June 30, 1931. H. HENTSCHEL ET AL 1,812,239

METHOD OF AND MACHINE FOR CUTTING HOLES

Filed May 6, 1927

FIG. 1.

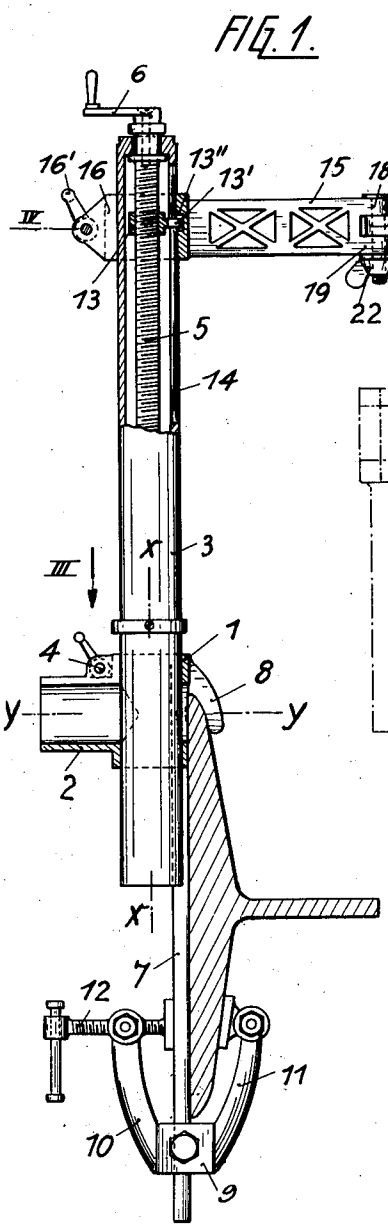


FIG. 2.

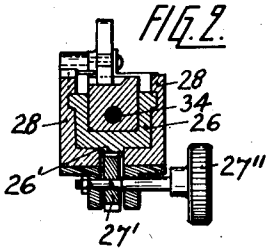


FIG. 5.

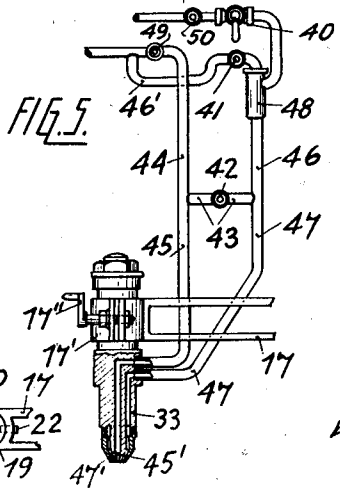


FIG. 3.

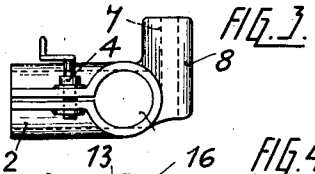
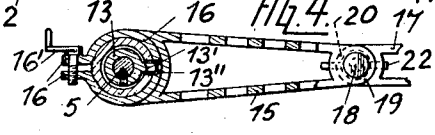


FIG. 4.



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UNITED STATES PATENT OFFICE

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METHOD OF AND MACHINE FOR CUTTING HOLES

Application filed May 6, 1927, Serial No. 189,416, and in Germany June 15, 1926.

The invention is directed to a process for cutting holes by means of an oxygen-burner, in which a burner with a heating and cutting nozzle, as, for example, a burner with a medial cutting nozzle and an annular heating nozzle surrounding the same, is used.

According to the process, upon rapid heating of the perforating point, both nozzles carry, at first, a mixture of oxygen and heating-gas, then, there is an unrestricted passage through the two pipes of oxygen only, and then, upon the actual cutting of the holes, only oxygen is passed through the cutting nozzle and in the heating nozzle there is a mixture of oxygen and heating gas.

In the apparatus for carrying out this process is a burner, provided, in the gas feed pipes leading thereto, with an automatic device for the stoppage of the heating-gas current, by means of the action of the cutting gas, with back-action valves for the occasional combining in the feed pipes of both gas streams, the apparatus including a holding device adjustable to the piece on which the work is being done, which holding device is connected at the top to a rotating adjustable arm.

The drawings present an example of the construction of the apparatus, and in which:

Figure 1 is a longitudinal vertical section, partly in elevation, through the device.

Figure 2 is a section on line II—II of Figure 1.

Figure 3 is a top view of the upper tension arrangement of the device, in the direction of the arrow III of Figure 1.

Figure 4 is a section on line IV—IV of Figure 1, and

Figure 5 is an elevation, partly in section, showing the burner with its appurtenant conduits and the valves.

