

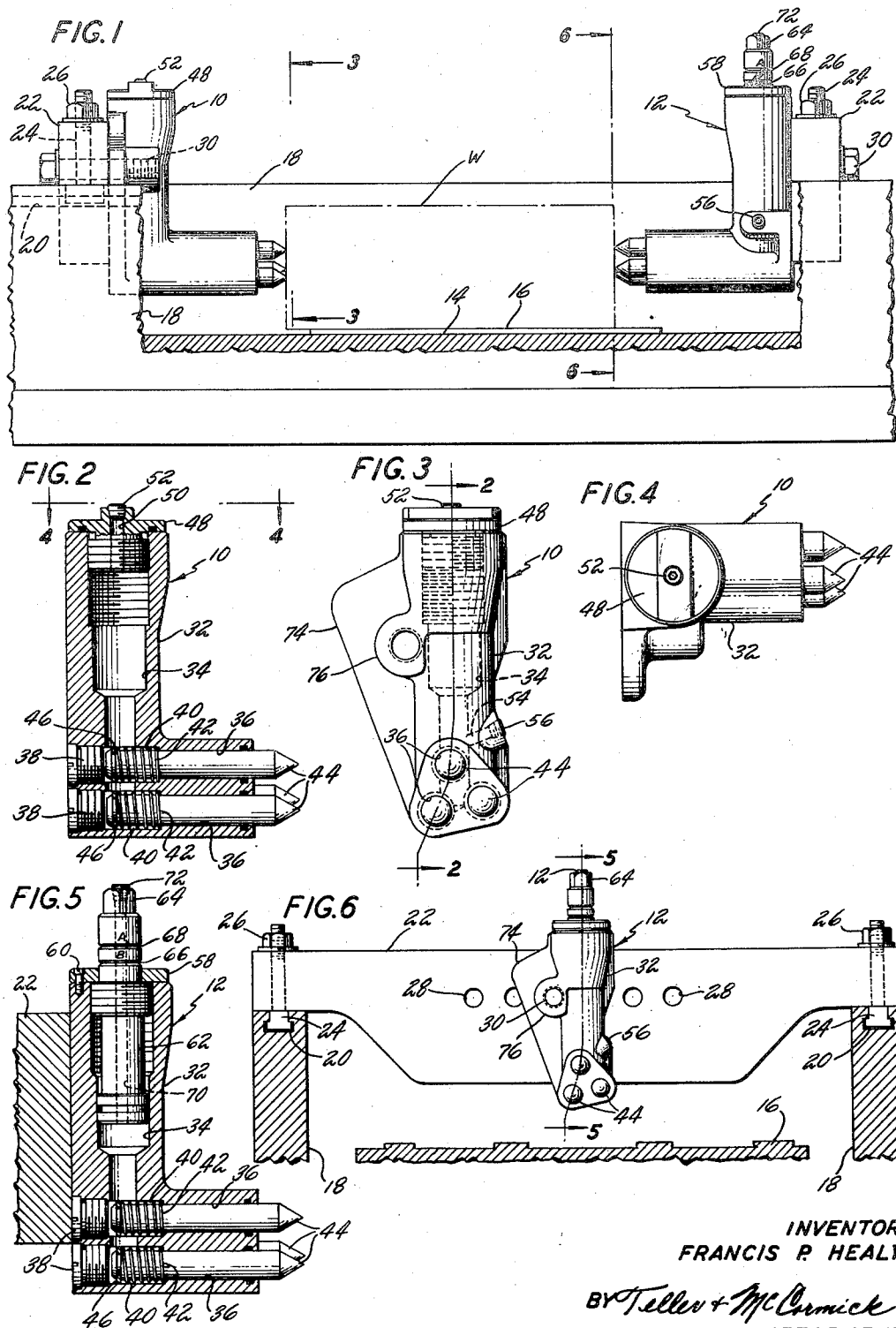
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F. P. HEALY

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HYDRAULIC WORK-SUPPORTING CLAMP ASSEMBLY

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INVENTOR
FRANCIS P. HEALY

BY *Teller + McCormick*
ATTORNEYS

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HYDRAULIC WORK-SUPPORTING CLAMP ASSEMBLY

Francis P. Healy, Springfield, Mass., assignor, by mesne assignments, to Van Norman Industries, Inc., Springfield, Mass., a corporation of Massachusetts

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This invention relates to an improved hydraulic clamp and to a frame assembly associated therewith to adjustably support a pair of the improved clamps for engagement with work of different sizes and shapes.

