

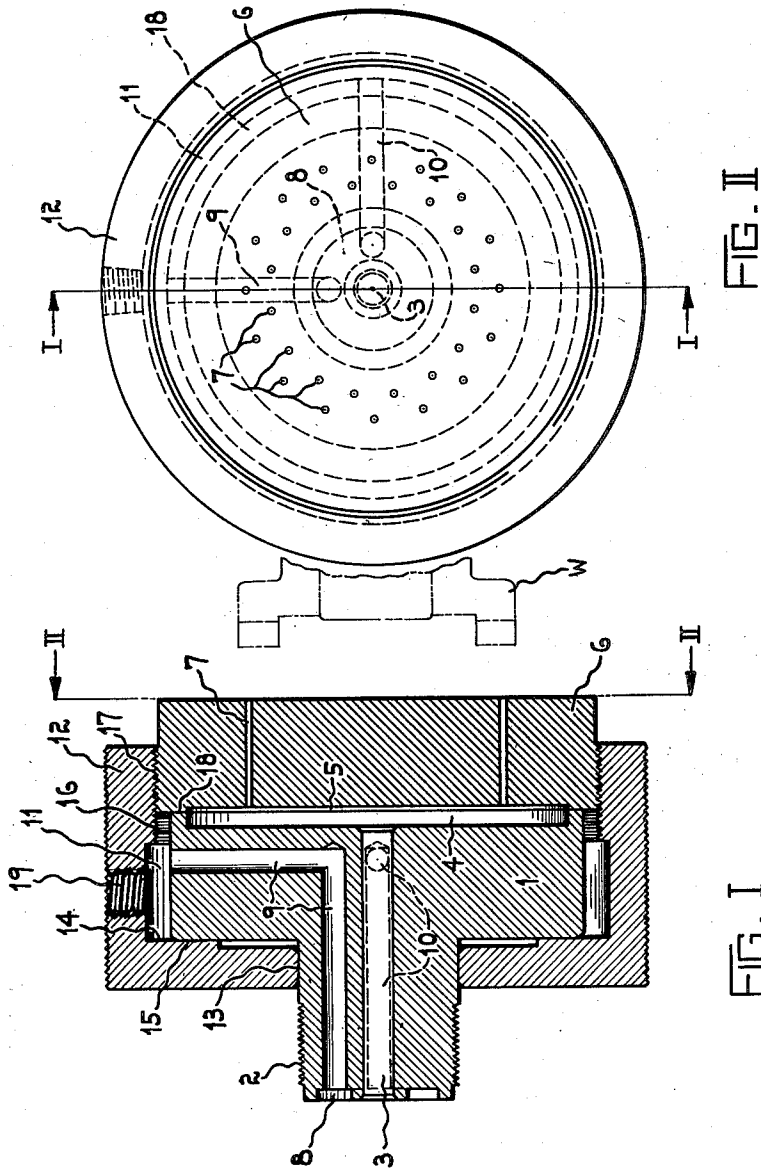
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FLAME HARDENING APPARATUS

