Sept. 14, 1943. E. C. HOKANSON ET AL 2,329,613

ENGINE WORKSTAND

Filed Feb. 2, 1942 2 Sheets-Sheet 1

Fig. 2

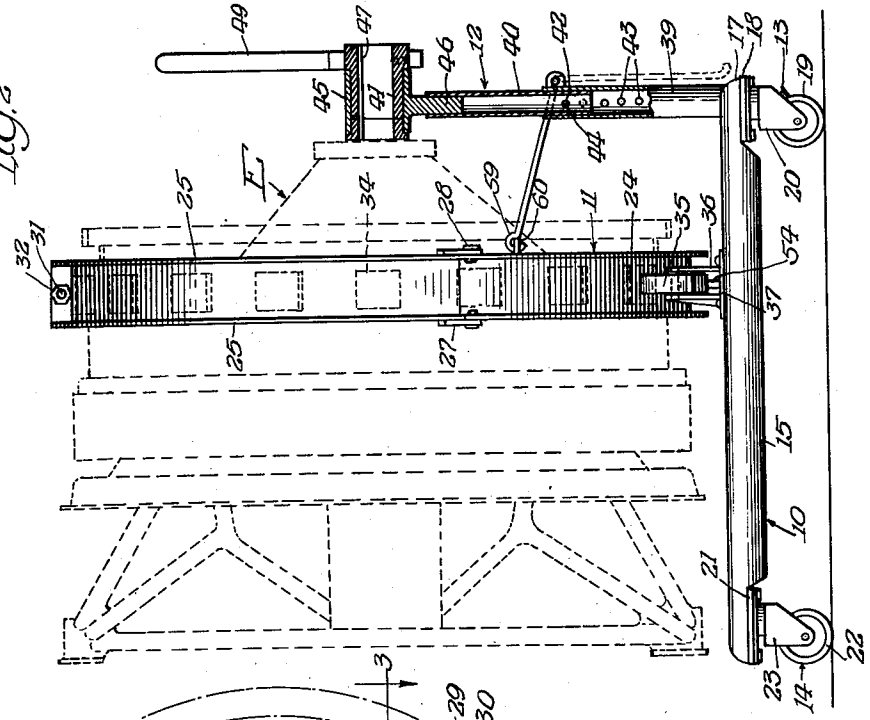
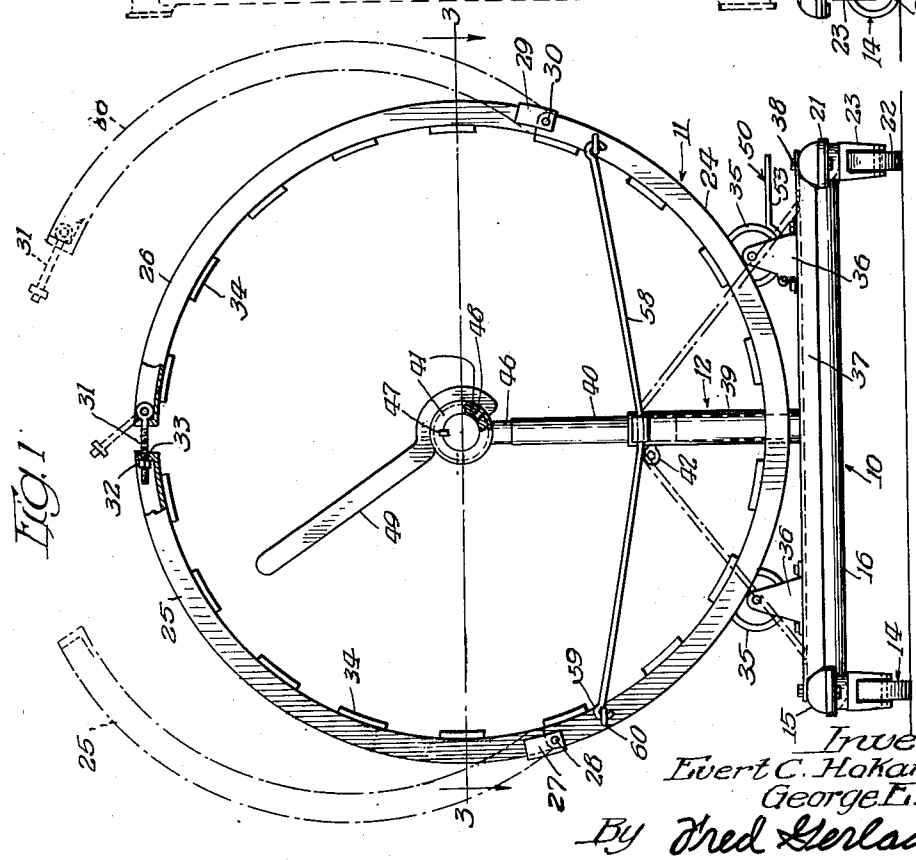


