Our invention relates to stands for mounting or positioning work pieces and more particularly to an improved positioning stand which has universal applications for mounting and supporting work pieces, such as engines, motors, and the like, so that the work pieces may have work conveniently performed thereon.

Apparatus or devices of this type are well known and in general use. The present devices for mounting work pieces, however, have various disadvantages which the present invention overcomes. For example, the present day device of this type in attaining universal application to large numbers or sizes of motors, become complex and physically large restricting the accessibility to the various surfaces of the work piece or engine mounted thereon. Further, such devices or supports have normally required large numbers of various size adapters to accommodate a variety of engines and motors. These prior devices generally limit accessibility of the surfaces of the work piece to their general outline of the piece. In addition, most of the prior engine supports required a large amount of setup or mounting time because of the large number of adjustments to be performed thereon.

The present invention is directed to a simplified positioning stand designed to position any size work piece with the provision that such mounting could be accomplished through non-symmetrically located mounting holes in the work piece to provide universal application. This improved positioning stand provides complete accessibility to all parts of the machine or motor mounted thereon and in addition permits any number of connecting members between the stand and the work piece for securing the same thereon. The symmetry of the connecting parts simplifies the manufacture of the device and the arrangement of parts simplifies the balancing of the work piece to be supported on the stand.

Therefore, it is an object of this invention to provide an improved positioning stand which is universal in application to various sized work pieces, such as motors and the like, eliminating the need for special adapters for mounting purposes.

Another object of this invention is to provide an improved positioning stand which is rugged yet mobile and permits working accessibility to all surfaces of the work piece being supported.

Still another object of this invention is to provide an improved positioning stand in which adapter plates and adjustable connecting arms permit connection to various non-symmetrically located mounting holes in the work piece being supported.

It is also an object of this invention to provide in a universal type positioning stand an arrangement of accurately located support members which are adjustable positioned apart to accommodate various sizes of work pieces to be supported in a balanced and positioned while being capable of imparting rotation to the work piece to provide working accessibility to all surfaces of the work piece.

A further object of this invention is to provide an improved positioning stand which is simple in design and construction and requires a reduced number of parts and adjustments in the setup or mounting of a work piece thereon.

These and other objects of this invention will become apparent from the reading of the attached description together with the drawings wherein:

FIG. 1 is a side view in perspective of the improved positioning stand with an object or motor mounted thereon;

FIG. 2 is an end view in perspective of a portion of the improved positioning stand showing details of the construction of the same;

FIG. 3 is another end view in perspective of the improved positioning stand showing the bed way for a portion of the stand;

FIG. 4 is an end view in perspective of a portion of the improved positioning stand showing the method of positioning an object or motor for mounting the same on the stand; and

FIG. 5 is a detailed view in perspective of a connecting arm used in the improved positioning stand.

As will be seen in FIG. 1, the improved positioning stand has a base or frame member 10 which is generally triangular in form. This frame member is made up of a base part of angle iron indicated at 11 with connecting side rails 12 and 13, generally T shaped in form, which are connected at one extremity to the base part 11 through journalling blocks 15 which support and journal casters or wheels 18 for the frame member. The connection of the blocks 15 and the frame parts 11, 12, and 13 may be by suitable means such as welding, the part 11 being connected as will be hereinafter described. The opposite extremity of the frame parts 12 and 13 at the uper part of the triangular form are integral with and connected to an upstanding support member 20 which is generally cylindrical in form and designed to carry the load of the object being supported. Attached to the base of this cylindrical support is a generally U shaped flange member 22 with transversely extending flange parts 24 which mount smaller swiveled casters or wheels 25 through suitable means such as a nut and bolt connection indicated at 30. This wheel arrangement which is conventional provides a maneuverable mounting for the frame while adding to the stability of the same.

Support 20 at its upper or free extremity includes a journal section 32 having bearing means (not shown) which receive and mount a shaft and flange unit 40 to define the axis of rotation of the support. This shaft and flange combination is best seen in FIG. 3 and is operated by a self-locking gear assembly 42 suitably attached to the upstanding support 20 and being connected to the shaft for rotation of the same about the axis of the journal and the shaft. The self-locking gear assembly includes a crank arm 45 by means of which the flange and shaft assembly 40 may be rotated through operation of the gears (not shown in detail). Also included on the upstanding support 20 is a transversely extending trapezoid portion 48 mounted with the gear box of the self-locking gear assembly which is in turn bored to a flange on the pedestal as indicated at the numeral 50.

