Aug. 2, 1938. E. S. EPLETT 2,125,434

METHOD OF MAKING HONED GUIDES

Filed Jan. 5, 1937

Fig. 1

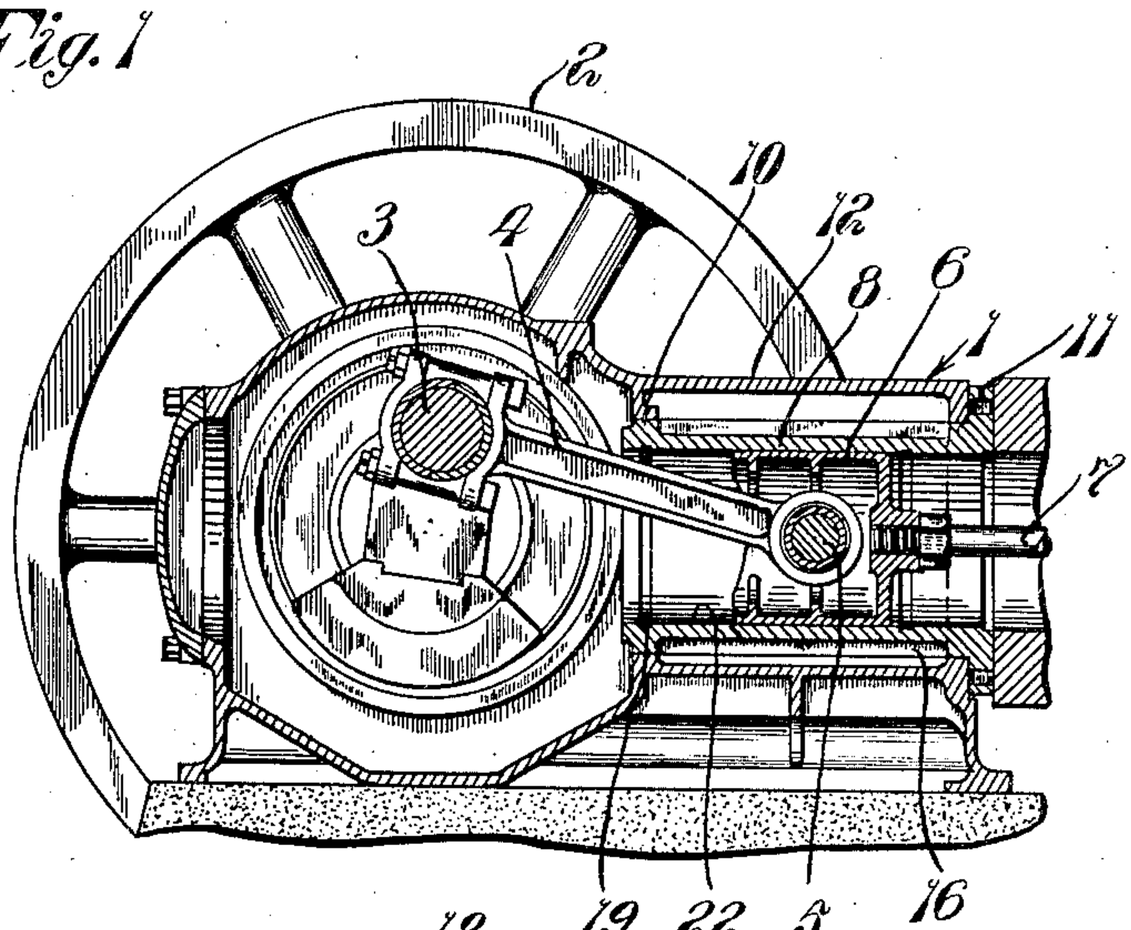


Fig. 2

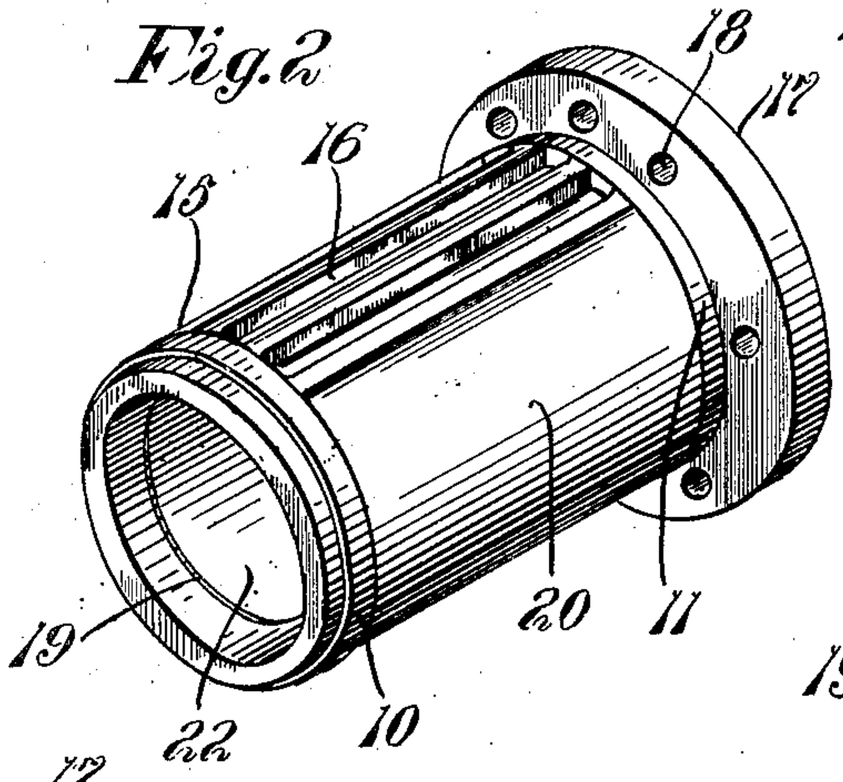


Fig. 3

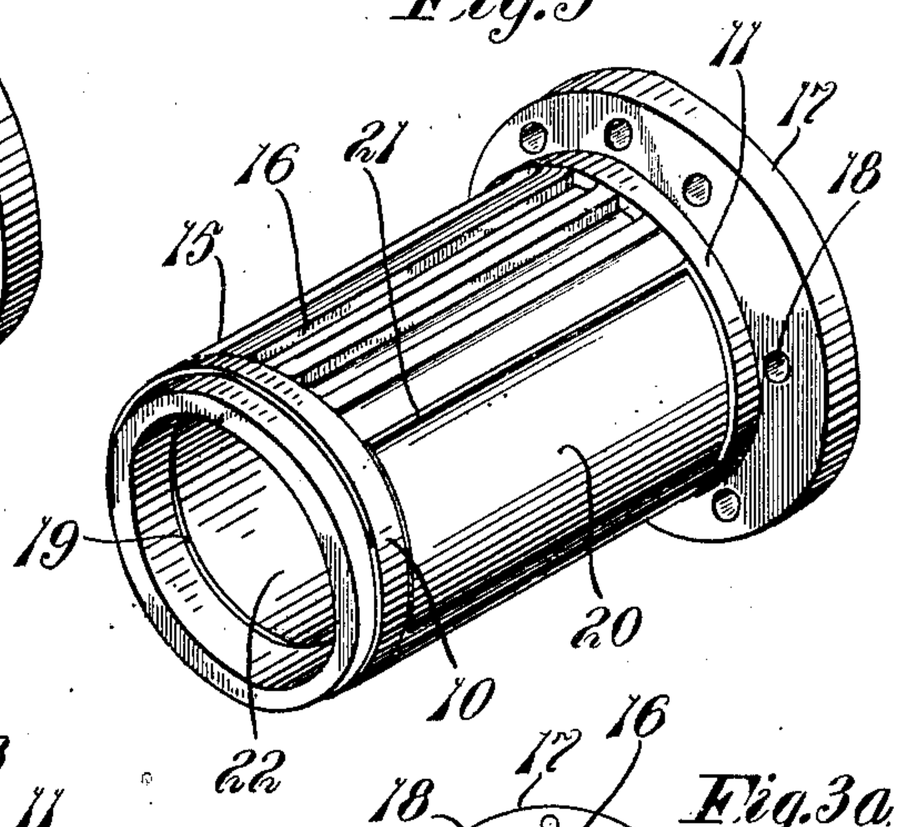