2,247,494

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3 Sheets-Sheet 1



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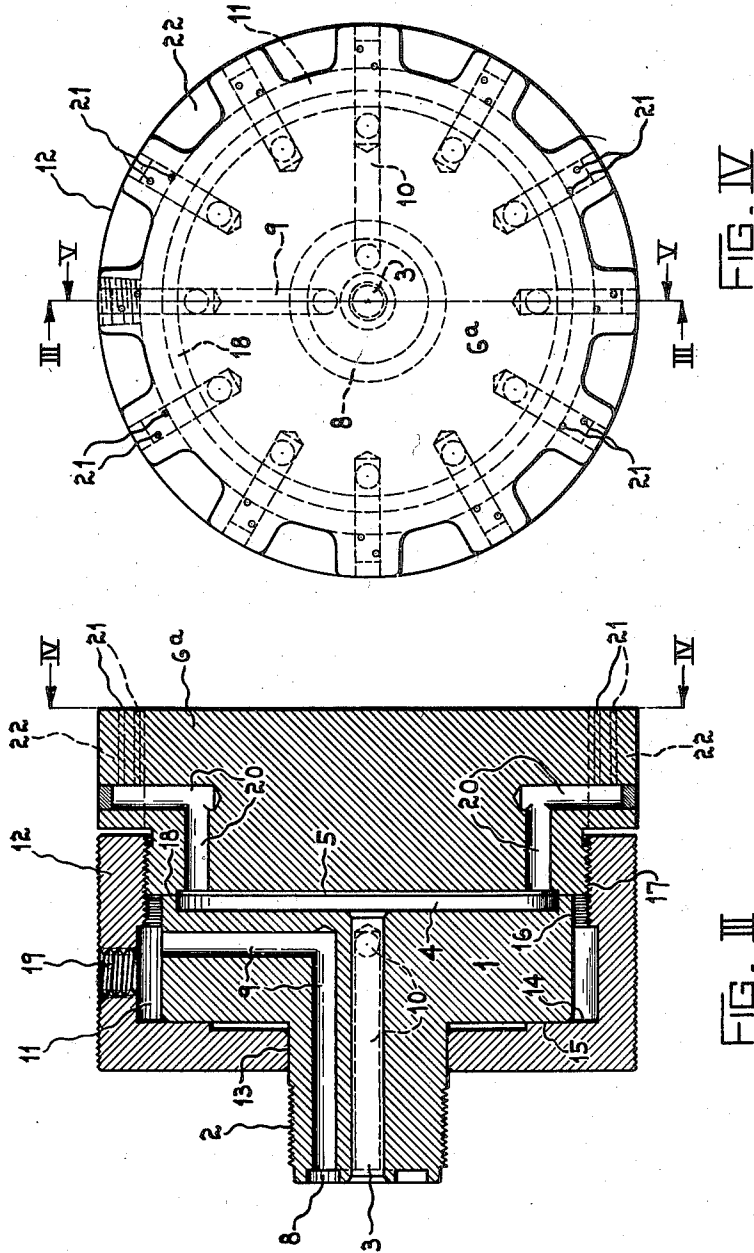


FIG. III

FIG. IV

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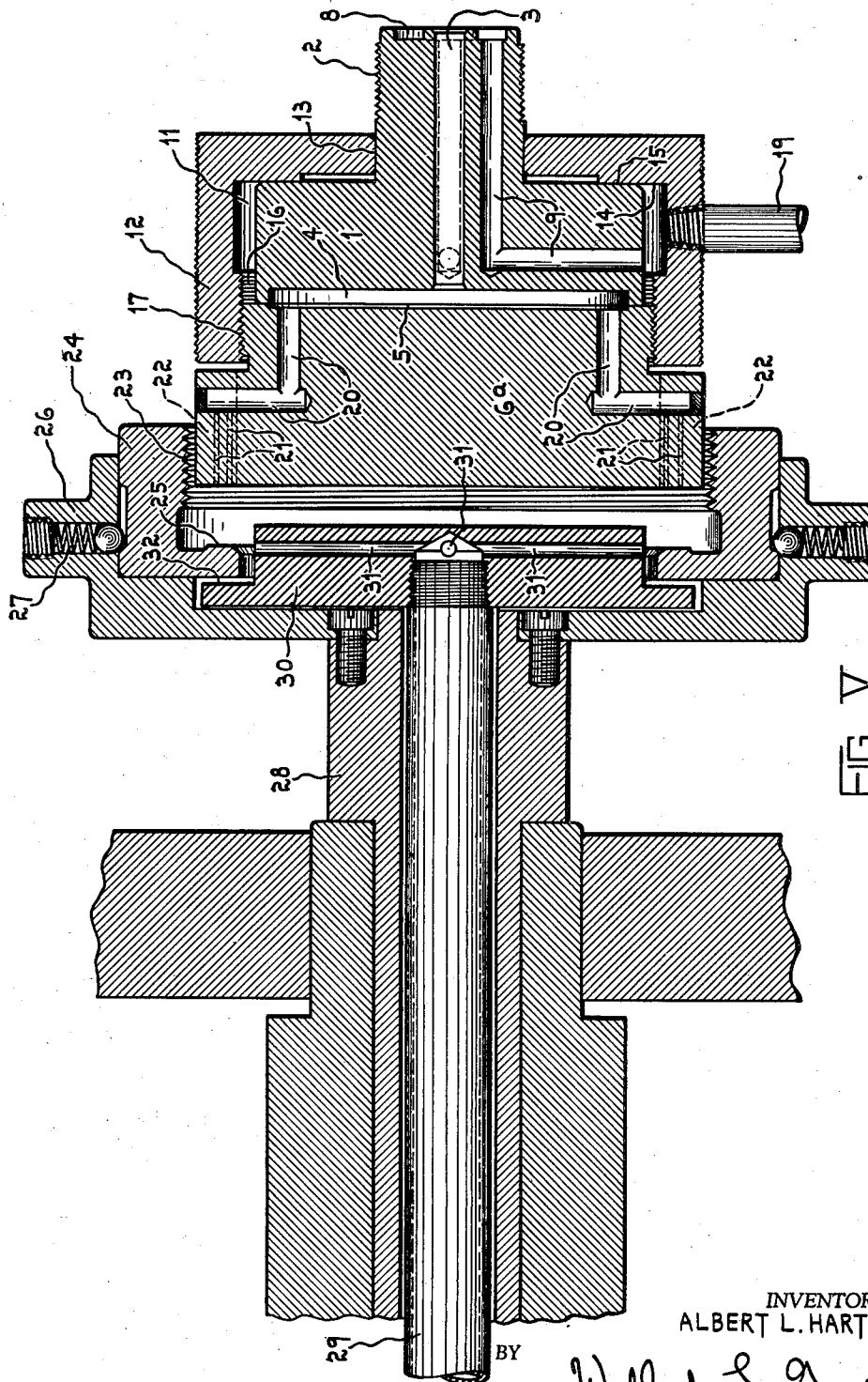
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3 Sheets-Sheet 3