Fig. 1



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Filed Feb. 2, 1942 2 Sheets-Sheet 2

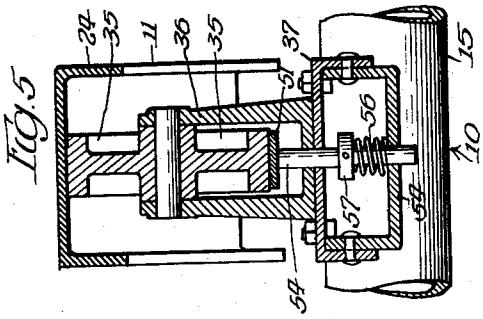


FIG. 5

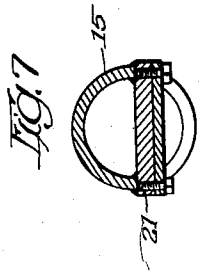


FIG. 7

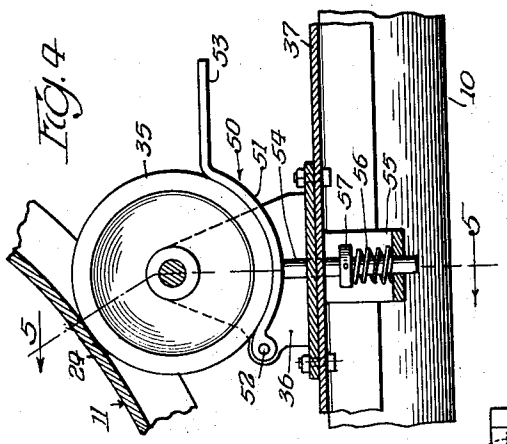


FIG. 4

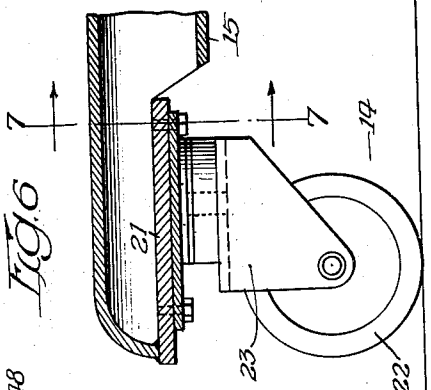


FIG. 6

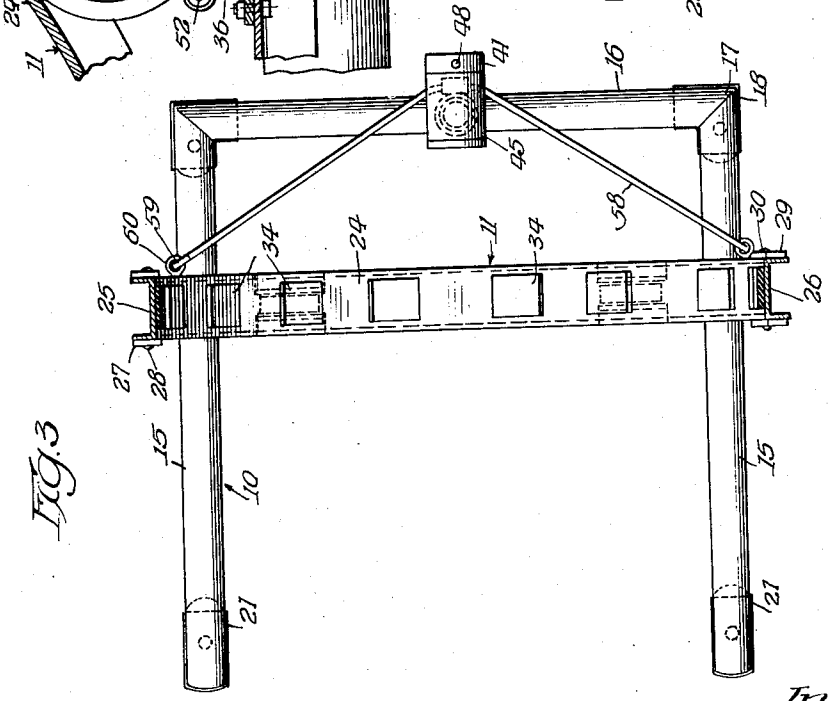


FIG. 3

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UNITED STATES PATENT OFFICE

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ENGINE WORKSTAND

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Application February 2, 1942, Serial No. 429,203

7 Claims. (Cl. 29—89)

The present invention relates generally to workstands. More particularly the invention relates to that type of portable workstand which is designed for use in production assembly lines and serves as a medium for supporting an internal combustion engine during installation or mounting thereon of the various auxiliary equipment such as the mounting structure or supports and the gas and oil lines and other engine accessories, preparatory to mounting of the engine on the vehicle or other mechanism for which it is designed.

One object of the invention is to provide a workstand of this type which is generally of new and improved construction and is characterized by the fact that it not only effectively and efficiently fulfills its intended purpose but also permits the person or worker using the stand to carry out his work on the engine while assuming a standing or upright position.

Another object of the invention is to provide a stand of the type and character under consideration comprising an upstanding ring which is adapted to encircle the engine and is supported by a base frame so that it, together with the engine, may be turned or rotated into different angular positions about a horizontal axis.

Another object of the invention is to provide a workstand of the last mentioned character in which the upstanding rotatably supported ring comprises a pair of adjoining arcuate sections which have releasable clamping means between their adjacent ends and hinges at their other ends and are adapted, upon release of the clamping means, to be swung outwards into an open or inoperative position in order to permit of insertion and removal of the engine with respect to the ring.

Another object of the invention is the provision in connection with an engine workstand of the type under consideration, of a strut which is connected to, and extends upwards from, the base frame and has at its upper end a bearing for receiving and supporting the drive shaft of the engine.