Fig. 2a

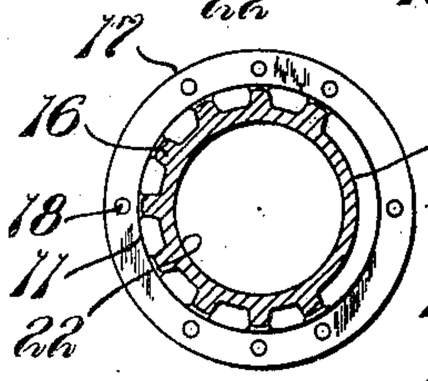


Fig. 4

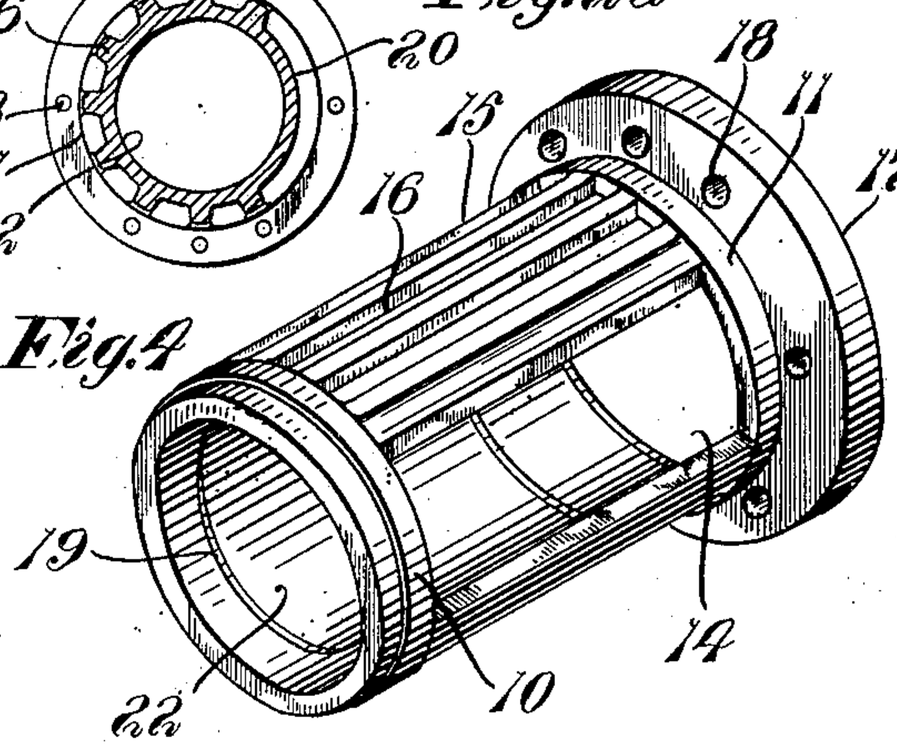
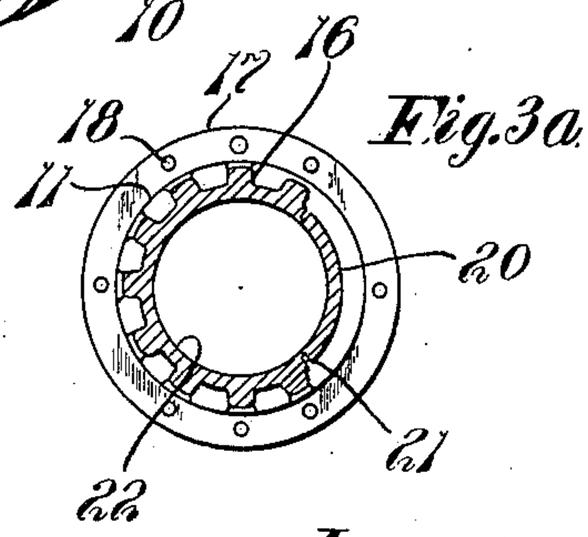


Fig. 3a



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METHOD OF MAKING HONED GUIDES

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4 Claims. (Cl. 29—156.4)

My invention relates to methods of making parts having honed bores and traversed by lateral openings, as, for example, crosshead guides, ported cylinder liners, etc.