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FLAME HARDENING APPARATUS

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2 Claims. (Cl. 158—27.4)

This invention pertains to flame hardening apparatus and is particularly related to certain types of flame hardening burners which are used for flame hardening the faces or ends of work pieces and also internal bore portions of work pieces when rotated in front of a circular jetted arrangement of the burner. This flame hardening burner is particularly adapted to use when hardening such work pieces which are to be subsequently quenched by emersion in a coolant or which may be cooled immediately after the application of the flame to bring it to the proper hardening temperature.

More especially the object of this invention is to provide a simplified type of burner which is economical of manufacture and which is very versatile in so far as easy adaptation is concerned to applying it to a large variety of spot or face hardening of work.

Another object of this invention is to provide a burner body and a clamping shell which may be used to hold different types of cylindrical circular flame jet tips which may be easily manufactured and which may be readily accommodated to a large variety of work to be flame hardened while being rotated in the presence of the hardening flame.

Further features and advantages of this invention will appear from the detailed description of the drawings in which:

Figure I is a transverse section through a typical flame hardening burner assembly arranged for hardening the teeth on the end of a clutch sleeve when rotated in front of the hardening flame, the work piece then being dropped into a quenching medium promptly after being heated by said burner.

Figure II is a front view of the burner shown in Figure I on the line II—II thereof particularly showing the circular arrangement of the flame jets in the cylindrical burner tip.

Figure III is a vertical transverse section through the burner tip in Figure I shown on the line III—III of Figure IV showing a modification adapted to heating internal surfaces in a bore of a work piece as illustrated in Figure V.

Figure IV is a front end view of the burner tip, particularly showing the arrangement of the flame jets and the gas escape passageways or slots in the periphery of the burner tip.

Figure V is an assembly view in section on the line V—V of Figure IV, showing a specific application of the burner of Figures III and IV to the hardening of an internal surface in a bore

when used in conjunction with a conventional rotary flame hardening machine.

Referring particularly to Figures I and II, the burner body 1 is provided with the usual threaded connecting end 2 for mounting on a conventional oxyacetylene blow pipe (not shown) which delivers the mixture of combustionable oxygen and acetylene to the passageway 3 formed in the burner body 1 which then passes to the counter-bored portion 4 in this body and thus into the counterbored portion 5 of the burner tip 6 in which is formed the series of circularly arranged flame jets 7, as best seen in Figure II.

