

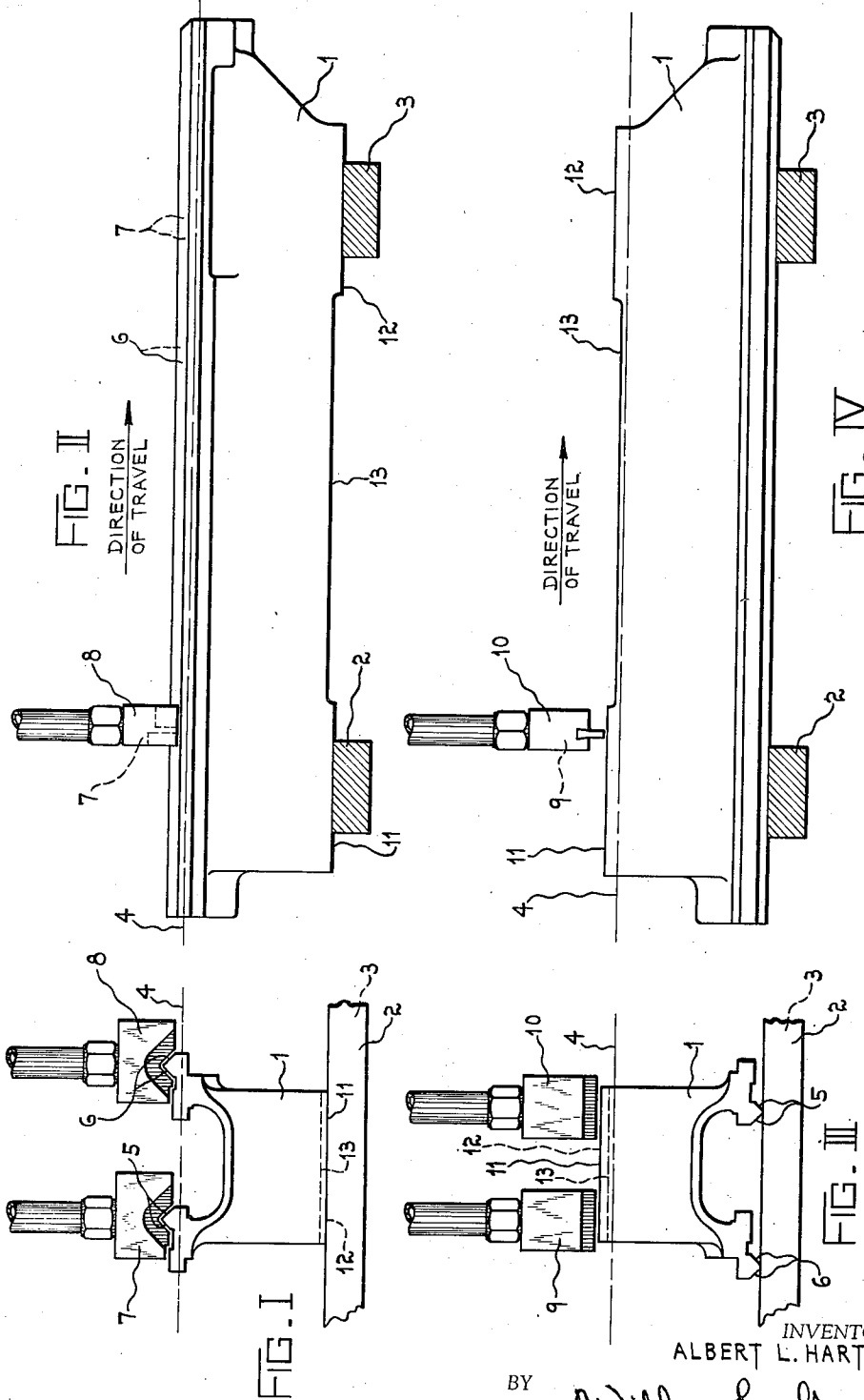
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METHOD OF FLAME HARDENING LATHE BEDS

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METHOD OF FLAME HARDENING LATHE BEDS

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This invention pertains to the flame hardening of relative long slender parts and is particularly related to the flame hardening of the wearing surfaces, ways or shares of lathe beds.

It is well known in the flame hardening of relatively long pieces of work of the nature of lathe beds that in progressively passing the flame hardening torches over the shears of the bed, the resulting work is found to be distorted or bowed due to the change of structure of the hardened surface produced on the work causing strains to be set up in the work to thus cause it to be bent or sprung out of its true aligned position to which it had been machined prior to the flame hardening. In many cases it is found that this distortion is excessive to the point where it is impossible to correct this sprung condition by grinding the flame hardened surface without completely removing parts of the flame hardened surface produced, thus leaving soft portions on the shears of the bed when finished.

It is, therefore, this problem that it is the object of this invention to overcome, that is to minimize the amount of distortion set up in the bed which has had its ways flame hardened and to bring this distortion to a minimum well within the range of the finishing grinding operations to be performed on the bed ways so that uniformity of hardened surface will result on the finish ground bed ways.

