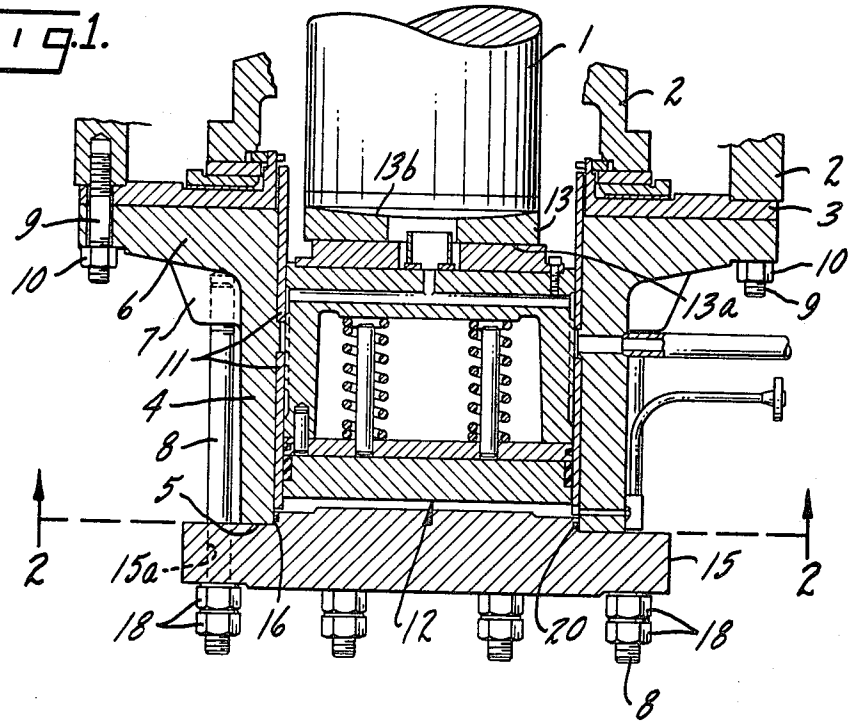
Aug. 6, 1968 H. PETERS 3,395,621

HYDRAULIC CYLINDER SUPPORT

Filed March 17, 1966

Fig. 1.



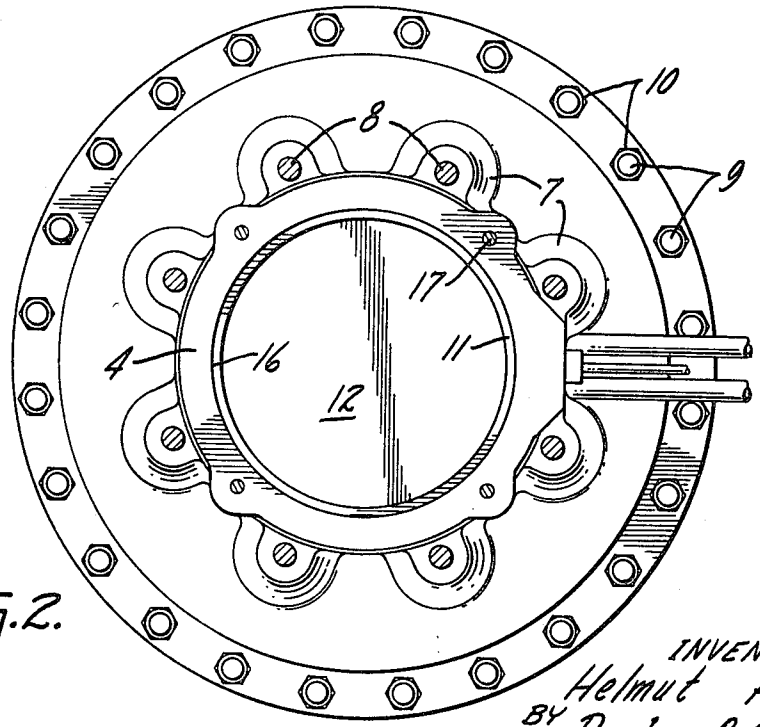


Fig. 2.