A further object of the invention is to provide a stand of the aforementioned type in which the ring is freely supported so that it may be interchanged with different sized rings, and the upstanding strut consists of a pair of separable telescopically connected parts for supporting the drive shaft of the engine which is held or retained by the particular ring on the base frame of the workstand.

A still further object of the invention is to provide an engine workstand which is both rugged and durable, has casters on the base frame thereof to render it portable, and, due to its design and construction, may be manufactured or produced at a comparatively low cost.

Other objects of the invention and the various advantages and characteristics of the present workstand will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like letters and numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a rear view of an engine workstand embodying the invention;

Figure 2 is a side view, parts of the extensible bearing equipped strut for receiving and supporting the drive shaft of the engine being shown in section for purposes of illustration;

Figure 3 is a horizontal section taken on the line 3—3 of Figure 1 and illustrating in detail the construction and design of the base frame and the engine encircling ring;

Figure 4 is a section showing the design of one of the rollers for rotatably supporting the ring and illustrating the arrangement and construction of the brake means for releasably locking the ring against rotation;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 is a section of one of the casters for the base frame; and

Figure 7 is a section on the line 7—7 of Figure 6.

The workstand which is shown in the drawings constitutes the preferred form or embodiment of the invention. It is preferably of the portable type or variety and serves, as described hereafter more in detail, as a medium or means for supporting a radial engine E during installation or mounting thereon of the various auxiliary equipment. The engine E is of the airplane type and comprises in addition to a crank case and an annular series of radially extending cylinders, rocker boxes at the sides of the cylinders and a drive shaft which projects forwards from the front portion of the crank case. Preparatory to installing the engine E on the airplane for which it is designed it is necessary to mount on the engine the auxiliary equipment,

including the mounting structure or supports for attaching the engine in place and the engine accessories, such as the gas and oil lines and parts of the cowling structure. The improved workstand retains or supports the engine in a position wherein the drive shaft extends horizontally, and enables the person or worker operating on the engine to install the auxiliary equipment while he is in a standing position. As its principal parts the workstand comprises a base frame 10, an engine encircling ring 11 and an upstanding strut 12.

