

Oct. 24, 1950

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2,526,951

METHOD OF ELECTROLYTIC POLISHING

Filed Feb. 28, 1947

2 Sheets-Sheet 1

Fig. 1.

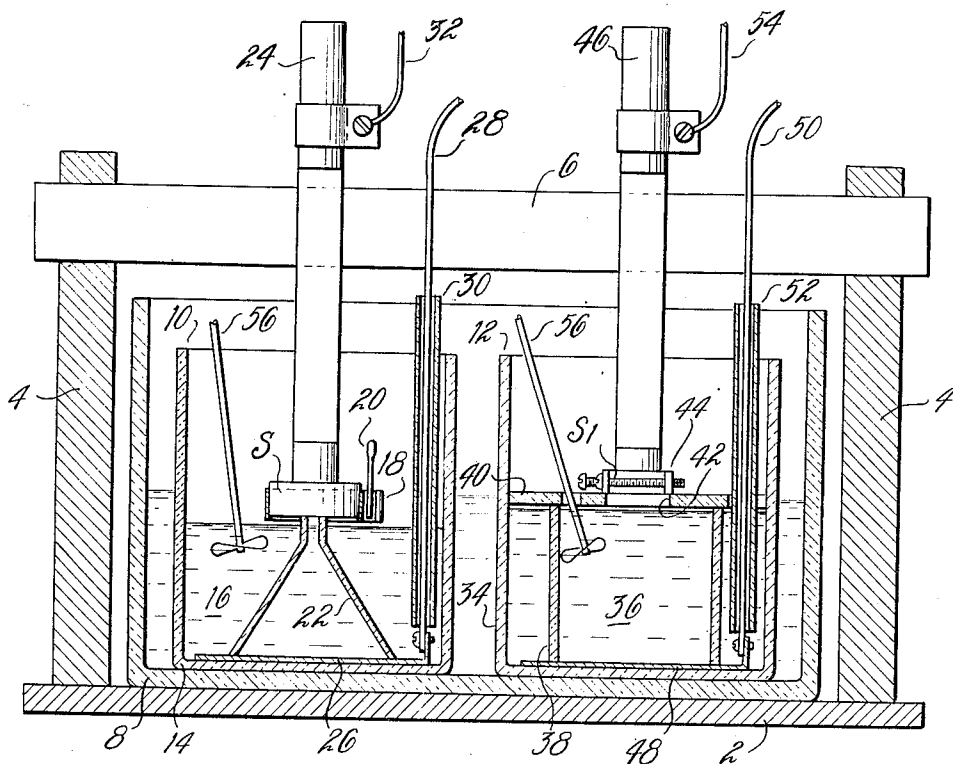


Fig. 2.

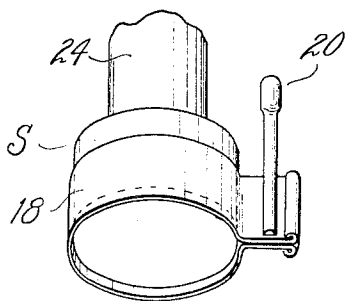
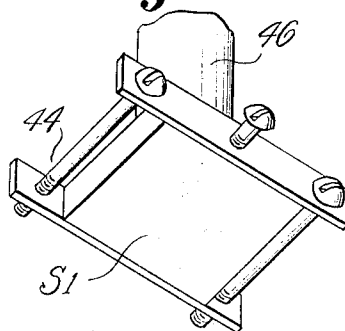


Fig. 3.



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Fig. 4.

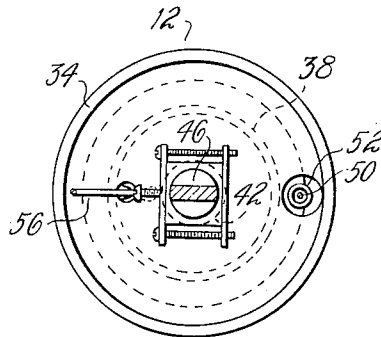
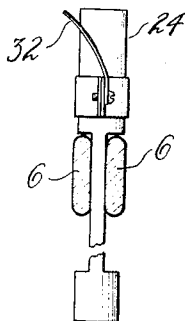


Fig. 5.



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METHOD OF ELECTROLYTIC POLISHING

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3 Claims. (Cl. 204—140.5)

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This invention relates to a method of electrolytic polishing and more particularly to a method for polishing steel specimens for metallographic examination. In polishing such specimens by methods now commonly known, the current density is decreased by virtue of the fact that the sides of the specimen as well as its end are polished and therefore the efficiency of the polishing operation is reduced. Furthermore, the edges of the specimen are rounded because both the end and the sides of the specimen are attacked and true readings of decarburization, seams, casehardening, nitriding and the like cannot be obtained.