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HYDRAULIC CYLINDER SUPPORT

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ABSTRACT OF THE DISCLOSURE

A vertically axised hydraulic cylinder, for use with the frame and crushing head of a vertically axised gyratory crusher. The cylinder has an integral flange at its top with a plurality of integral bosses formed between the flange and the cylinder. A bottom plate closes the lower end of the cylinder and is held in place by a plurality of tie rods screwthreadedly secured to the bosses.

This invention relates to an improvement in hydraulic cylinder supports and has for a major purpose to provide an improved support for the bottom closure or cylinder head of a hydraulic cylinder used for the support and adjustment of the shaft of a gyratory crusher.

Another purpose is to provide securing means for such a cylinder head or closure that can be readily applied and readily removed.

Another purpose is to provide supporting means for such a cylinder head in the form of tie rods which are externally accessible and readily applied or removed by means of the application of heat to the tie rods.

Other purposes will appear from time to time in the course of the specification and claim.

I illustrate the invention more or less diagrammatically in the accompanying drawings wherein:

FIGURE 1 represents a vertical, axial section through the hydraulic cylinder at the bottom of the gyratory crusher; and

FIGURE 2 is a section on the line 2—2 of FIGURE 1.

Like parts are indicated by like symbols throughout the specification and drawings.

1 generally indicates the lower end of the gyrated shaft of a gyratory crusher. It will be understood that suitable means are provided for gyrating the shaft 1, which carries, at its upper end, a crushing head in the general form of a truncated cone. 2, 2 indicate parts of the frame, the details of which form no part of the present invention. It will be understood, however, that suitable means are provided for supporting a normally fixed crushing bowl surrounding the head, and for gyrating the shaft 1 and thereby gyrating the head within the crushing bowl, to effect crushing of material fed to the crushing cavity so formed.

Since the present invention relates primarily to supporting means for the shaft, the structure will not further be disclosed.

3 indicates an annulus which abuts outer parts of the frame 2. Beneath it, 4 indicates a hydraulic cylinder for the support of the head 1. The cylinder 4 terminates in a bottom face or edge 5 which is shown as generally horizontal. It has a somewhat massive, outwardly extending upper flange or annulus 6. A plurality of bosses 7 are of one piece with the cylinder 4 and its flange 6, and are tapped to receive the screwthreaded upper ends of radius rods 8. The flange 6 is suitably secured to the main frame end portions 2, for example, by bolts 9 and nuts 10. Within the cylinder 4, and within liner sleeves 11, is a piston structure, generally indicated as 12, the details of which do not form part of the present invention. It will be noted that an upper sliding plate or annulus 13 is provided, shown as having a plane lower surface 13*a* and an upwardly concave upper surface 13*b*, which receives the

lower end of the crusher shaft 1. It will be understood that hydraulic pressure is supplied to the interior of the cylinder 4 below the piston by any suitable means, not herein indicated in detail. Variations in the height at which the piston 12 is supported in the cylinder 4 adjust the crushing cavity. Generally pressure below the piston 12 remains constant with a change in volume resulting in adjusting movement of piston 12. During operation of the crusher, the pump which supplies fluid to the cylinder 4 does not operate and reverse flow will be prevented by a conventional check valve.

The bottom of the cylinder 4 is closed by a closure plate or cylinder head 15, having a central portion which, as at 16, enters the interior of the cylinder. Any suitable means may be provided for properly centering the plate 15. The tie rods 8 may be inserted upwardly through the apertures 15*a* and may be screwthreadedly engaged in or otherwise secured to the bosses 7. Securing nuts 18 may then be applied to the tie rods and below the plate, and suitably tightened on the lower screwthreaded ends of the tie rods 8. It will be noted that the tie rods 8 are exposed, and that they are easily accessible to operators or workmen for insertion and removal. They may readily be tightened, for example, as by heating the tie rods with torches. This causes an extension of their length, and the nuts 18 may then be tightened by the use of suitable tools. When the tie rods cool their length is shortened, and the bottom plate 15 is thereby firmly thrust into its position against the lower edge of the cylinder. If desired, any suitable seal 20 may be employed, rendering the structure oil-tight. Again, when it becomes necessary to remove the plate 15 the operator, by heating the exposed parts of the tie rod 8, thereby increases the length of the tie rods, and the nuts may easily be backed off. Thereafter, the tie rods may be removed from the bosses, or the plate 15 may be removed along the tie rods. The long tie rods 8 are advantageous in that they have greater capacity to absorb shock and they do not need a great deal of heat to expand for tightening.