It is the general object of the invention to provide an hydraulic clamp which is substantially foolproof and extremely simple to operate, which is capable of applying great force, which has self-aligning work engaging means adapted to engage and support work on uneven surfaces thereof, and which is particularly adapted to be adjustably supported on a suitable frame or frame assembly whereby a pair of the clamps can be utilized to releasably support work of differing sizes and shapes.

The drawing shows a preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction disclosed, and that the drawing and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawing,

Fig. 1 is an elevational view of a frame assembly and a pair of clamps mounted thereon in operating position for engagement with a typical workpiece;

Fig. 2 is an enlarged vertical sectional view through the left-hand clamp shown in Fig. 1, the section being taken as indicated by the line 2-2 of Fig. 3;

Fig. 3 is a front view of the left-hand clamp;

Fig. 4 is a plan view of the left-hand clamp taken as indicated by the line 4-4 of Fig. 2;

Fig. 5 is a vertical sectional view of the right-hand clamp, the section being taken as indicated by the line 5-5 of Fig. 6; and

Fig. 6 is a front view of the right-hand clamp and it comprises a vertical sectional view through the frame assembly as indicated by the line 6-6 of Fig. 1.

Work supporting clamps provided in accordance with the present invention are preferably utilized in pairs as shown in Fig. 1 wherein one of the clamps 10 is provided to engage one end of the work W, and the other clamp 12 is provided to engage the other end of the said work. While the clamps 10 and 12 are substantial duplicates and can in all respects be identical, in a preferred assembly only one of the clamps, the clamp 12, is particularly adapted for manual operation to advance its work-engaging and holding means toward and away from the work W whereby selectively to clamp and to release the work.

A clamping assembly adapted to utilize a pair of clamps includes a frame structure for adjustably supporting the clamps 10 and 12 in spaced apart relationship and for supporting the work W between the clamps for engagement therewith. While the frame structure may take various forms, a preferred frame assembly includes a bed or table 14 upon which a work locating plate 16 can be mounted. The plate 16 is particularly adapted to locate a workpiece of particular form and shape on the

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bed 14 in desired position for engagement by the work-engaging and holding means of the clamps 10 and 12. For example, the workpiece or work W may be the cylinder head of a vehicle engine and the work locating plate 16 may be particularly adapted to locate and support the cylinder head in such a position that it can be conveniently reached and will be accessible to grinding tools, and the locating plate 16 supports the cylinder head so that its opposite ends can be engaged by the work-engaging means of the clamps 10 and 12.

The preferred frame assembly or structure also includes a pair of longitudinally extending spaced apart rails or walls 18, 18 which project upwardly from the bed 14 and which are provided with longitudinally extending T slots 20, 20 in their upper surfaces. A pair of cross plates 22, 22 extend transversely of the bed 14 and the ends of each of the plates rest upon the rails 18, 18. The cross plates 22, 22 are secured in adjusted positions longitudinally of the bed 14 by means of T bolts 24, 24 extending through their ends, the heads of the T bolts being disposed in the slots 20, 20 on the rails and the T bolts being tightened by nuts 26, 26. Thus, it will be seen that the transversely disposed cross plates 22, 22 can be located in selectively spaced apart positions. Each cross plate 22 has a plurality of apertures 28, 28 between its ends for receiving a bolt 30 (Fig. 1) to mount a clamp 10 or 12 in adjusted position.

Each of the clamps shown includes an L-shaped body 32 having one portion residing in a vertical plane as viewed in the drawing and another portion extending horizontally. A bore 34 is provided in that portion of the body 32 which resides in the vertical plane with the outer end of the bore being provided with threads to receive a cap or to receive a threaded piston as will be described, and the inner end portion of the bore 34 is of reduced diameter.

