March 29, 1932. J. L. MATTHEWS 1,851,397

GEAR SHAPING MECHANISM

Filed Jan. 7, 1931

Fig. 1

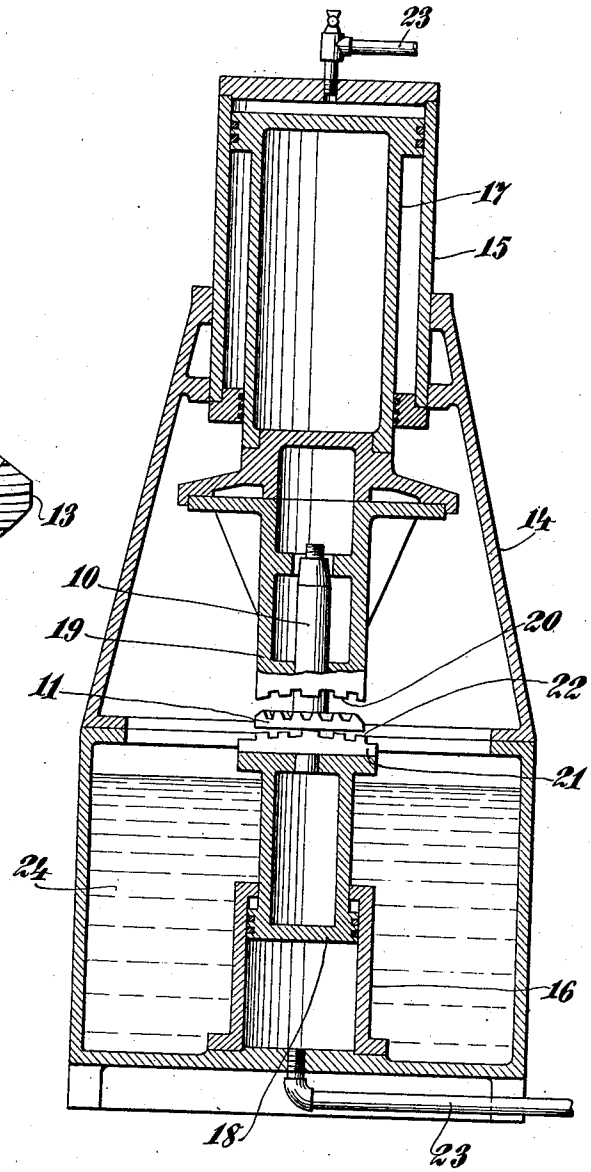


Fig. 2

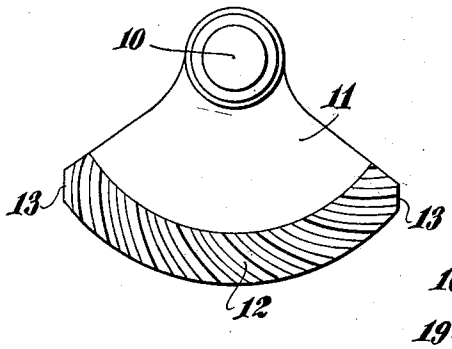
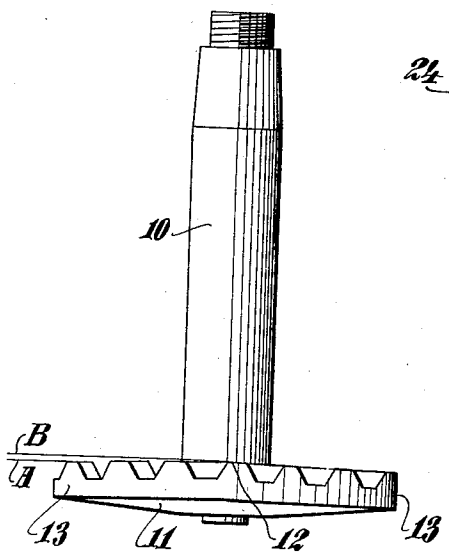


Fig. 3



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UNITED STATES PATENT OFFICE

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GEAR SHAPING MECHANISM

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The present invention relates to steering mechanism and embodies, more specifically, an improved method of forming steering gear sectors and the like where a deformation or other change is required prior to the final hardening thereof.