The base frame 10 is in the form of a horizontally extending U-shaped pipe and is sustained or supported in spaced relation with the floor over which the workstand is employed by way of a pair of front casters 13 and a pair of rear casters 14. The pipe is formed of steel or any other suitable material and consists of a pair of laterally spaced parallel side pieces 15 and a front cross piece 16. The front piece extends between the front ends of the two side pieces and is connected at its ends to the front ends of the side pieces by right angle bends 17. Such bends have the lower portions thereof cut away and provided with flat horizontally extending plates 18. These plates are welded or otherwise fixedly secured to the cut away lower portions of the bends and overlie the front casters 13. Such casters consist of wheels 19 and inverted U-shaped brackets 20 which straddle the wheels 19 and are connected to the plates 18 by swivel type connections. The under portions of the rear ends of the side pieces 15 of the U-shaped pipe constituting the frame 10 are cut away and have flat horizontally extending plates 21. The latter are welded or otherwise fixedly secured in place and over lie the rear casters 14. Such casters, as shown in Figure 6, consist of small wheels 22 and inverted U-shaped brackets 23. The brackets 23 straddle the wheels 22 and have swivel connections between them and the plates 21. The front and rear casters 13 and 14 permit the workstand to be shifted bodily in any direction over the floor or other supporting surface.

The ring 11 is preferably of channel shaped cross section and consists of an arcuate lower section 24 and a pair of upper opposed complemental arcuate sections 25 and 26. It is positioned in an upstanding manner over the central portion of the base frame 10 and is adapted to encircle and be clamped around the engine E (see Figure 2). The lower section 24 of the ring 11 extends throughout an arc of somewhat less than 180° and embodies a web and a pair of laterally spaced outwardly extending side flanges. The upper sections 25 and 26 normally extend upwards and inwards from the ends of the lower section 24 and like the lower section, comprise intermediate webs and outwardly extending laterally spaced side flanges. The upper section 25 extends through an arc of slightly more than 90° and is connected at its lower end to the adjacent end of the lower section by way of a hinge. The latter is in the form of a pair of plates 27 which are welded to the lower ends of the side flanges of the section 25 and have rivet type pivots 28 between them and the adjacent ends of the side flanges of the lower section 24. The hinge consisting of the plates 27 and the pivots 28 permit the upper section 25 to be swung outwards into an inoperative position, as shown by dotted lines in Figure 1. The upper section 26 of the ring 11, like the section 25, extends through an arc of slightly more than 90°. The lower end of the upper ring section 26 is connected to the adjacent end of the lower section 24 by way of a hinge so that it also may be swung outwards into an inoperative position. The last mentioned hinge consists of a pair of plates 29 which are welded to the lower ends of the side flanges of the upper section 26 and have rivet type pivots 30 between them and the adjacent ends of the side flanges of the lower section 24. The ring 11 is adapted to be contracted into encircling and clamped relation with the engine E by way of a hinge bolt 31. This bolt is provided with a nut 32 and is hinged to the upper end of the ring section 26 so that it may be swung into lapped relation with the upper end of the section 25, as shown in Figure 1. The upper end of the section 25 is provided with a lug 33 which has a notch for receiving the shank of the hinge bolt 31. When the hinge bolt is in place within the notch the nut 32 is positioned adjacent the outer face of the lug 33 and is adapted when tightened to contract the ring 11 around the engine E. To release the engine it is only necessary to loosen the nut 32 and swing the hinge bolt 31 out of engagement with the lug 33. Upon release of the hinge bolt the upper sections 25 and 26 of the ring are free so that they may be swung outwards or apart into their open position. When the upper sections are in such position the engine may be inserted into, or removed from, the ring. It is contemplated that the engine E shall be manipulated into, and removed from, the ring by way of an overhead sling. The webs of the ring sections are provided on their inner faces with equidistantly spaced cushion type pads 34 and these are adapted to engage the outer ends of the rocker boxes of the engine. The ring is supported by a pair of rollers 35 so that it, together with the engine E, may be shifted into different angular positions about a horizontal axis which coincides with the center of the ring and the axis of the drive shaft of the engine. The rollers 35 are disposed between the side flanges of the ring sections and engage during rotation of the ring the outer faces of the webs of the ring sections. They are located inwards of the side pieces 15 of the U-shaped pipe constituting the base frame 10 and are rotatably supported by way of a pair of U-shaped brackets 36 on a horizontally extending beam 37. The latter is preferably of the channel variety. It is disposed in parallel relation with the front cross piece 16 of the frame 10. The ends of the beam 37 are shaped to rest upon the side pieces 15 and are fixedly secured in place by way of vertically extending bolts 38. The latter extend through aligned holes in the ends of the cross web of the beam and the subjacent portions of the side pieces 15. The U-shaped brackets 36 for rotatably supporting the rollers 35 are bolted or riveted to the upper face of the cross web of the beam 37. The rollers 35, being free to rotate, permit the ring to be rotated in either direction into different angular positions. By supporting the ring rotatably the engine E, when in place within the ring, may be swung or rotated in one direction or the other so as to bring the various parts thereof into proper position for ready mounting of the auxiliary equipment for the engine.