In Figure 1, in the example, illustrated, a pivot post 3 serves as a carrier for the feeding-in device of the burner. The pivot post 3 is clamped perpendicularly into the boring of the part 1 of a socket 2, by means of a tension device 4, by which the split socket can be so tightly pressed together as to bind the pivot post. A second socket 2 forms a 90° integral piece with the socket 1, which socket 2 is split above, and can likewise be pushed together by means of the tension device 4, whereby the pivot post 3 may be removed from the socket 1, and pushed horizontally into the socket 2. The mounting frame includes a flat member 7 having an end formed as a hook portion 8 corresponding to the thickness of the average beams with which the device may be used. A sliding member 9 arranged movably on member 7 has two arms 10 and 11 between which, as shown in Figure 1, any beam may be attached with absolute security by means of a vise assembly 12.

In the hollow pivot post 3 there is, above and below, a worm 5, mounted so as to be turnable but not displaceable, which can be operated through a crank 6. A matrix 13 cooperates with the worm 5 and may be moved upward or downward, according to the direction of the turning. The matrix 13 is held against rotation but capable of being moved up or down in a slot 14 of the hollow pivot post 3 by a bolt 13′. The bolt 13′ extends into a boring 13″ of a stretching ring 16 which carries an arm 15 and, according to the turning of the worm 5, moves the arm 15 with it. When the arm 15 is placed at its correct height level, it may be secured in the desired position on post 3 by the stretching ring 16. A second arm 17 is secured to the arm 15 by a knuckle 20 which fits between two knuckles 19 of the arm 15 and may be secured by the bolt 18. On operation of a thumb nut 22 the arm 17 is held against being moved relative to the arm 15. The arm 17 carries a socket 24 in which, by means of two ball bearings 25, a hollow shaft 23 rests, capable of being turned but not subject to displacement. A block guide 26,

along which a slide can be moved, is secured on the lower end of shaft 23. In the arm 29, which is tightly fastened to the slide 27, and may be turned on the ball bearings, is fitted a burner 33, into which, at its upper end, the gas feeding tubes 45 and 47 open (Figures 1 and 5).

The slide 27 moves on the bed 26 and has its side walls 28 slidably interfitting with the bed (Figure 2). A ratchet 27′, provided with an outer rimming-disk 27″ and meshing with a toothed bar 26′ provided for it, beneath, on the bed 26, serves to move the slide 27. A matrix 36 is placed in a niche of the bed 26 through a spindle 34. It has, above, a nut 35 in which a ratchet-piece 38 on a cheek 28 of the slide 27, linked thereto, into which the same can catch under the pressure of a spring 37 by which it is held aside. By means of a small handle 39, the toothed bar 38 can be displaced out of the location drawn and shown, as indicated by the dotted lines, when the slide 27 is displaced, as in Figure 2. In the hollow shaft 23, a centering pin 30 is inserted. The hollow shaft 23, furthermore, carries a hand wheel by means of which it, and also therewith the bed 26, the slide 27 and the burner 33 as well, can be turned.

The burner 33 consists of an ordinary median peak and an annular pipe surrounding it (Figure 5). To the inner pipe or nozzle (cutting nozzle) the gas is conducted by a tube 45 and is conducted to the outer nozzle (heating nozzle) by a tube 47. Both tubes, or their extensions 44 and 46 respectively, are bound together by a connecting tube 43 in which the outlet valve 42 is inserted. In the tube 46 is inserted an injector 48, which is connected with the upper end of the tube 44 which in its turn possesses a back action valve 41, which only allows passage to the injector 48.

In the carrying out of the cutting process, the mechanism is used as follows:

The tension socket 1 is hung over the upper part of a piece of material in which the holes are to be cut, by the hook-like part 8, as, for example, over the upper flange of a beam, so that the flat member 7 lies on its outer edge. At this time the sliding member 9 is displaced upon the flat member 7 far enough upward so as to cause the linking portion of the arm 10 to lie against the inside of the lower flange of the beam, and the turnable linking piece on arm 11 is held fast by the vise assembly 12 so that the carrying pivot post 3 is firmly fixed upon the piece to be worked upon. After releasing the tension device 4, the carrying pivot is stopped at the working height of the burner 33, approximately, and the tension device 4 is then made fast. Thereupon the tension device of tension socket 16 is released and, thus, adjusts to a nicety the location of the burner at the correct height, in such a manner that by turning the vise assembly 5 by means of the crank 6, the matrix 13 is moved up or down, whereupon the tension device is made fast and the tension socket 16 is fixed. By the height fixation the swinging arm 15, which is seated upon the socket 16, is placed at about the height of the holes to be cut. By means of the outer arm, which is rotatable upon releasing the matrix 22, the centering bar 30, which is placed in the hollow shaft 23, is placed exactly upon the precise middle of the holes to be cut, then the matrix 22 is again made fast so that all movable parts are incapable of being turned, and stand firmly in the correct working position. By the spindle 34 in the slide 26, a scale on the matrix 36 (not shown) is applied to the radius of the holes which are to be bored; thus, for exampie, as is shown in the distance assumed in Figure 1, by the burner, from the middle of the hole. One now takes the centering pin out of the hollow shaft 23, and moves the sliding members 27, 28 by the turning of the disk 27″, after displacing the ratchet 27 on the toothed bar 26, until the left end of the jack 38′ for the rabbet 38 lies against the part 26″ of the shaft 23. This position is so controlled that when on this location the axis of the bore of the burner 33 coincides exactly with that of the hollow shaft 23, which has, heretofore, been made fast. At this juncture the actual cutting begins. First of all, the gas conducting valve 40, the oxygen valve 41, and the valve 42 are opened into the combining tube 43, and both of the tubes 45 and 47 likewise carry the heating gas which is well mixed in the injector 48, with oxygen, both to the cutting nozzle and the heating nozzle of the burner 33. The gas mixture issuing from both of the blow-pipes is ignited, and the place in which the holes are to be made is quickly heated. As soon as the section in which the holes are to be made is sufficiently heated, the oxygen tube's valve 49 opens into the conducting tube 44 and the oxygen passes through both of the tubes 45 and 47 to both of the nozzles of the burner 33 and, from here, out. The extra pressure of the oxygen prevailing at this time in the conducting tube forces the gas which is not yet thrown off, out of the tube 46 and back over the injector and thus closes the back action valve 50, so that no more gas can enter into the conducting tube so long as the extra oxygen pressure prevails. By the present strong and sudden application of the oxygen, the material in which the holes are to be made, already well heated, is immediately penetrated at the middle of the holes to be bored, by which means, due to the sudden and violent departure of the oxygen from both tubes at the same time, the accumulation of any deposit on the burner is prevented.

As soon as the metal in the middle of the

holes to be cut is penetrated, the valve 42 in the connecting tube 43 is closed, so that the extra pressure of the oxygen in the upper conducting tube ceases, the back action valve 50 again opens itself under the pressure of the heating gas, and now a mixture of heating gas and oxygen enters into the conducting tube from the injector 48. At this time the middle blow pipe only contains oxygen and the outer blow pipe carries only a mixture of heating gases. The heating gas is ignited upon the metal which is still hot. Now, the slides 27 and 28 are again shoved back to the right by the turning of the disk 27″ until the rabbet 38 catches in the nut 35 of the matrix 36 and automatically fixes the slide. At this juncture, the burner cuts the radius of the hole which it is desired to make in a straight line, and after the catching of the rabbet 38, the burner is turned about in a circle by means of the hand wheel on the shaft 23, until the peripheral cutting of the hole is completed and the gas conductors are both shut off.

What we claim to be new is:

1. A method for autogenously cutting holes involving the use of a cutting nozzle and a relatively annular heating nozzle, consisting in delivering a suitable mixture of oxygen and fuel gas through both nozzles for heating the point of the material to be perforated, then delivering oxygen through both nozzles to cause perforation of the material.

2. A method for autogenously cutting holes involving the use of a cutting nozzle and a relatively annular heating nozzle, consisting in delivering a suitable mixture of oxygen and fuel gas through both nozzles for heating the point of the material to be perforated, then delivering oxygen through both nozzles to cause perforation of the material, and thereafter delivering oxygen through the cutting nozzle and a mixture of oxygen and fuel gas through the heating nozzle and operating the nozzles to cut the material surrounding the perforation.

3. A method of autogenously cutting holes in solid material involving the use of a cutting nozzle and a relatively annular heating nozzle, consisting in delivering a mixture of oxygen and fuel gas through both nozzles for heating the point of the material to be perforated, thereafter delivering oxygen under materially increased pressure to both nozzles to cause the perforation of the material, and utilizing the increased pressure of the oxygen as a means for cutting off the delivery of the fuel gas to the nozzles.

4. A method of autogenously cutting holes in solid material involving the use of a cutting nozzle and a relatively annular heating nozzle, consisting in delivering a mixture of oxygen and fuel gas through both nozzles for heating the point of the material to be perforated, thereafter delivering oxygen under materially increased pressure to both nozzles to cause the perforation of the material, increasing the pressure of the oxygen to a degree to operate a cut-off to prevent delivery of the fuel gas to the nozzles, and thereafter delivering a mixture of oxygen and fuel gas through the heating nozzle and oxygen alone through the cutting nozzle and operating the nozzles to cut through the material surrounding the perforation.

In testimony whereof we affix our signatures.

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HANS GREGGERSEN.