The object of this invention is to provide a method whereby the bed is submerged in a coolant medium with substantially only the bed way portion protruding from the cooling medium and to pass a progressively moving flame hardening torch over the bed ways so as to effect the hardening of these ways. It is then the object to arrange a method whereby the bed is turned over and again submerged in the coolant fluid so as to just expose the bottom webs and supporting pads of the bed above the cooling solution and then to again pass the flame hardening torches over these bottom portions of the bed to set up counteracting forces in the opposite side of the bed which automatically substantially neutralize the distortion caused by the initial flame hardening of the bed ways.

In this way a substantially accurately aligned finished bed is provided after flame hardening which is well within the limits of the subsequent finish grinding operations to be performed on the bed ways.

Further features and advantages of this invention will appear from the detail description of the drawing in which:

Figure I is an end elevation of a typical lathe bed submerged in coolant with its bed ways or shears exposed to the action of a series of progressively moved flame hardening torches.

Figure II is a front elevation of such a lathe bed shown in Figure I showing the direction of travel and method of mounting the bed submerged in the coolant during the flame hardening operation.

Figure III is an end view of the bed shown in Figure I, shown turned upside down with the bottom surfaces of the bed just projecting above the coolant solution and the application of surface flame hardening torches to these surfaces to effect the counter strains and neutralizing forces in the lathe bed to remove the distortion caused by flame hardening the shears in Figure I.

Figure IV shows a rear elevation of the bed shown turned upside down in the coolant solution with the direction of travel indicated for the flame hardening torch which passes over the bottom side of the bed.

In carrying out this process of flame hardening, the bed 1 is mounted in a suitable coolant tank on suitable supports 2 and 3 with the liquid level 4 just below the surfaces to be flame hardened on the bed shears 5 and 6 seen in Figure I. The progressively moved flame hardening torches 7 and 8 are moved longitudinally of the bed ways 5 and 6 in the usual manner for flame hardening the surfaces in the direction of travel shown in Figure II to complete the flame hardening of the shears 5 and 6.

It is usually found after completing this operation that the bed 1 and its ways 5 and 6 are somewhat distorted or bowed upwardly to an amount beyond the practical limits of machining or grinding of these ways 5 and 6 without completely removing portions of the hardened case provided by the flame hardening operation.

In order to avoid this difficulty, however, the bed 1 is then turned over as shown in Figure III and IV and again rested on the supporting members 2 and 3 with its shears 5 and 6 resting thereon, the bed being submerged in the coolant up to the surface 4 and a second series of flame hardening torches 9 and 10 are passed over the pads 11 and 12 and the web portion 13 of the bottom of the bed 1. These torches are moved in the direction of travel as shown in Figure IV so as to flame harden these surfaces primarily from the standpoint of correcting the distortion set up by the previous flame hardening operation on the opposite side of shears 5 and 6 of the bed.

In this way a substantially non-distorted

flame hardened bed is produced with the shears 5 and 6 in substantially correct alignment and well within the limits of the finishing grinding operation to be performed on the ways for finishing them with precision surface accuracy for the various sliding members of the lathe.

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

1. The method of flame hardening the shears of a lathe bed comprising the steps of: (a) submerging said bed in a coolant medium with its shears projecting above the surface of said coolant; the step (b) of progressively passing flame hardening torches longitudinally of said shears to effect a flame hardening of said shear surfaces; the step (c) of turning said bed upside down in said cooling medium so that its bottom surfaces just project above the surface of said coolant; and the step (d) of passing a flame hardening torch over said bottom surfaces so as to neutralize the effect of the flame hardening operation performed on the top shear surfaces of said bed.

2. The method of flame hardening a lathe bed comprising the steps of: (a) mounting said bed in a coolant solution with its shears exposed therefrom; the step (b) of progressively passing a series of flame hardening torches over the ways to be hardened on said bed; the step (c) of mounting said bed, after flame hardening said shears, in a coolant solution with its bottom surfaces projecting from said coolant; and the step (d) of passing a series of flame hardening torches over said bottom surfaces so as to neutralize the distortion set up during the flame hardening of said shears.

3. The method of flame hardening a lathe bed comprising the steps of: (a) mounting said bed

submerged in a coolant solution with its shears to be hardened projecting above said solution; the step (b) of progressively passing a flame hardening torch longitudinally of said shears to harden said members; the step (c) of mounting said bed in a coolant solution with its bottom surfaces projecting therefrom; and the step (d) of progressively moving a flame hardening torch in the same direction, as in hardening said shears, longitudinally of said bottom surfaces of said bed.

4. The method of flame hardening a lathe bed comprising the steps of: (a) passing a flame hardening torch over the shears of said bed to be flame hardened and cooling said shears of said bed at a sufficient rate to effect a hardening of said shears; and the step (b) of passing a flame hardening torch over the bottom surfaces of said bed and cooling said bottom surfaces of said bed at a sufficient rate to effect a hardening of said surfaces after the completion of the flame hardening of the shears of said bed so as to eliminate the distortion set up by the flame hardening of said shears of said bed.

5. The method of flame hardening a relatively long metallic work piece comprising the steps of: (a) passing a flame hardening torch over a portion of said work piece and cooling said portion of said work piece at a sufficient rate to effect a hardening of said portion; and the step (b) of passing a flame hardening torch over an oppositely disposed portion of said work piece and cooling said oppositely disposed portion at a sufficient rate to effect a hardening thereof so as to develop forces in said oppositely disposed portion which substantially neutralize the forces developed in said work piece in flame hardening said first mentioned portion.

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