FIGS. 2 and 3 of the drawings show the frame 10 with the upstanding support 20 and perspective view with the remaining portion of the positioning stand removed. In FIGS. 2 and 3 is shown a flange type support member 52 which is connected to the frame at the side rails 12 and 13. This support member together with the angle frame member 11 of the frame serve as a bed or a supporting structure for supporting member 52 wherein indicated generally at 55 in FIG. 1. The bed for this support member on the frame 10 must be accurately located since it determines the alignment of this part with the axis of the flange and shaft assembly 40 on the pedestal or support member 20. Thus FIG. 2 shows basically the method and apparatus by means of which the support member 52 is aligned for attachment to the side rail parts or members of the frame member 10. A special jig, indicated at 60, and comprised of a rod 62 with a circular flange and hub 64 integral therewith is
positioned over the shaft and flange assembly 49 and attached thereto by suitable means such as nuts and bolts indicated at 65. It will be noted that the flange and shaft assembly includes a shaft like projection 66 thereon defining or locating the axis of the shafting and a similar mating surface in the flange and hub portion 64 of the jig 60 fits over the same to accurately locate the jig on the flange and shaft assembly 40. Connected to the bar type portion of the jig 62 is a rectangular jig member 66 which is normal to the axis or extent of the rod portion 62 and of the same physical dimensions in cross section as a corresponding cross support portion 73 of the support member 55. The jig 60 when positioned on the flange and shaft assembly 40 will define a horizontal surface against which the cross support 52 of the frame member will bear to align its upper surface with the upper edge of the flange member 11 of the frame providing a horizontal bed surface for way parts indicated generally at 75. The cross support member 52 when adjusted in the horizontal plane will be secured to the side rail portions 12 and 13 of frame member 10 by a welding operation and way parts 81, 52 will be positioned on the cross support 52 and temporarily clamped thereon when the rod portion 62 of the jig is in a vertical position. These way parts will provide side bearing surfaces for the cross member 72 of support 55 as will additional way parts 83, 84 which are mounted on the base part 11 of the frame member 10 and welded thereto when the jigs is in the true or vertical position. The support member 72 of the upsetting support 55 will also be positioned in the horizontal direction by the way surfaces on the flange member 11 and support member 52. It will be understood that the flange member 11 is positioned and welded in place on frame member 10 after it is adjusted relative to the jig member 65 and support member 52 to provide the way surface described above.

This assembly provides an elongated way means through which the support member 55 is accurately aligned and rigidly supported on the frame member in the same vertical plane as the support member 20. In addition, the second or removable support member 55 includes an upsetting member 85 attached to and integral with the cross support member 72 which has at a predetermined height or length a hub and journal assembly 66 designed to align axially with the axis of the shaft and flange assembly 40. The second or removable upsetting support member 55 has a pin through the same as the jig 64, is designed to be slidably held in the frame member 11. A top plate 90 is secured to the way parts 81, 82 through suitable metal bolts means 92 threaded into apertures in the way parts and forms therewith a box way which slides, in a close fitting relationship, the surfaces of the cross member 72 of the support member 55 to aid in the positioning of the support member on base member 10. Thus, these members may be adjustably positioned apart to accommodate various sizes of objects or motors to be mounted on and carried by the positioning stand.

FIG. 3 also shows a second support member 95 positioned behind the way parts 81, 82 and above the support member 52. This cross support member is spaced from the support member 52 to provide a spacing therebetween, the purpose of which will be hereinafter noted. The cross support member 95 is suitably attached to the side rails or members 12 and 13 of the frame member 10, such as by welding.

The view in FIG. 3 of the portion of the positioning stand discloses the condition of the positioning stand prior to assembly or mounting of an object or motor thereon. To this structure is added (as shown in FIG. 4) a pair of rectangular temporary support members 100, 101 in the setting or positioning of a motor or object on the positioning stand. These members are identical in form and include a projection on the bottom portion thereof, at as 105, which fits between support members 52 and 95 of the frame member 10 to temporarily position these parts on the frame member so as to provide a temporary bed for the object or motor to be mounted on the frame stand prior to connection to the motor or object. Thus, as will be seen in FIG. 4, the stands or support members 100, 101 are positioned on the frame member and have been positioned thereon the number of blocks indicated generally at 108 which serve to raise the height of the temporary stand in the initial positioning of the motor relative to the positioning stand. Since the positioning stand at this stage of assembly has the support member 55 removed therefrom, the stand is readily accessible for the positioning of a motor relative to the stand prior to connection thereto. Since the objects mounted on this improved positioning stand are normally quite large and heavy, they must be moved into mounting position through auxiliary machinery and provision must be made for temporarily supporting the same in the mounting position while connections are made thereto in the mounting of the object on the stand. Thus the disassembly feature of the improved positioning stand permits ready access to the stand for this initial stage of the mounting operation.

It will be understood, however, that upon connection of the motor or object to be mounted on the stand, the temporary supporting structure of the brackets or supports 100, 101 and the spacing block members 108 will be removed therefrom.