The upstanding strut 12 is adapted to receive, and serves as a supporting means for, the outer

end of the drive shaft of the engine E. It is located over the central portion of the cross piece 16 of the base frame 10 and consists of a vertically extending tubular lower part 39, a vertically extending tubular part 40, and a cylindrical bearing 41. The lower end of the lower part 39 is welded or otherwise fixedly secured to the central portion of the front cross piece 16 and the upper end of said lower part is open. The upper part 40 is smaller in diameter than the lower part 39 and the lower end thereof fits snugly and slidably within the upper end of the upper part, as shown in Figure 2. Because of the telescopic or sliding connection between the upper and lower parts 40 and 39 the strut 12 may be adjusted as to length. The two parts are releasably secured in their various adjusted positions by way of a cross bolt 42. The latter is adapted to extend through any one of a vertical series of holes 43 in the upper end of the lower part 39 and a hole 44 in the lower end of the upper part 40. When it is desired to adjust the upper part 40 of the strut with respect to the lower part 39 the bolt 42 is removed and the upper part is raised or lowered as desired. As soon as the upper part is adjusted to the desired position the bolt is inserted into the hole 43 which registers with the hole 44 and then is shifted inwards into the hole 44. The bearing 41 is at the upper end of the upper part 40 of the strut and is rotatably mounted in a cylindrical shell 45. It is adapted to receive the outer end of the drive shaft of the engine and is suitably secured against axial displacement with respect to the shell. The shell is provided with a fixed depending stem 46 which fits within and is welded or otherwise suitably attached to the upper end of the upper part 40 of the strut. As shown in Figure 2, the bearing 41 is provided on the inner periphery thereof with a longitudinally extending key 47. This key is adapted to fit within one of the grooves in the outer end of the drive shaft of the engine E and serves, when the engine is mounted on the workstand, to lock the bearing 41 to the drive shaft. The outer end of the bearing is provided with one or more holes 48 whereby a wrench 49 of the spanner variety may be applied to it should it be desired to turn the engine shaft while the engine is in place in the ring 11. When the engine is in place in the ring 11 the bearing 41 and the two ring-supporting rollers 32 constitute a three point support for the engine and prevent the ring and engine from tipping or tilting with respect to the base frame 10. In assembling the engine with respect to the workstand the upper part 40 of the strut is removed from the lower part 39 and is applied to the engine by shifting the bearing 41 around the outer end of the drive shaft. Thereafter the engine is lowered so as to bring it within the ring. During lowering of the engine the lower end of the upper part 40 of the strut is manipulated into the upper end of the lower part 39. By reason of the fact that the bearing 41 is rotatably mounted within the cylindrical shell 45 the engine E is free to turn in connection with rotative angular adjustment of the frame of the ring 10.