It is therefore an object of my invention to provide a more efficient method of polishing specimens.

Another object is to provide such a method that will eliminate or at least greatly minimize the rounding of the edges of the specimen.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a sectional view of the apparatus used in carrying out my invention;

Figure 2 is a perspective view of a specimen mounted in its holder;

Figure 3 is a perspective view of another type of specimen mounted in its holder;

Figure 4 is a plan view partly in section of a portion of Figure 1, and

Figure 5 shows the anode support.

Referring more particularly to the drawings, the reference numeral 2 indicates a base plate on which is mounted a pair of spaced apart upwardly extending supports 4, 4. A pair of spaced apart rectangular glass bars 6, 6 extend between and are supported by the supports 4, 4 in any suitable manner. Resting on the base plate 2 between the supports 4, 4 is a glass container 8. A pair of electrolytic polishing cells 10 and 12 are located in the glass container 8 and are used to polish different types of specimens. Cooling water is contained in the container 8 around the cells 10 and 12.

The cell 10 consists of a glass container 14 which is filled with an electrolyte 16. The specimen S, as best shown in Figure 2, is round and is prepared for polishing by wrapping it in a thin gauge soft steel strip 18, which is tightly wrapped around the specimen and its edges bent and held in place by a cotter pin 20 which does not extend beyond the end of the strip. The strip 18 extends a short distance ($\frac{1}{2}$ of an inch) beyond the end of the specimen S which is supported on a fun-

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nel 22 arranged in inverted position in the electrolyte and extending a slight distance above the top of the electrolyte 16. An anode 24 passes between the bars 6 (see Figure 5) and rests on top of the specimen S to hold it in place. A cathode 26 rests on the bottom of the container 14 with a wire 28 extending upwardly therefrom through a glass tube 30. Power is applied to the anode through a wire 32.

The cell 12 consists of a glass container 34 containing the electrolyte 36. A glass cylinder 38 extends from the bottom of the container 34 to the top of the electrolyte and supports a porcelain member 40 having holes 42 therein. The specimen S—1 is held in clamps 44 as best shown in Figure 3 and supported over an opening 42. An anode 46 passes between the glass bars 6 and rests on top of the specimen S—1 to hold it in place. A cathode 48 rests on the bottom of the glass container 34 with a wire 50 extending upwardly therefrom through a glass tube 52. Power is supplied to the anode 46 through the wire 54. A glass propeller 56 extends into the electrolyte for a purpose which will appear later. The electrolyte may be of any well known type such as perchloric acid-acetic anhydride solution and is maintained at the usual temperature. The apparatus shown in cell 10 is particularly adapted for use with round specimens while that shown in cell 12 is adapted for irregular specimens.

The operation is essentially the same in both cases and the operation using cell 10 will be first described.

Prior to the electropolishing the samples should be prepared by grinding the bottom of the specimen on a 150 grit paper and then wrapping it with the layer of .004 inch thick shim steel projecting about $\frac{1}{2}$ inch beyond the surface to be polished. The specimen is placed in the cell with its bottom slightly above the top of the electrolyte 16. The bath is then agitated by means of the propeller 56 to create waves which wash across the bottom surface of the specimen in a manner such that only the crest of the waves will contact the surface to be polished. This makes it possible to create higher current densities because only that portion of the specimen which is actually to be polished is contacted by the bath. The surface washing also tends to preserve the edges of the specimen from attack so that the edges are not rounded to the same extent as previously. Rounding of the edge is also prevented by the soft steel strip extending beyond the end of the specimen since it prevents attack on the sides of the specimen by diverting the power of the bath

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from the specimen to itself. Good results in respect to edge roundness have also been obtained by suspending the specimen so prepared in the electrolyte. In polishing specimen S-1 the same procedure is followed with the bath 42 being agitated by the propeller 56 and the electrolyte so that it passes through the openings 42 and contacts the bottom of the specimen.

While two embodiments of my invention have been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. The method of electrolytically polishing metal specimens which comprises suspending the specimen a slight distance above the top of the electrolyte, agitating the electrolyte to cause it to wash across the bottom surface of the specimen to polish said bottom surface while maintaining the mean level of said electrolyte a short distance below the said bottom surface, and passing current through the electrolyte during said agitation with the specimen being the anode.

2. The method of electrolytically polishing metal specimens according to claim 1 in which the sides of the specimen are covered with thin metal strip extending slightly below the bottom surface of the specimen.

3. The method of electrolytically polishing steel

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specimens which comprises suspending the specimen a slight distance above the top of the electrolyte, making contact between the anode and the specimen, supplying current to the anode, and agitating the electrolyte to cause it to wash across the bottom surface of the specimen to polish said bottom surface while supplying said current and maintaining the mean level of said electrolyte a short distance below the said bottom surface.

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