A plurality (preferably three) of horizontal bores 36, 36 are provided in the horizontally extending portion of the clamp body 32, the rear end portions of the said horizontal bores being in communication with the reduced inner end portion of the first mentioned bore 34. It will be observed that the said rear end portion of each horizontal bore 36 is threaded to receive a plug 38 and it will also be observed that each horizontal bore is enlarged as indicated at 40 to accommodate a spring 42 which surrounds a piston-like plunger or clamping finger 44, there being one such finger provided for each of the three bores 36. The spring 42 surrounding each finger 44 is seated upon a split ring 46 carried on the rear end of the finger and the spring is seated within the enlarged portion 40 of the bore 36 to bias the finger 44 rearwardly therein. The enlarged portion of each of the bores 36, 36 communicates with the first mentioned bore 34 so that when grease or hydraulic fluid is subjected to pressure within the bore 34, it will force the fingers 44, 44 outwardly or forwardly in the bores 36, 36 toward engagement with a workpiece.

The outer end of the bore 34 in the clamp 10 is preferably closed by a plug or cap 48 having external threads adapted to engage the thread in the said bore and also having a small central passage 50 which is normally closed by a plug 52. The plug 52 can be removed so that grease or hydraulic fluid can be pumped into the clamp body bore 34 through the cap bore 50. However, grease is preferably introduced to the main bore 34 through an inlet passage 54 in the side of the body 32, the said inlet passage being normally closed by a plug 56. In filling the body of the clamp 10, the top plug 52 and the side plug 56 are removed and grease is introduced through the passage 54 until it reaches the top of the bore 50 in the cap 48. Then, the plug 52 is replaced and the grease fitting is removed from the

passage 54 and replaced by the plug 56. By threading the plugs 52 and 56 into the passages 50 and 54, respectively, the grease or hydraulic fluid within the clamp body can be subjected to sufficient pressure to project the clamping fingers 44, 44 forwardly.

While the clamp 12 is similar in all other respects to the clamp 10, its bore 34 is not closed by a cap or plug such as the cap 43. Instead, a sealing ring 53 is secured as by a plurality of screws 60, 60 around the open end of the bore 34 to slidably receive the outwardly projecting end portion of a threaded piston 62. The piston 62 has a threaded portion engaging the internal threads in the bore 34 and it has a sealed end portion movable within the smooth portion of the bore 34 to subject grease or hydraulic fluid therein to pressure. That is, by turning the threaded piston 62 to advance it into the bore 34, the grease or hydraulic fluid within the bore is subjected to increased pressure to project the clamping fingers 44 outwardly or forwardly. The outer or projecting end of the piston 62 is preferably formed with a hexagonal head 64 for convenient engagement by a conventional wrench whereby the piston can be turned to advance it or to retract it in the bore 34. The said projecting end portion of the threaded piston 62 is also preferably provided with spaced apart annular grooves 66 and 68 which are identified for reference by the stamped letters "B" and "A," respectively. Like the cap 43 on the clamp 10, the threaded piston 62 is provided with an internal passageway 70 for the flow of grease or other hydraulic fluid and the outer end of the passageway is normally closed by a threaded plug 72.

When the clamp 12 is filled with grease, the threaded piston 62 is fully retracted within the bore 34 to the position shown in Fig. 5 wherein the "B" line 66 is spaced from the outer surface of the sealing ring 53, and the plug 72 is removed from the passageway 70. The grease is pumped into the bore 34 through the side passageway 54 until it appears at the end of the passageway 70 in the piston 62 and then the plug 72 is replaced as is the plug 56 in the side passageway 54.

With the clamps 10 and 12 filled with grease as described, they are ready to be used to support the work W. It will be observed that a lateral flange 74 and threaded boss 76 are provided on the portion of each clamp body residing in a vertical plane for the purpose of engaging a cross plate 22 and receiving a mounting bolt 30. As shown in Fig. 1, the clamps 10 and 12 are mounted as desired on the respective backing plates 22, 22 so that the clamping fingers 44, 44 will face each other for engagement with the respective ends of the work W. While each clamp 10 and 12 can be secured in adjusted position transversely of the frame bed 14 and while each clamp can be secured in pivotal adjustment relative to its respective cross plate, the clamps are preferably arranged so that their work-engaging fingers 44 are in substantial alignment whereby to avoid any twisting of the work W after pressure has been applied thereto by the clamps.