In order to lock the ring and engine in the various positions into which they are turned or rotated a brake 50 is provided. This brake comprises a brake shoe 51 which underlies one of the ring-supporting rollers 35. The inner end of the shoe is pivotally supported by a pin 52 so that the shoe is free to swing vertically into and out of engagement with the superjacent roller. The outer end of the shoe is provided with a horizontal extension 53 which serves as a foot pedal whereby the brake shoe may be urged or forced downwards when it is desired to release the brake and thus free the ring 10 for rotative adjustment. The brake shoe is urged upwards into engagement or braking relation with the superjacent roller by way of a vertically slidable plunger 54. The latter, as shown in Figures 4 and 5, extend through aligned holes in the web of the channel beam 37 and the bracket for rotatably supporting the roller to which the brake is applied, and is carried by a U-shaped bracket 55. A compression spring 56 extends around the lower end of the plunger and is interposed between the bracket 55 and a collar 57 on the central portion of the plunger. This spring urges the plunger 54 upwards and exerts the desired upward pressure on the brake shoe. When it is desired to release the ring so that it, together with the engine E, may be turned or rotated the foot pedal which is formed by or constitutes the extension 53, is depressed. This operation results in lowering of the brake shoe and the plunger against the force of the spring 56. When the ring is adjusted to the desired extent the foot pedal is released and this results in the spring 56 shifting upwards the plunger 54 and bringing the brake shoe into engagement with the superjacent roller 35. The brake shoe, together with the plunger and compression spring, constitutes simple means for releasably locking the engine encircling ring 10 in the various positions into which it is rotated.

For the purpose of preventing the ring 11 from tilting with respect to the base frame 10 when there is no engine in the ring a brace 58 is provided. The central part of this brace is pivotally connected to the lower part 39 of the strut 12, as shown in Figure 2. The end parts of the brace project rearwards from the strut and have down-turned hooks 59 which are adapted to fit within eyes 60 on the front side flange of the lower section 24 of the ring 10. The brace 58 is only used when there is no engine within the ring since its primary or sole purpose is to prevent dislodgement of the ring from its normal or operative position when the ring is empty. To release the brace it is only necessary to shift the hooks 58 out of interfitting relation with the eyes 59. As soon as the hooks are disconnected from the eyes the brace may be swung forwards with respect to the ring into an inoperative position.

In using the workstand the nut 32 on the bolt 31 is first loosened and then the bolt is swung out of engagement with the notched lug 33 in order to release the upper arcuate sections 25 and 26 of the ring 11. As soon as the sections are released they are swung outwards. Thereafter the upper part 40 of the strut 12 is removed from the lower part 39 and is applied to the outer end of the drive shaft of the engine. After this operation the engine is lowered into the lower section 24 of the ring. During lowering of the engine the lower end of the upper part 40 of the strut 12 is inserted into the upper end of the lower part 39. After the engine is lowered into place the upper sections 25 and 26 of the ring are swung inwards into encircling relation with the upper cylinders of the engine. Thereafter the ring is contracted into clamped relation around the engine by use of the hinge bolt 33. After contraction of the ring around the engine the bolt 42 is manipulated so as to lock the upper

and lower parts of the strut 12 in place. When the engine is in place on the workstand the various auxiliary parts or equipment may be readily applied to it. If it is desired to work on the lower portion of the engine the brake consisting of the brake shoe 51 is released by depressing the foot pedal type extension 53. Thereafter the ring 11, together with the engine, is rotated so as to raise the lower portion of the engine to the most convenient height for work thereon. As heretofore pointed out, the ring and engine may rotate in one direction or the other. Because the ring is capable of being rotated at least 90° in either direction it is possible rotatably to adjust the engine so that work may be conveniently done on it while the operator or worker assumes a standing position. When the ring is in place around the engine the pads 34 grip yieldingly the rocker boxes and hence no damage or injury to the engine occurs. Should it be desired to turn the drive shaft of the engine while the latter is in the ring 11 and locked against rotation relatively to the base frame 10 by the brake 50 it is only necessary to apply the wrench 49 to the outer end of the bearing 41 and then swing the wrench in the desired direction.

The herein described engine workstand is essentially simple in design and construction and hence may be manufactured at a low and reasonable cost. It is rugged and durable and may be readily shifted from place to place due to the fact that the base frame 10 is caster-equipped. The workstand may be used on engines that vary in size by substituting a larger or smaller ring for the ring 10, depending upon whether the stand is used with a larger or smaller engine. Due to the fact that the strut 12 includes the vertically adjustable upper bearing equipped part 40 it is immaterial whether rings of different sizes are employed.