The bottom plate 15 had previously been secured to the cylinder 4 by fastening with bolts through a lower flange on the cylinder 4. This required that an excessive number of such bolts be used and they were difficult to tighten, either by the use of heat or otherwise. Further, such an arrangement is not as well suited to stand up to the shock loads applied to it by either normal or abnormal crushing action.

The bolts 8, being exposed, have the advantage that they can be directly heated by any suitable heating unit, such as a blow torch. When heated, the bolts will expand and the nuts 18 can be easily turned up, so that the lower plate 15 will be tight when the bolts cool. Note that a substantial length of the bolts 8 can be exposed so that a greater overall portion can be heated. This means that the individual bolts do not have to be raised to as high a temperature for the same degree of tightening. Further, the number of bolts can be substantially reduced because, being on the outside, they individually can be larger. Thus I can reduce the total number of bolts used without giving up any overall holding power. At the same time the strength of the overall structure is greatly improved. In a sense, the bolts 8 function as exposed tie rods rather than merely connecting screws. Further, the shock loads from the crushing action are received by the lower plate and transmitted directly to the upper flange 6 so that no corners are involved in stress concentration.

It will be realized that whereas I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departiig from the spirit of my invention. I therefore wish my description and drawings

to be taken as in a broad sense illustrative or diagrammatic rather than as limiting me to the details of my disclosure.

The use and operation of the invention are as follows:

Gyratory crushers of the type herein described are frequently made in large sizes, and with great pressures involved in the hydraulic support of the lower end of the crusher shaft. Since the downward thrust of the head, which may involve great pressures, is, to a substantial degree, received by the plate **15**, or its equivalent, ready and efficient means for supporting the plate in position are essential. It is important, also, that whatever securing means are employed shall cause a minimum of stress on the cylinder wall. In the present structure the cylinder **4**, with its upper flange **6**, provides an inherently stable structural element, with no substantial lateral strains on the cylinder wall **4**. The bosses **7** are integral with the flange **6**, as well as the wall **4**, and constitute further reinforcements. The tie rods **8** enter these reinforcements and extend downwardly parallel with the outer wall of the cylinder **4**. The plate **15**, by the tie rods and nuts **18**, is drawn upwardly directly against the bottom of the cylinder **4**. Thus there will be no damaging stresses on the wall **4**. On the other hand, the poistioning of the tie rods permits them to be heated, for example, by blow torches, without any damaging heating of the cylinder wall **4**. Heating the tie rods then permits the nuts **18** to be tightened or removed, as the case may be.

I claim:

1. For use with the frame and crushing head of a vertically axised gyratory crusher, supporting and adjusting means including a vertically axised hydraulic cylinder receiving within it a piston assembly, the cylinder being open at the top and bottom, a bottom plate for the cylinder, a body of fluid introduced between said piston assembly and said bottom plate, means for removably supporting said plate including an outwardly extending flange integral with the top end of the cylinder, said flange being of a diameter substantially greater than the diameter of the bottom plae, a pluraliy of integral bosses extend downwardly from the bottom of the flange and outwardly from the circumferential wall of the cylinder, and means for securing the bottom plate in position to close the bottom of the cylinder including a plurality of tie rods extending upwardly through holes in the plate and having their upper ends screwthreadedly secured within closed internally threaded bores in said bosses, and securing nuts for the lower ends of said tie rods, said nuts being screwthreadedly secured to said tie rods beneath said plate, said tie rods being exterior to the circumferential wall of the cylinder, said tie rods and nuts being thus readily accessible from outside the securing assembly thus formed.

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