June 24, 1930. A. E. SHORTER ET AL 1,768,160

MACHINE FOR HARDENING IRREGULAR METAL SURFACES

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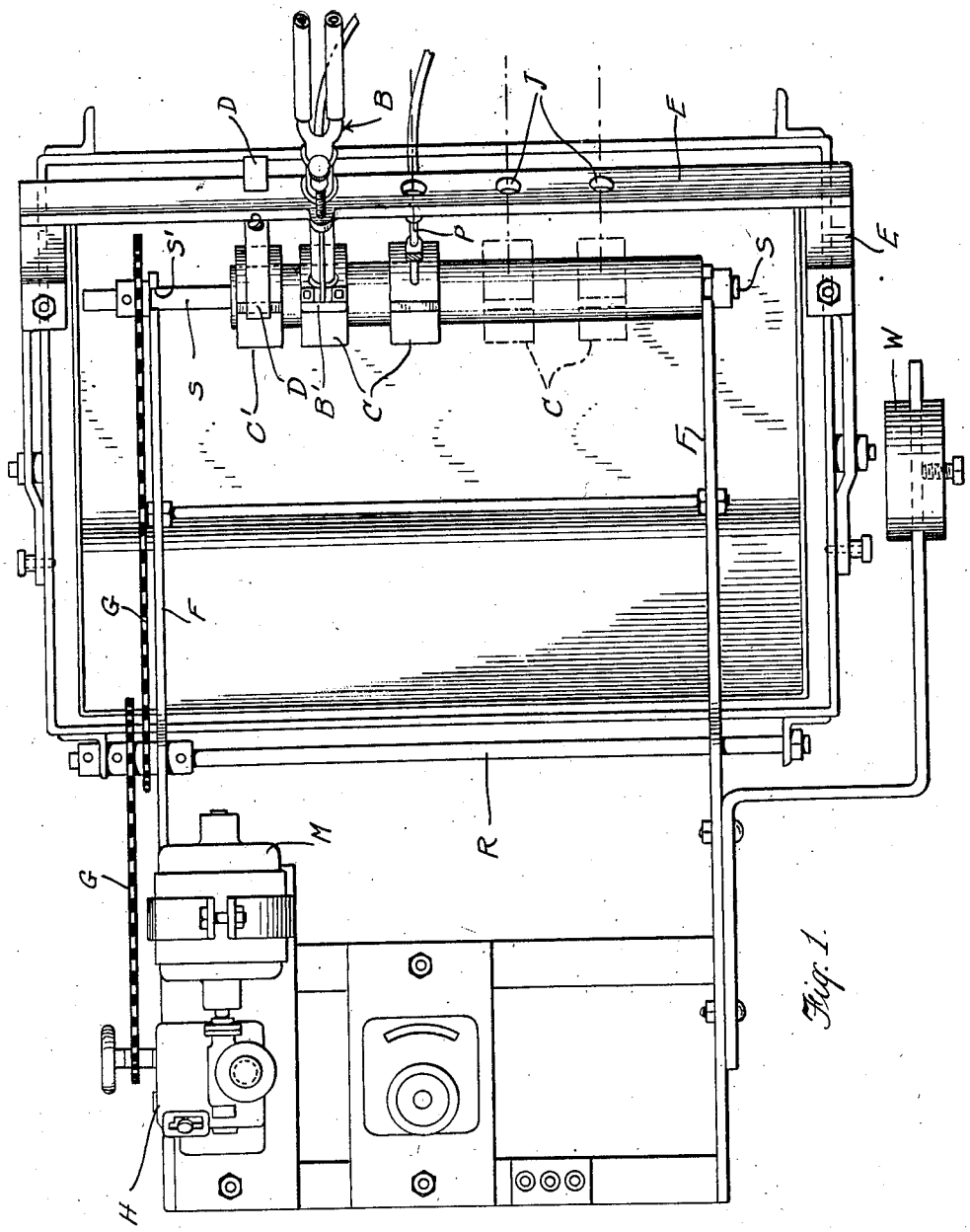


Fig. 1.

