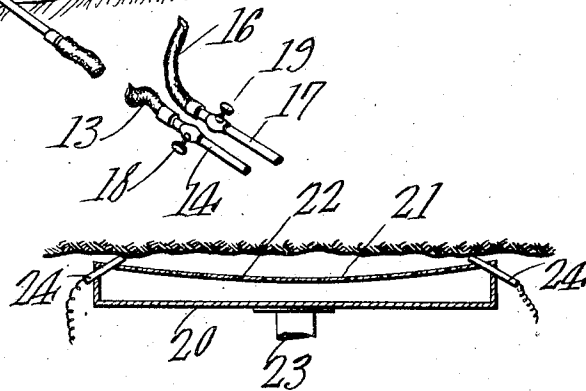
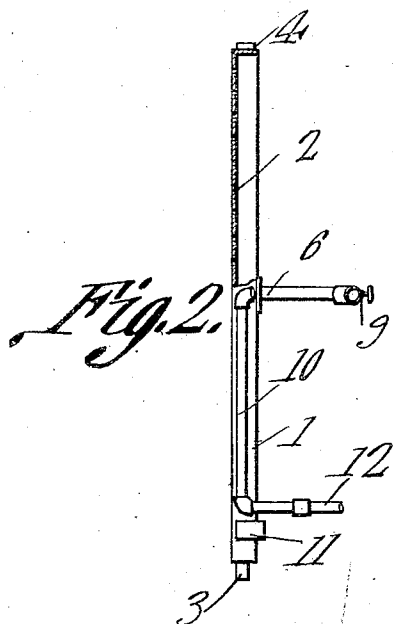
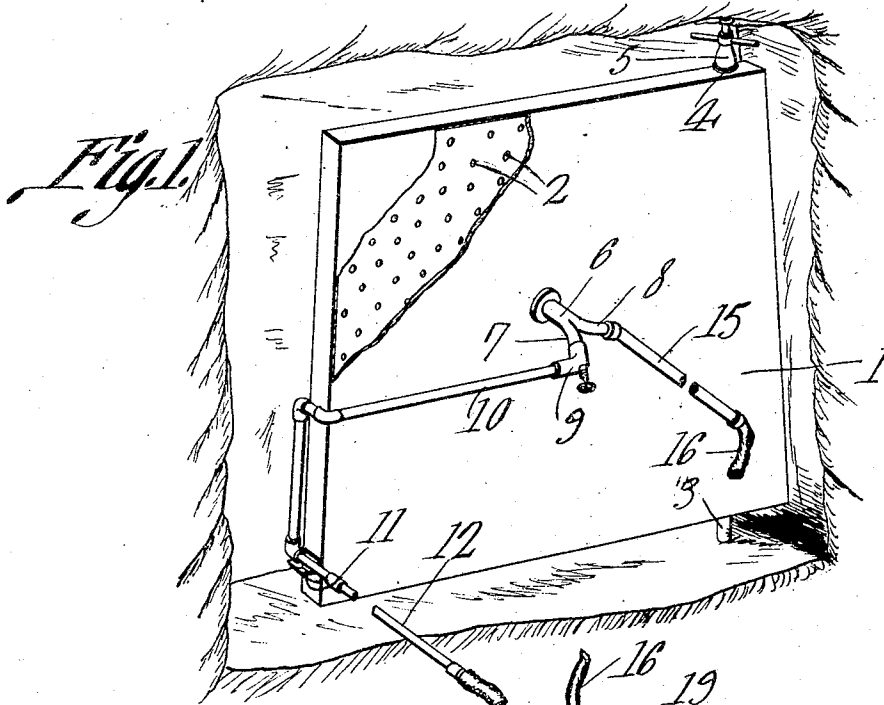


H. F. SUTTON.
 APPARATUS FOR TUNNELING ROCK.
 APPLICATION FILED MAR. 7, 1911.

1,025,029.

Patented Apr. 30, 1912.



Witnesses

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UNITED STATES PATENT OFFICE.

HARVEY F. SUTTON, OF SALT LAKE CITY, UTAH.

APPARATUS FOR TUNNELING ROCK.

1,025,029.

Specification of Letters Patent.

Patented Apr. 30, 1912.

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To all whom it may concern:

Be it known that I, HARVEY F. SUTTON, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented a new and useful Apparatus for Tunneling Rock, of which the following is a specification.

This invention relates to a new and useful apparatus for tunneling rock.

The principal object of the invention is to subject rock alternately to the action of opposite extremes of temperature, it having been found that when rock is first heated and then suddenly chilled, it becomes softened or partly disintegrated so as to be easily removed by hand or by pneumatic tools or the like.

Another object is to provide new and novel means whereby the rock can be treated in the manner set forth.

With the foregoing and other objects in view the invention consists in setting up against the face of the rock a heater of such form as to subject the rock to a high temperature, means being provided whereby the heat can be quickly cut off and a blast of cold air or any other chilling medium directed against the heated surface so as to quickly lower the temperature thereof.

In the accompanying drawings, apparatus to be used in carrying out the process, has been illustrated.