In applying the clamps to the work after it has been positioned on the bed 14 and located by the locating plate 16, the clamp 10 and its backing plate are moved along the rails 18, 18 until the clamping fingers 44, 44 firmly engage the adjacent end of the work. Then, the cross plate or backing plate 22 supporting the clamp 10 is secured in position by tightening the nuts 26, 26 on the associated T bolts 24, 24. Then, the threaded piston 62 in the clamp 12 is advanced into the bore 34 until the "B" line 66 resides in the same plane as the outer surface of the sealing ring 53. This will project the clamping fingers 44 slightly forwardly. Then, the clamp 12 and its associated cross plate 22 are moved along the rails 18, 18 until the fingers 44, 44 of the clamp 12 engage the other end of the work W. Then, of course, the backing plate or cross plate 22 associated with the clamp

12 is secured in position by tightening the nuts on its associated T bolts.

Clamping pressure is applied to the work after positioning the clamps 10 and 12 as described by turning the threaded piston 62 to advance it farther into the bore 34 of the clamp 12. Sufficient clamping force will be applied under all anticipated conditions before the "A" line 68 registers with the outer surface of the sealing ring 53. If the threaded piston 62 can be advanced easily to a point where the "A" line 68 resides in the plane of the outer surface of the sealing ring 53, it indicates that there is insufficient grease or hydraulic fluid in the clamp 12, and under such condition, grease should be added to the clamp 12 before the clamping force is fully applied and relied upon. It is important to observe that the forwardly extending end of each clamping finger 44 is pointed. When the threaded piston has been advanced as described, the pointed ends of the fingers 44, 44 on each of the clamps will penetrate the surface of the work W to grip the work firmly. It should also be observed that such gripping by the fingers 44, 44 can be applied despite uneven surfaces at the ends of the work and that the fingers will be self-aligning to accommodate an uneven surface. In any and in all events, equal force will be applied to the work by each finger in a clamp.

When the work W is to be released, the threaded piston 62 in the clamp 12 is turned to retract the piston to the position shown in Fig. 5. In this position of the piston, the fingers 44, 44 will be fully retracted and will release the work and provide sufficient clearance for removal and replacement thereof. If the clamp assembly described is to be used in a production operation on a series of similar workpieces, it is only necessary to advance the threaded piston 62 in the clamp 12 to engage each successive workpiece and to retract the piston to release and to replace each successive workpiece. It is not necessary to move or to adjust the cross plates or backing plates 22, 22 when operating upon a series of workpieces of the same size.

While the assembly has been described as comprising the clamps 10 and 12 wherein the clamp 10 contains no threaded piston, it will be readily understood that both clamps in the assembly can be provided with feed pistons if desired. It will also be understood that various other changes can be made in accordance with the invention and within the scope of the following claims.

The invention claimed is:

1. A work-supporting clamp assembly comprising a bed for receiving a workpiece, a pair of spaced apart parallel rails extending longitudinally of the bed and projecting upwardly therefrom, a pair of cross plates extending transversely of the bed and slidable along the said rails, means for securing the cross plates to the rails in adjusted positions thereon adjacent opposite ends of a workpiece resting on the bed, a pair of hydraulic work-supporting clamps respectively secured to the said cross plates, each of the said clamps comprising a body provided with a first bore for receiving an hydraulic medium and having one open end and also provided with at least one additional bore communicating with the first bore and having an open outer end facing an end of the workpiece, a work-engaging plunger slidably supported in said additional bore for movement toward and away from the workpiece, and means adapted to close the outer end of the first bore in each clamp and adapted to be advanced into said first bore to subject an hydraulic medium therein to pressure which will project the plunger outwardly into engagement with the workpiece.