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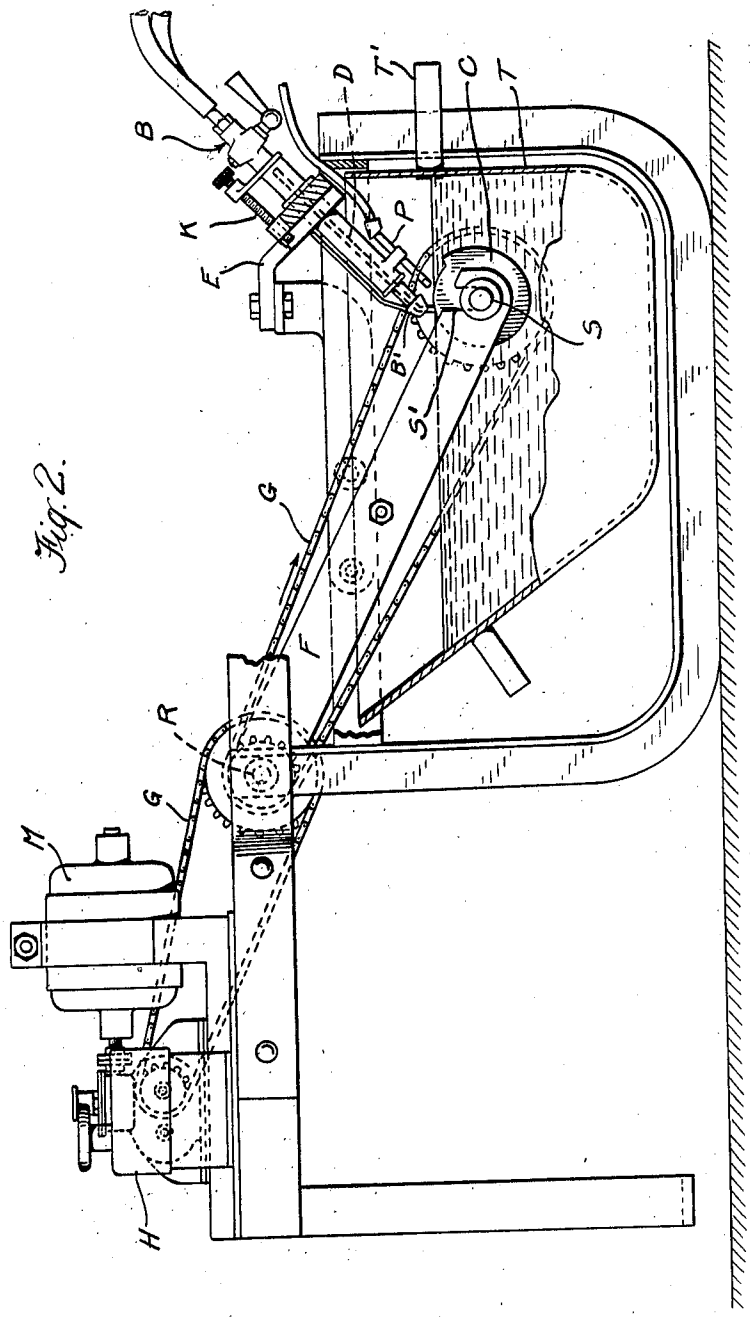


Fig. 2.

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UNITED STATES PATENT OFFICE

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MACHINE FOR HARDENING IRREGULAR METAL SURFACES

Application filed December 21, 1927, Serial No. 241,633, and in Great Britain September 29, 1927.

This invention relates to improvements in the surface hardening of metal articles and particularly to a machine for surface hardening metal articles having irregular peripheral surfaces, such as cams.

The principal object of this invention is to provide a machine for uniformly hardening irregular peripheral surfaces without distorting the article. Another object is to provide a machine for simultaneously hardening the wearing surfaces of a number of cams or like articles.

The objects and the novel features of this invention will be apparent from the following description and the accompanying drawings, in which:

Fig. 1 is a plan view of a machine embodying this invention; and

Fig. 2 is a side view of the same, parts being shown in section.

Broadly speaking, the improved machine comprises means for supporting one or more of the articles in such position that successive parts of their peripheral faces may be intensely heated, and quenched immediately after such heating. The article and the means for applying heat thereto must be moved relatively to each other peripherally of the article, and in order to uniformly heat the successive parts it is essential that the surface and the heating means be separated a uniform distance at all times. In the drawings, the invention is shown as embodied in a machine for surface hardening cams or similar metal articles having irregular surfaces subject to wear, but the principles of the invention may be incorporated in machines for surface hardening the peripheries of other forms of metal articles.

As illustrated, a plurality of cams C carried by a shaft S are supported so that portions of their peripheral faces may be successively presented to suitable means for intensely heating them. Such heating means may advantageously consist of one or more water-cooled oxy-acetylene blowpipes B having multiple jet nozzles B′ of sufficient width to produce elongated flames extending across the faces of the cams. The oxy-acetylene flames produced by the mixture of oxygen and acetylene issuing from such nozzles intensely heat successive transverse sections of the cam surfaces as the cams are rotated. Immediately after the successive sections are heated, they are quenched by suitable means, such as jets of cold water or atomized sprays of cold water and compressed gas issuing from suitable outlets in the pipe P and discharging across the surfaces of the cams just after they pass the nozzles B′ of the blowpipes. A suitable tank T may be arranged below the cams to collect the water from the cooling jets and to hold an additional body of cooling water in which the cams are submerged in such a manner that the parts of their faces undergoing treatment are substantially at or just below the level of the liquid in said tank. This level may be kept constant by an overflow pipe T′.