In said drawings:—Figure 1 is a perspective view of the head of the apparatus set up for use and showing the various pipe connections, a portion of said head being broken away. Fig. 2 is a view partly in side elevation and partly in section of said head and portions of the pipes. Fig. 3 is a transverse section through a modified form of head.

Referring to the figures by characters of reference 1 designates a hollow head of sheet metal or other suitable material, said head being of any proportions desired and having its advancing or working face formed with a large number of small openings such as indicated at 2. One side portion of the head may be mounted on a pivot stud 3 and a socket 4 may be formed in the upper portion of the head and in vertical alignment with said stud, for the reception of a jack 5 designed to engage the top of the tunnel, this stud cooperating with the stud

3 to permit the head to be swung laterally away from the end wall of the tunnel.

The head 1 is provided with an inlet pipe 6 preferably located at the center thereof and provided with branches 7 and 8, the branch 7 being connected to a valve casing 9 from which extends a fuel pipe 10. This pipe is directed along one side of the head and thence above and in close proximity to a fuel cup 11 carried by the head. A connecting pipe 12 of any desired length is coupled to the pipe 10 and a flexible tube 13 serves to connect this pipe 12 with a main pipe 14 arranged within the tunnel and connected to a fuel tank not shown. Pipe 12 is to be of such length as to allow the flexible tube 13 to lie at a point where it will not be affected by the heat generated. The branch 8 of pipe 6 is connected, by means of a pipe 15 of suitable length, to a flexible tube 16 which in turn is coupled to a main air supply pipe 17 extending from suitable air forcing means not shown. Valves 18 and 19 may be connected to the pipes 14 and 17 respectively or may be located at any other points desired, these valves being employed for the purpose of controlling the supply of fuel and air to the head 1.

In using the apparatus, the head 1 is set up close to the rock to be acted on, lugs 3 being mounted on the bottom of the tunnel while the jack 5, which is mounted in the socket 4, is shifted into engagement with the top of the tunnel, thus cooperating with the lug to form means for holding the head in upright position although permitting it to swing back against the side of the tunnel. Air is admitted in a predetermined quantity to the interior of the head 1 and fuel is then directed into the pipe 10, it mixing with the air within the pipe 6 and in the head 1. By burning fuel in the cup 11, the contents of pipe 10 can be vaporized, this vapor mixing with the air in pipe 6 and forming a highly combustible gas which will escape, in minute jets, through the openings 2 where it will be ignited, these jets being directed against the rock forming the wall of the tunnel and heating said rock to a high temperature. The supply of fuel is then cut off by means of valve 18 or any other valve which may be provided and air, in a cold state, is directed into the head 1 and escapes through the openings 2 into contact with the heated rock.

It has been found that when cold air is suddenly directed against rock which has been heated to a high temperature, the said rock is quickly softened or disintegrated and, by
5 then uncoupling the pipes 12 and 15 and swinging the head 1 against one side of the tunnel, the softened stone can be removed by hand or by means of pneumatic or other
10 power actuated tools provided for that purpose. The head 1 may be of substantially the same transverse area as the tunnel or can be made much smaller than the tunnel if deemed desirable.

In Fig. 3 a modified form of head has
15 been disclosed, this head which has been indicated at 20, being formed with a concaved working face 21 in which apertures 22 are produced. This head has an inlet pipe 23
20 corresponding with the pipe 6 but to which only an air supply pipe is connected. The heat to be used in connection with this form of head is generated electrically, one means
25 being the provision of electrodes 24 at opposite sides of the head so that arcing will occur between the said concaved face 21 and the surface of the rock. After the rock has
30 been heated in this manner, the current may be cut off and air directed against the rock from the interior of the head 20.

While the apparatus has been described
for use in tunneling through rock, it is to be understood that by the term "rock," is
35 meant any non-combustible deposit of a silicious nature.

The head 1, it will be noted, not only constitutes means for distributing heat, as well as jets of a chilling medium, upon the sur-

face of the substance being acted on, but also constitutes a reflector to reflect heat against face of tunnel.

What is claimed is:

1. Apparatus for tunneling rock, including a hollow head having a mixing chamber therein, said head having a working face
45 formed with a plurality of minute apertures, means for pivotally supporting the head close to the surface to be acted upon, means for directing fuel into the head,
50 valves for controlling the passage of fuel through said means, and means for directing air under pressure into the head.

2. Apparatus for tunneling rock, including main fuel and air conducting pipes, a hollow head, upper and lower alining pivot
55 devices upon the head, said head being shiftable about the axis of the pivot devices and into and out of operative relation to the surface to be acted upon, the working face
60 of the head having a plurality of minute apertures, a fuel pipe opening into the head, a valve for controlling the passage of fuel therethrough, an air pipe opening into the
65 head, said fuel and air pipes being movable with the head, and flexible pipe connections between the movable fuel and air pipes and the main fuel and air pipes respectively.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

HARVEY F. SUTTON.

Witnesses:

F. C. N. GRAYDON,
JOHN J. HINDES.