

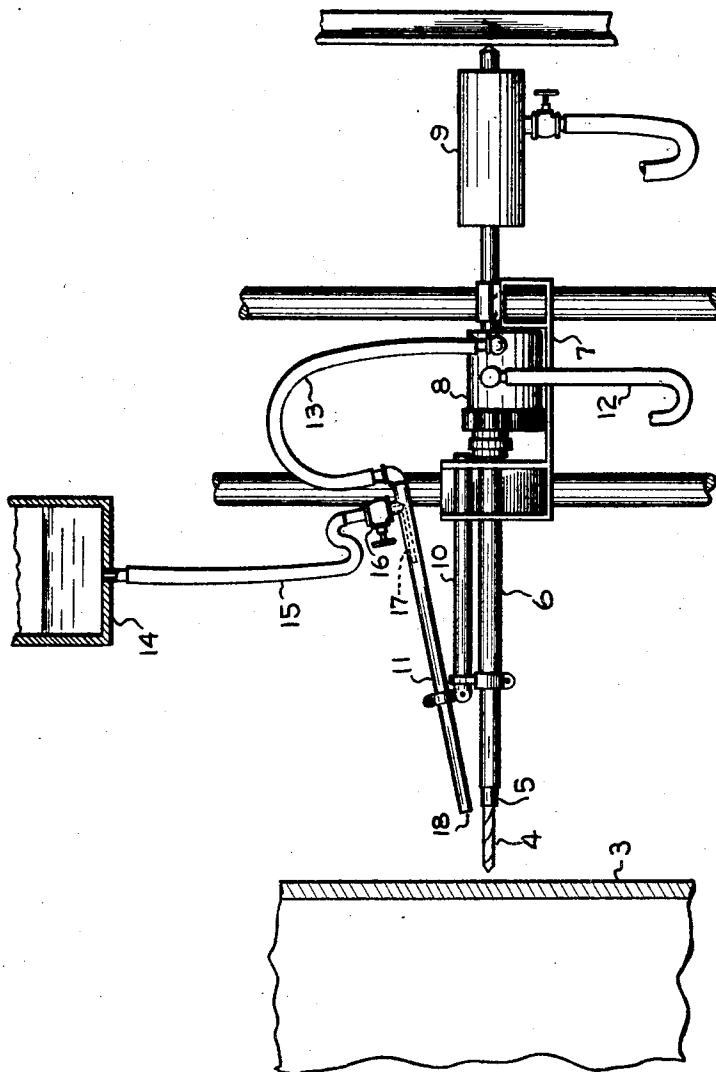
May 31, 1927.

J. W. DOYLE

1,630,835

METHOD AND MEANS OF UTILIZING EXPANDING AIR

Filed May 3, 1926



INVENTOR
John W. Doyle.
BY
Frank Warren
ATTORNEY

Patented May 31, 1927.

1,630,835

UNITED STATES PATENT OFFICE.

JOHN W. DOYLE, OF SEATTLE, WASHINGTON.

METHOD AND MEANS OF UTILIZING EXPANDING AIR.

Application filed May 3, 1926. Serial No. 106,429.

My invention relates to improvements in the method and means of utilizing expanding air and water for the purpose of cooling and lubricating a tool and the material upon which the tool is working, and the object of my invention is to provide a method and means for conveying and expanding air and directing the same upon a tool and the material upon which the tool is working.

Compressed air is usually allowed to cool to the temperature of the surrounding atmosphere before being used. The heat generated during the process of compression is thereby dissipated and its mechanical equivalent is lost. When such compressed air is released it expands and its temperature drops below the temperature of the surrounding atmospheric temperature in proportion to its previous degree of compression and in accordance with well known physical laws.

My invention consists in directing such cold expanding air upon a tool and the material upon which the tool is working in such a manner that the material and the tool will at all times be cooled to such an extent that it is not necessary to use any lubricants for the drilling operation, and in instances where the material to be drilled is of considerable thickness then I intermingle just sufficient water with the expanding air so that said water will be cooled below the atmospheric temperature and be conveyed to the tool and material thereby cooling and lubricating the same.

I accomplish these objects by devices illustrated in the accompanying drawing wherein the figure is a view in side elevation of a device embodying the means by which my method may be practiced.