In the making of parts which are to be honed, it is necessary that there shall be no openings in the surface to be honed of such size or location as to permit any tendency towards catching of the hone during the honing operation. In the formation of guide or other cylindrical elements within which parts are to move reciprocably, or oscillate, or both, it has been found that if the cylindrical finished guide surface is first formed, and thereafter a substantial section of metal is removed and an opening formed through the finished cylindrical surface, there is very apt to be a warping of the remaining portions of the cylindrical surface in view of the internal rearrangements of the strains within the guide-forming member. I have found, however, that by nearly severing the portion to be ultimately removed, by an operation which does not form objectionable openings extending through the surface to be honed, honing the surface to be so treated, and then removing the thin web of metal which has been left to hold the portion to be removed in place, it is possible to form a guide or like member which will be nearly perfectly cylindrical at the conclusion of its manufacture, and will not be subject to a material warping tendency.

An object of my invention is to provide an improved method of making a part having a honed bore and one or more lateral openings. Another object of my invention is to provide an improved method of making a honed crosshead guide having an opening in its side. A further object of my invention is to provide an improved method of providing a virtually perfectly cylindrical guiding surface upon a part which is traversed by one or more lateral openings. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawing, which includes certain views which will be of assistance in understanding the illustrative mode of practice of my invention,—

Fig. 1 is a view, with parts broken away, in central section through a compressor in which a guide element constructed in accordance with my invention is embodied.

Fig. 2 is a perspective view of a casting from which a guide is to be formed by certain operations thereon.

Fig. 2*a* is a section through the casting of Fig. 2, midway between the ends of the latter, taken perpendicular to its axis, on a reduced scale.

Fig. 3 is another perspective view of the same casting after the same has been prepared for honing.

Fig. 3*a* is a section through the structure of Fig. 3, taken similarly to Fig. 2*a*, and also reduced.

Fig. 4 is a persective view of the completely finished guide member.

Referring to Fig. 1, it will be observed that a compressor or pump, generally designated 1, is provided with a flywheel 2 mounted upon a crank shaft 3, and the latter is operatively connected, by a connecting rod 4, to a crosshead pin 5 supported in a cylindrical crosshead element 6. The crosshead element is connected by a suitable rod 7 with the parts to be actuated—for example, the piston of the compressor or pump. The crosshead 6 is reciprocable in a crosshead guide 8 of the liner type, this crosshead guide element being centered by cylindrical surfaces 10 and 11 within the frame 12 of the compressor. A suitable hand and inspection hole, designated 14 in Fig. 4, is provided to permit inspection of the crosshead and guide structure, and access to the crosshead.

The liner type crosshead guide 8 is formed from a casting such as is shown in Figs. 2 and 2*a*, generally designated 15, and suitably ribbed, as at 16, throughout a substantial portion of its periphery for stiffness and strength. A flange 17 traversed by bolt holes 18 is arranged at one end of the crosshead guide for securing the same in position. The casting 15 is hollow from end to end, before the commencement of machining operations upon it. As a desirable first step, while it is understood that the sequence of steps is subject to variation, the casting 15 may be turned to provide the surfaces 10 and 11, which will serve to center it. The flange 17 may be turned and provided with the bolt holes 18. Casting 15 will then be rough-bored, and counterbored or grooved, as at 19. The portion 20 of the casting which is to be cut away to provide the opening 14 will then be subjected to what may be termed a profiling operation, a milling cutter being employed to cut around the designed opening or openings, these cuts, however, not being made completely through the peripheral wall of the member 15, but instead stopping just short, perhaps an eighth or a sixteenth of an inch or so—although a considerable variation is permissible—, of cutting through into the bore of the member 15. This milling operation surrounds the portion 20—of which only one is shown here, although there may be others—with a narrow