2. A work-supporting clamp assembly comprising a bed for receiving a workpiece, a pair of spaced apart parallel rails extending longitudinally of the bed and projecting upwardly therefrom, a pair of cross plates extending transversely of the bed and slidable along the said rails, means for securing the cross plates to the rails in adjusted positions thereon adjacent opposite ends of a

workpiece resting on the bed, a pair of hydraulic work-supporting clamps respectively secured to the said cross plates, each of the said clamps comprising a generally L-shaped body having at least one bore in each leg portion thereof which communicate internally of the body and are open at the ends of the respective leg portions, one of the said bores being internally threaded adjacent its open end and adapted to receive an hydraulic medium and the other of said bores having its open end facing an end of the workpiece, a work-engaging plunger slidably supported in the said other bore for movement toward and away from the workpiece, resilient means biasing said plunger inwardly, and threaded closure means disposed in the said one bore of each of the said clamps to retain an hydraulic medium within the body under pressure, the closure means on one of the said clamps comprising a threaded piston adapted to be advanced into the said one bore of the clamp associated therewith to project the associated plunger outwardly to a work-engaging position.

3. A work-supporting clamp assembly comprising a bed for receiving a workpiece, a pair of spaced apart parallel rails extending longitudinally of the bed and projecting upwardly therefrom, a pair of cross plates extending transversely of the bed and slidable along the said rails, means for securing the cross plates to the rails in adjusted positions thereon adjacent opposite ends of a workpiece resting on the bed, a pair of hydraulic work-supporting clamps respectively secured to the said cross plates, each of the said clamps comprising a generally L-shaped body having one leg portion secured to a cross plate and wherein one bore is provided to receive an hydraulic medium, the said body also having another leg portion projecting toward the workpiece and which is provided with a plurality of parallel bores all of which communicate with the said one bore and all of the bores in the body being open at the ends of the respective leg portions, a work-engaging plunger slidably supported in each of the said parallel bores, spring means biasing each plunger inwardly in its respective bore, and closure means for the said one bore in each of the clamps adapted to retain an hydraulic medium within the body under pressure, the closure means for one of the said clamps comprising a manually operable piston movable into the body to increase hydraulic pressure therewithin and to project the plungers associated therewith outwardly to work-engaging positions under substantially equal force.

4. A work-supporting clamp assembly comprising a generally horizontal bed for receiving a workpiece, a pair of spaced apart generally horizontal rails extending longitudinally of the bed and projecting upwardly therefrom, a pair of cross plates extending transversely of the bed, and slidable along the said rails, means for secur-

ing the cross plates to the rails in adjusted positions thereon adjacent opposite ends of a workpiece resting on the bed, a pair of hydraulic work-supporting clamps respectively secured to the said cross plates, each of the said clamps comprising a generally L-shaped body having a leg portion disposed in a substantially vertical plane and adjustably secured to a cross plate, the said leg portion being provided with one bore adapted to receive an hydraulic medium, the said body also having a generally horizontal leg portion which is provided with a plurality of substantially horizontal bores all of which communicate with the said one bore and all of which have open ends facing an end of the workpiece, a work-engaging plunger slidably supported in each of the said horizontal bores for movement toward and away from the workpiece, spring means biasing each plunger inwardly in its respective bore, and closure means for the said one bore in each clamp adapted to subject an hydraulic medium within the body to pressure, the said closure means on at least one of the said clamps comprising a manually operable piston which is movable into the bore to increase the hydraulic pressure therein and thereby to project the plungers in the horizontal bores outwardly to work-engaging positions under substantially equal force.

5. A work-supporting clamp assembly comprising a pair of spaced apart longitudinally extending parallel rails, a pair of cross plates connected with an extending between said rails, at least one of said cross plates being slidable along the rails toward and away from the other of said cross plates and having means for connection with the rails in adjusted positions thereon whereby the said cross plates can be located adjacent opposite ends of a workpiece disposed between the rails, a pair of hydraulic work-supporting clamps respectively secured to the said cross plates, each of the said clamps comprising a body provided with a first bore for receiving an hydraulic medium and having one open end and also provided with at least one additional bore communicating with the first bore and having an open outer end facing an end of the workpiece, a work-engaging plunger slidably supported in said additional bore for movement toward and away from the workpiece, and means adapted to close the outer end of the first bore in each clamp and adapted to be advanced into said first bore to subject an hydraulic medium therein to pressure which will project the plunger outwardly into engagement with the workpiece.

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