Referring to the drawing throughout which like reference numerals indicate like parts, the numeral 3 indicated a metal plate, 4 indicates a drill disposed on a spindle 5 that is supported by a tubular member 6 and a frame 7. The drill 4 is adapted to be rotated by a pneumatic driving mechanism 8 and is arranged to be forced into the metal plate 4 by means of a pressure operated feeding mechanism 9.

The frame structure 7 supports the tubular member 6, the pneumatic driving mechanism 8 and the feeding mechanism 9 so as to form a complete drilling unit.

A tube 10 having one end secured to the

frame 7 and the other end clamped to the tubular member 6 is arranged to carry a conduit 11 to permit the movement of said conduit 11 within said clamp to any desired position relative to the drill 4 and plate 3.

The numeral 12 indicates an inlet conduit for conveying compressed air from a source of supply, not shown, to the pneumatic driving mechanism 8. A flexible conduit 13 conveys the exhausting air from said driving mechanism to the conduit 11.

Water from a reservoir 14 is conveyed by a flexible conduit 15, and a conduit 17 to the conduit 11. A valve 16 for controlling the flow of water is disposed between the conduits 15 and 17. The conduit 17 is bent at the angle shown in the drawing. This arrangement eliminates any back pressure which might be caused by the exhausting air which would stop the flow of water through the valve 16 if the water was allowed to drop directly into the conduit 11.

The operation of the disclosure herein is as follows: The drill 4 is rotated by means of the driving means 8 and the drill is then fed into the metal plate 3 by means of the feeding mechanism 9. The exhausting air from the driving mechanism passes through the flexible hose 13 and thence into the conduit 11 and is directed upon the tool 4 and plate 3 as shown. The angular position of the conduit 11 may be adjusted by the clamping means shown. In instances where the plate 3 is of considerable thickness sufficient water is allowed to flow from the reservoir 14 into the conduit 11, in the manner shown, which water intermingles with said expanding air and is thereby cooled below the atmospheric temperature and said water and air is conveyed to and directed upon the tool 4 and plate 3 thereby cooling and lubricating the same.

The cold expanding air coming into contact with the water lowers the temperature of the water and raises the temperature of the air by reason of an exchange of heat units.

By combining the water and exhausting air I provide an inexpensive and efficient cooling and lubricating medium. The cold air acting to keep the tool and material cool so that the tool can do its cutting without becoming hot and the water removing all the particles that would otherwise stick to the tool. If too much water is added to the expanding air the temperature of the ex-

panding air would be raised to almost the temperature of the atmosphere and the purpose would be entirely defeated.

The factor that limits the speed with which a drill can be forced through metal is heat. Heat is always generated as a result of the frictioned resistance being overcome by a drill as it removes material while passing through metal. This heat causes small particles of metal to adhere to the cutting edges of the drill and thereby seriously impairs its cutting ability. It is necessary therefore to either apply a substance of some kind to the drill or to keep the drill and material at a low temperature in order to prevent the adherence of these particles to said drill.

The substance applied is generally in the form of an oil or oils compounded and sold on the market under various trade names by reliable manufacturers. These oils or compounds do not always carry away the heat generated by the drill but simply aid in preventing the adherence of metal to the cutting edge. The heat as generated softens the material of which the drill is made and serious damage results.

For the purpose of illustration I have shown the expanding air taken and conveyed from a pneumatic driving mechanism but it will be understood that any expanding air from any source may be used to aid in accomplishing the results mentioned.

What I claim is:—

1. The method of cooling and lubricating

a driven tool which consists in conveying an expanding air in a suitable conduit, causing a flow of water to flow in said conduit, and directing said expanding air and said water upon said tool to cool and lubricate the same.

2. The method of cooling and lubricating a driven tool and the material being operated upon by said tool which consists in conveying an expanding air in a suitable conduit from a pneumatic driving mechanism and causing a flow of water to flow in said conduit and directing said expanding air and said water upon said tool and said material.

3. The method of cooling and lubricating a driven tool and the material being operated upon by said tool which consists in intermingling just sufficient water with expanding air so that the resultant temperature of the combined air and water will be below the temperature of the surrounding atmosphere and provide enough water to lubricate the tool, and directing said expanding air and water upon said tool and said material.

4. The method of cooling a driven tool and the material being operated upon by said tool which consists in conveying an expanding air in a suitable conduit and directing said expanding air upon said tool and said material to cool the same.

In witness whereof, I hereunto subscribe my name this 28th day of April, A. D. 1926.

JOHN W. DOYLE.