Also proceeding from the flame hardening blow pipe is the flow of cooling fluid, usually water, which enters the annular slot 8 and from which is flows to the passageways 9 and 10 to the chamber 11 formed by the clamping ring 12 which is journaled about the bearing portion 13 of the burner body 1 and has an internal abutment surface 14 which engages the surface 15 of the burner body 1 and has an outer threaded bore 16 adapted to engage the threaded portion 17 of the burner tip 6 so that when it is rotated in proper direction, it will securely hold the burner tip 6 in fluid tight engagement at the point 18 with the burner body 1 and will also form a fluid tight seal therebetween and at the point between the surfaces 14 and 15 and the threaded portions 16 and 17 so that the chamber 11 will be fluid tight and so that the chamber formed by the counterbores 4 and 5 will be gas tight for proper delivery of the combustible fuel for the flame jets 7. The chamber 11 is supplied by cooling fluid issuing from the passageways 9 and 10 and is exhausted through the outlet opening through a suitable pipe line 19 and is circulated through the chamber 11, so as to properly keep the clamping ring 12 and the burner body 1 cool to prevent warpage and distortion therein during the excessive heat developed by the flame jets 7 as they impinge upon the work piece W when it is being rotated in front of it.

This burner is capable of quick changeover for a large variety of diameters of rotating work to be flame hardened. It is obvious that this can be done with this unique construction merely by substituting various cylindrical burner tips 6 having different circular diameter arrangements of flame jets 7 anywhere within the range of the diameter of the tip piece 6.

For example, a further variation of this type of burner arrangement is shown in Figures III and IV in which the burner tip 6a is arranged for relatively large diameter work and also for

hardening an annular surface while it is being rotated and which is located inside of a bore in a work piece as is shown in Figure V. In this case the burner tip 6a is provided with passageways 20 from which extend the flame jets 21 arranged in a relatively large diameter circle as shown in Figure IV. In between these jets are cut away portions 22 formed in the burner tip 6a so that as it is moved into the threaded bore 23, Figure V, of a clamping ring collar 24, the burned fuel which escapes from the flame jets 21 after impinging upon the surface 25 of the work piece 24 can escape backwardly out through these passageways 22 away from the work, so that proper burning action will take place for the flames.

In the particular illustration of Figure V, showing the burner applied inside of a bore of a work piece to harden an internal surface 25, the work is carried to a suitable fixture 26 by holding detent arrangements 27, which is mounted on a rotatable work spindle 28 of a conventional rotary flame hardening machine, so that as this spindle 28 is rotated, the surface 25 will be rotated in front of the flame jets 21 for the proper and thorough heating of this surface of the work piece.

During the operation of the apparatus shown in Figure V, while the spindle 28 is rotating the flames from the jets 21 are constantly being played on surface 25 so as to bring it up to hardening temperature. Meanwhile, coolant fluid is applied to the chamber 11 to at all times keep the burner body 1 and clamping ring 12 properly cooled. As soon as the surface 25 has been properly heated, the burner is withdrawn to the right as shown in Figure V and a stream of quenching fluid from the line 29 passes into the quenching fluid distributing block 30 out through the radially extending passageways 31 where it impinges upon the heated surface 25 quenching it properly to effect the proper hardening of this particular surface on the work. The work is then ready to be removed from the rotating fixture 26 by moving the distributing line

29 axially to the right causing the flange portion 32 of the quenching fluid distributing member 30 mounted on the line 29 to push the work piece 24 out of the fixture past the detents 27. Thus with this arrangement we have provided a simplified burner construction which is capable of application to a large variety of diameters of rotary work to be flame hardened and also have provided a construction whereby this burner is adapted to hardening surfaces inside of bores of work pieces with equal facility.

Having thus fully set forth and described my invention what I claim as new and desire to secure by United States Letters Patent:

1. A flame hardening burner comprising, a circular burner body, a circular clamping ring surrounding said body, a circular burner tip adapted to be held on said burner body by said clamping ring, said clamping ring and said burner tip forming a coolant chamber around said burner body when said tip is held on said body by said clamping ring.

2. A flame hardening burner comprising, a circular burner body, means formed on said body for attaching it to a flame hardening blowpipe, a counterbore formed in said body, a fuel passageway in said body communicating with said blowpipe opening into said counterbore a circular disc-like member for forming the burner tip adapted to be mounted over said counterbore on said body to form a closed fuel distributing chamber, flame jet orifices formed in said disc-like member communicating with said fuel distributing chamber, a circular clamping ring surrounding said body adapted to hold said burner tip on said body, said clamping ring and said burner tip forming a coolant chamber around said burner body when said tip is held on said body by said clamping ring, a coolant passageway in said body communicating with said blow pipe and opening into said chamber, and a coolant discharge passageway in said clamping ring opening into said chamber.

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