inside of the shell, and an electric heater surrounding the tube within the shell.

7. A subterranean heater comprising a tubular shell, a discharge head at one end and a cable head at the other, a central tube within the shell extending into the discharge head at one end and close to the cable head at the other, a valve for establishing communication between the central tube and the shell near the cable head, and a sectionalized electric heater surrounding the tube within the boiler.

8. A subterranean heater comprising a closed tubular shell, forming a boiler, a discharge head at one end provided with an orifice and a cable head at the other, a cable extending through the cable head, a fluid-tight packing therefor, a central tube within

the shell extending into the discharge head at one end and close to the cable head at the other, a valve for establishing communication between the central tube and the boiler near the cable head, and an electric heater comprising a plurality of tube sections, having abutting end flanges and assembled end to end, a plurality of screw-threaded studs spaced about the tube extending through and insulated from the flanges, nuts on the studs for clamping the tube sections together, a plurality of carbon resistance rods spaced around each section; and sockets on said studs surrounding the ends of the rods removably securing the rods to the studs.

9. A subterranean heater comprising a plurality of hollow supporting members having abutting end flanges connected end to end and forming therethrough a continuous opening, and a plurality of resistance rods spaced about the members between the flanges and secured thereto.

10. A subterranean heater comprising a closed casing, electric insulating matter therein, adapted to be discharged therefrom, an electric heater within the casing submerged in said matter, means for supplying electric energy to the heater, and means automatically opened at a predetermined pressure in the casing to discharge the heated insulating matter from the casing.

In witness whereof I have hereunto set my hand this 31st day of December, 1912, in the presence of two subscribing witnesses.

ALFRED PICK.

Witnesses:
G. R. QUIMBY,
F. B. GRAVES.