The cams are so supported in the tank that they may be rotated and at the same time moved upwardly and downwardly to maintain their surfaces at the water level and at a uniform distance from the blowpipe nozzles. As shown, this may be accomplished by mounting the cam-carrying shaft S in suitable bearings S′ in the lower end of a frame F which may be pivoted on the rod R secured to the tank or other adjoining support. The shaft S with the cams or other articles thereon may be rotated at the desired speed by suitable chain-and-sprocket gearing G driven through speed-change mechanism H and an electric motor M.

Suitable means may be provided for maintaining the surfaces undergoing treatment adjacent or just below the level of the water in the tank T. The shaft S may carry a master cam C′, the peripheral surface of which corresponds to those of the cams C, and engages a fixed follower D. The master cam rotates in unison with the cams C, so that the surfaces of all the cams on the shaft S will be kept just at the surface of the water in the tank T while the cams C are being intensely heated. The frame F is so pivoted and the weight of the motor M and its associated parts so arranged that the master cam will be held against the follower D. Minor

adjustments for properly balancing the frame and associated parts are provided for by the adjustable weight W.

The number of blowpipes may correspond to the number of cams, each blowpipe being mounted on a fixed supporting bar E so that the flames thereof shall severally impinge on the surfaces of the cams at the water level. The blowpipes may be guided and supported in holes J of the bar E and finer adjustments may be procured by means of adjusting screws K.

The operation of the machine will be apparent from the foregoing description. Briefly, the cams or other articles are mounted in position and the follower is preferably so adjusted that each of the cams will be completely submerged in the water in the tank and so that there will be only a thin film of water over the part of the surface nearest the tip of the blowpipe flame. During operation, this film is blown away by the blowpipe flame, exposing the cam surface for intense heating. Immediately after each part of the surface is intensely heated, the pipe P delivers a cold jet or spray to such surface to quench it. The submerged body of the cam with its associated supporting means are kept cool, thus avoiding distortion.

Numerous changes may be made in the construction of the machine shown without departing from the principles of the invention.

What is claimed is:

1. A machine for surface hardening metal articles having irregular peripheral surfaces, comprising the combination of a fixed high-temperature heating device, and means whereby successive parts of the peripheral surface of such article are presented to said device at a substantially uniform distance therefrom.

2. A machine for surface hardening articles having irregular peripheral surfaces, comprising a high-temperature heating device, and means for moving said device and the surface of said article relatively to one another peripherally of said surface to uniformly heat successive parts of said surface, said device being maintained stationary and at a fixed distance from the successive portions of the surface.

3. A machine according to claim 2, wherein such moving means comprises means for rotating said article relatively to said device and maintaining successive parts of its surface at a uniform distance therefrom.

4. A machine according to claim 2, in combination with means for quenching such successive parts immediately after they have been intensely heated.

5. A machine according to claim 2, in combination with a tank containing cooling liquid, the successive parts of said surface being disposed adjacent the level of said liquid while they are being heated and the major parts of the article being submerged in such liquid.

6. A machine for surface hardening metal articles having irregular peripheral surfaces, comprising the combination of a fixed high temperature heating device, a tank containing cooling fluid, means for rotating the article to be treated, means for maintaining said article substantially submerged in said cooling fluid with successive parts of its face at a substantially uniform distance from said device, and means for quenching successive parts of said face immediately after they have been heated.

7. A machine for surface hardening metal articles comprising a tank, a rotatable article support movable up and down in said tank while said article is rotating, blowpipe means for heating successive parts of the article as it is rotated, means for maintaining the parts undergoing heating at a uniform distance from said blowpipe, and means for quenching such parts immediately after they have been intensely heated.

8. A machine for surface hardening metal articles comprising the combination of a tank containing a quenching liquid, a support for a plurality of articles having surfaces to be heated, blowpipe means for heating said surfaces, means for rotating said articles to present successive portions of said surfaces to said blowpipe means, means for adjusting said support while said articles are rotating to maintain said surfaces a uniform distance from said blowpipe means, and means for quenching the successive parts of said surfaces after they have been intensely heated.

9. A machine for surface hardening metal articles comprising the combination of a tank containing a quenching liquid, a support for a plurality of articles having surfaces to be heated; means for heating said surfaces; means for rotating said articles to present successive portions of said surfaces to said heating means; means for maintaining said surfaces at a uniform distance from said heating means; and means for quenching the successive parts of said surfaces in said liquid after such surfaces have been heated; said support comprising a pivoted frame, and such rotating means being carried by said frame.

10. A machine for surface hardening a metal cam or the like comprising means for rotating said cam, fixed high-temperature means for heating successive peripheral portions of said cam, means for quenching such portions after they are intensely heated, and means whereby said successive portions are maintained a uniform distance from said heating means.

11. A machine for surface hardening a metal cam or the like comprising a tank containing a liquid at a constant level, means for rotating said cam, means for maintaining said cam submerged in said liquid with the successive portions of the surface undergoing treatment always adjacent the surface of said liquid, means for heating such successive portions of the cam, and means for quenching such portions after they have been intensely heated.

In testimony whereof we affix our signatures.

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