While the following description is made with respect to steering gear sectors, it will be apparent that the invention may be utilized in many other ways, particularly where the desirability of forming an article in the manner described herein is presented.

It has been found in practice that steering gear sectors wear more at the central part thereof than at the ends of the sector and to compensate for this condition, it has been usual in standard sectors (of the helical worm type) to machine the teeth eccentric to the axis thus producing a high point in the center of the sector and low points adjacent the ends thereof. In this fashion, the teeth of the central part of the sector may be kept closely in mesh with the worm by means of adjustment, even after the central teeth become worn, without danger of binding or tightness at the ends of the sector. With sectors of the side worm type, it is difficult to obtain relief at the ends of the sector during machining since the provision of the above described eccentricity requires extremely difficult machining operations.

An object of the present invention is to provide an apparatus for obtaining relief at the ends of steering sectors and the like, the desired shape of the sector being perfected after the teeth have been cut.

A further object of the invention is to provide an apparatus of the above character, wherein the shaping and quenching operations may be effected simultaneously.

A further object of the invention is to provide an apparatus for obtaining relief at the ends of sectors by forming the same in a desired fashion after the teeth have been cut.

Further objects, not specifically enumerated above, will be apparent as the invention is described in greater detail in connection with the accompanying drawings, wherein:

Figure 1 is a sectional view in elevation, showing a quenching press which is adapted to quench and shape an object simultaneously.

Figure 2 is a view in end elevation showing a sector formed in accordance with the present invention.

Figure 3 is a view in side elevation, showing the sector of Figure 2.

Referring to the above drawings, particularly to Figures 2 and 3, it will be seen that the sector shaft 10 carries a sector 11, the plane of the teeth of which has been formed to slope away from a central or intermediate high point 12. This plane is indicated by the line A in Figure 3 and the plane of cutting, prior to shaping, is indicated by the line B. The ends 13 of the sector thus lie below the high point 12 and cause the teeth at the high point to engage the worm more closely than the teeth adjacent the low points 13.

After the cutting of the teeth in the normal plane B, the sector is formed in the manner described hereinafter, this step being done any time after cutting whether the sector is hot or cold. The shaping is preferably done at the time of final quenching for hardening the piece and may be done in a press comprising a frame 14 supporting cylinders 15 and 16. A piston 17 is slidably mounted within cylinder 15, while piston 18 is carried by the cylinder 16. At the lower end of piston 17, a die 19 is carried, this die being adapted to receive the sector shaft and, on its lower face, being curved, as at 20 to shape the sector suitably during quenching.

Piston 18 carries a cooperating die 21 which is formed with a curved surface 22 similar to the surface 20. Pipes 23 may supply compressed air to the respective cylinders and actuate the dies to shape the sector received therebetween in a desired manner as the sector is submerged in the oil 24.

From the foregoing, it will be seen that the process of shaping the sector, as outlined above, is quite simple and far less expensive and difficult in operation than that of machining the teeth with the desired eccentricity. The shaping process does not add to the manufacturing operations required in making the surface nor does it add materially to the expense of such operations, since the standard equipment now available may be used with

only the slight alteration of changing the dies of the press.

While the invention has been described with specific reference to the accompanying drawings, it is not to be limited, save as defined in the appended claim.

I claim as my invention:

A device for forming gear sectors in desired shapes comprising a receptacle adapted to receive a quenching bath, a pressure member carried thereby and movable into the bath, a cooperating pressure member coaxial with the first member and movable with respect thereto, and pressure plates carried by the members and having pressure surfaces each converging to a high point intermediate the ends thereof.

This specification signed this 31 day of December, A. D. 1930.

JOSEPH L. MATTHEWS.