groove 21; and because only a thin web of metal remains connecting the portion 20 with the body of the member 15, there will promptly be an internal rearrangement of the strains within the member 15 and the member 15 will attain approximately the shape which it will have in its finished form. After this strain-rearrangement has taken place, the interior guide surface 22 of the guide member will be honed by a suitable hone, and a highly finished cylindrical surface produced. Finally, a milling cutter will again be employed in cutting away the thin web of metal holding the part 20 in position in the member 15, the member 20 being removed and the finished guide thereby made complete.

It is to be understood, of course, that diametrically opposite portions may be removed from the sides of the cylindrical guide, and it will be further understood that this same method of manufacture could be applied to the cylinders of engines in which ported walls—liners or integral—traversed by the piston, will be desired. Other uses of this improved method will also suggest themselves to those skilled in the art. It will be evident that it would be possible, under some circumstances and with certain forms of honing devices, to make the end cuts—that is, those extending circumferentially of the element under construction—completely through, and thereby allow an even more perfect rearrangement of internal stresses.

To summarize, it will be noted that in the illustrative mode of applying my invention described, a suitable cast or otherwise produced cylindrical blank has its external mounting surfaces suitably turned and its interior bored. The portions which are ultimately to be removed from the wall which is to provide a cylindrical guide surface, are then cut around to such a degree and in such manner as to enable the nearest possible approximation to the ultimate structure of the device, without creating conditions inimical to successful honing. The bore of the part is then honed, and thereafter, as by a milling cutter, the remaining attachments of the portions which are to be removed are severed and, with any dressing of the edges of these openings which may be desired or needed, the guide is completed.

My improved method has been employed with much success in the manufacture of crosshead guides for compressors, and nearly perfectly cylindrical guides having highly finished honed surfaces are produced, and these are relatively free from unneutralized internal stresses which would result in a deformation of the cylindrical guiding surface subsequent to the installation of the guide element in its assembled relation in a machine.

From the foregoing description, it will be evident that I have provided an improved method of making cylindrical guides or other parts. It will be evident that the same is not limited to the formation of truly cylindrical bores, however. It will be noted, moreover, that I have provided an improved method which results in no difficulties in machining, and at the same time results in a finished part virtually free from any tendency to subsequent deformation due to portions thereof having been cut out after the final honing operation was performed.

While I have in this application specifically described one illustrative method in which my invention may be employed, it will be understood that this method is shown for purposes of illustration, and that the invention may be modified and embodied in various other methods without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. The method of forming cylindrical-guide-surface-providing parts which have opening-traversed, bored and honed guide surfaces, which includes, between the boring and honing of said parts the step of nearly severing from the adjacent material, any portions which are to be removed to provide openings.

2. The method of making cylindrical guide members or the like, which includes the steps of externally turning the same as needed, rough-boring the same, partially severing any portions of the cylindrical-guide-providing wall which may ultimately have to be removed, honing the rough-bored bore, and then completing the severing of the wall portions to be ultimately removed.

3. The method of forming cylindrical-guiding-surface-providing members which includes rough-boring, cutting nearly through from the outside to said rough bore the wall of said member around any portions of said wall which are ultimately to be removed, honing said bore after the strains in said member have again reached a state of equilibrium, and then completely severing the portions to be removed.

4. The method of making a cylindrical-guide-providing member which includes forming the positioning surface or surfaces of said member, boring said member, cutting away the material surrounding any portions of the wall of said member which are ultimately to be removed, in a manner to nearly sever said portion or portions while leaving the internal surface of said guide free of openings likely to cause hone breakage, honing the bore of said member, and then completing the severing of the parts to be removed from its wall.

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