Whereas the workstand has been described as being particularly designed for use in connection with a radial engine of the airplane type it is to be understood that it may be used in connection with engines other than radial engines or airplane engines. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what we claim as new and desire to secure by Letters Patent is:

1. A workstand designed to support an engine with radial cylinders and comprising a horizontal base frame with aligned supporting members thereon, and an upstanding contractable ring over the base frame adapted to encircle the cylinders of the engine and mounted on the supporting members so that it, together with the engine, may be turned about its axis, said ring including an arcuate lower section and a pair of adjoining arcuate upper sections with hinges between their far or remote ends and opposite ends of the lower section whereby they may be swung apart into an open position in order to permit the engine to be inserted into, and removed from, the ring, and additionally including releasable clamping means at the adjacent ends of the upper sections whereby when said upper sections are in their normal position the ring may be contracted into clamped relation with the engine.

2. A workstand designed to support an engine with radial cylinders and comprising a horizontal base having a plurality of longitudinally aligned rollers thereon, and an upstanding contractable ring above the frame and with outwardly extending side flanges, adapted to encircle the cylinders of the engine, and arranged so that the rollers engage the bottom portion thereof between said side flanges and support it so that it, together with the engine, may be turned about its axis, said ring including an arcuate lower section and a pair of adjoining arcuate upper sections with hinges between their far or remote ends and opposite ends of the lower section whereby they may be swung apart into an open position in order to permit the engine to be inserted into, and removed from, the ring, and additionally including releasable clamping means at the adjacent ends of the upper sections whereby when said upper sections are in their normal position the ring may be contracted into clamped relation with the engine cylinders.

3. A portable workstand designed to support an engine with radial cylinders and a drive shaft with an exposed end, and comprising a horizontal base frame, an upstanding transversely split contractable ring over the base frame, adapted to encircle the cylinders of, and carry, the engine, provided with means for contracting it into clamped relation with the engine cylinders, and mounted rotatably on the base frame so that it, together with the engine, may be turned about its axis, and an upstanding strut mounted on the base frame in opposed relation with the ring and provided at its upper end with a bearing for receiving and rotatably supporting the exposed end of the drive shaft when the engine is carried by the ring.

4. A workstand designed to support an engine with radial cylinders and a drive shaft with an exposed end, and comprising a portable horizontal base frame having a plurality of longitudinally aligned rollers thereon, an upstanding contractable split ring adapted to encircle the cylinders of, and carry, the engine, provided with means for contracting it into clamped relation with said engine, and resting freely on the rollers so that it, together with the engine, is permitted to turn about its axis, and an upstanding vertically extensible strut mounted on the base frame in opposed relation with the ring and provided at its upper end with a bearing for receiving and rotatably supporting the exposed end of the drive shaft when the engine is in the ring.

5. A workstand designed to support an engine with radial cylinders and a drive shaft with an exposed end, and comprising a portable base frame, an upstanding contractable split ring over the base frame adapted to encircle the cylinders of, and carry, the engine, provided with means for contracting it into clamped relation with said engine, and mounted rotatably on the base frame so that it, together with the engine, may be turned about its axis, and an upstanding strut on the base frame and in opposed relation with the ring, provided at its upper end with a rotatable bearing for receiving and rotatably supporting the exposed end of the drive shaft when the engine is in the ring and embodying a pair of elongated aligned longitudinally adjustable and separable parts together with releasable means for securing the parts in their various adjusted positions.

6. A workstand designed to support an engine with radial cylinders and a drive shaft with an exposed end, and comprising a base frame with a plurality of longitudinally aligned rollers thereon,

an upstanding ring adapted to encircle the cylinders of, and carry, the engine, and mounted on the rollers so that it, together with the engine, is permitted to turn about its axis, means associated with the base frame for receiving and rotatably supporting the exposed end of the drive shaft, and means independent of the rollers for preventing tilting of the ring relatively to the base frame when no engine is supported by the workstand.

7. A workstand designed to support an engine with radial cylinders and a drive shaft with an exposed end, and comprising a base frame with a plurality of longitudinally aligned rollers thereon, an upstanding ring adapted to encircle the cylinders of, and carry, the engine, and mounted on the rollers so that it, together with the engine, is permitted to turn about its axis, an upstanding strut mounted on the base frame in opposed relation with the ring and provided at its upper end with a bearing for receiving and rotatably supporting the exposed end of the drive shaft when the engine is in the ring, and a releasable brace between the strut and the ring for preventing tilting of the ring relatively to the base frame when no engine is supported by the workstand.

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