The disclosure of FIG. 4 shows an object to be mounted or motor positioned on a temporary support resting on the frame member prior to assembly or mounting of the motor. The actual height positioning of the motor from the frame member is roughly determined by using the second support member 55 as a guide for aligning the center of gravity or the center of the object to be mounted on the stand in line with the axis of rotation of the positioning stand. This axis of rotation is determined by the alignment of the bore through the journaled section 86 of the support member which is aligned with and coincides with the axis of the shaft and flange assembly 40 on the support member 20. The height of the temporary supporting structure for the object or motor will be roughly determined by sighting through the journalled section 86 onto the motor or object and locating this line of sight in the approximate center line or center of gravity of the motor to be mounted thereon. Once this temporary height has been determined, the second support member is temporarily added and positioned in the journal portion 86 of the support member 55 will be brought into desired proximity with the motor as the support member 55 is inserted into the longitudinal way defined by the way parts 81, 82, and 83, 84. When the desired spacing is obtained with respect to the motor and the support members 20 and 55, the support member 55 will be held against tipping. The motor will then be mounted on the stand through connecting arm means or connecting member provided by a plurality of members identical in construction and shown generally in FIG. 5 at 110. These arms and the remaining portions of the positioning stand provide the flexibility to the mounting of all objects such as motors, engines, transmissions and the like. The members 110 are basically a universal arm with an angle and bracket combination which provide five degrees of relative movement, as will be hereinafter described.

Thus, as will be seen in FIG. 5, the member 110 is comprised of an angle bracket 112 having a bore 114 therein by means of which the connecting member or arm is adapted to be connected to an engine or motor. This connection will be provided by a screw (not shown) extending through the bore 114 and into a tapped hole in the motor. As indicated by the curvature of the brackets 110, an angle of 90° in a circular direction to provide a first axis of adjustment. The opposite extremity of the angle bracket 112 has a second bore therein (not shown) through which the bolt or metal screw 117 extends. The
bracket 112 is connected to a flat circular hub portion 120 of a rod-like member 125, the hub having a mating bore therein designed to be aligned with the bore in the bracket 112 such that the metal screw or bolt extends therethrough and is secured therein by a suitable nut. The circular arrow 122 in FIG. 5 aligned with the axis of the screw 117 indicates relative adjustment in a circular direction between the flange 112 and the circular or cylindrical hub 120 on the rod-like member 125. The rod-like member 125 provides the arm portion of the connection member 110 and is cylindrical throughout its extent except for the circular hub 120. Mounted on this cylindrical surface is a split connecting block 130 having a bore therethrough to accommodate and mount the block on the rod-like member 125. The block 130 has associated therewith a nut and bolt combination indicated generally at 132 which extends through the split portion 134 of the block for the purpose of clamping the same on the rod-like member 125. The straight line 138 with arrows thereon indicate lateral or translational movement of the block 130 on the rod-like member 125. Similarly, the curved arrow 140 indicates that the split block member 130 may be rotated in a circular position on the surface of the rod-like member 125 to provide a circular adjustment thereon. Connected to the split block 130 is a second block member 145 having a bore therethrough (not shown) therein which is located in the various slots and threading into a tapped aperture (not shown) in the block 130 for the purpose ofjournaling and clamping the block 145 on the split block 130. The arrow 150 indicates that the adjustment of the block 145 on the block 130 is in a circular direction. Block 145 also includes a tapped aperture 155 by means of which the block 145 may be mounted on an adapter (to be herein-after described) or on the flange plate 109. The connecting member or means 110 thus provides a universal joint connection at either extremity of the connecting member with a sliding connection positioned therebetween. The block assembly 130, 145 in addition provides another axis of circular motion with respect to the rod-like member 125 to provide an arrangement by which the connecting members may be readily connected to various non-symmetrically located and relatively inaccessible mounting holes in the motor or object to be mounted.

As to accessibility to the time for performing operations thereon. Further, the provision of permitting the connecting members to be connected to the motor at various mounting holes while still maintaining the desired relationship between the motor center line and the axis of the positioning stand, permits the motor to be mounted in such a manner that oblique surfaces to the general profile or outline of the motor may be oriented with respect to the surface upon which the frame 10 is positioned to permit working operations thereon without obstruction from the positioning stand parts. Thus, recesses in a motor block, slanting surfaces thereon, and the cylinder bores in V type engines may be oriented with respect to the floor or surface upon which the stand is positioned to provide working accessibility thereto without special positioning of the working tools. The design and construction of parts for the positioning stand permits universal application in the mounting of various sized and shaped motors as well as mounting of the motors in various positions for universal application.

Also mounted on the frame member 10 and shown basically in phantom at 200 is a cover that fits over the frame member after the object or motor has been assembled thereon which cover will serve to protect the working surfaces of the apparatus and to shield or cover the interior or frame from parts which might be dropped during the working operation on the object being mounted.

The improved positioning stand in the use of the triangular shaped frame or base reduces the area of support for the positioning stand on the surface on which
it is positioned and thereby permits greater accessibility from the standpoint of bringing auxiliary working machines into adjacent position with the object mounted on the positioning stand. This does not, however, affect the stability of the same since the caster and wheel arrangement as well as the triangular frame shape provides stability and maneuverability for the positioning stand. The object mounted on the stand may be rotated freely thereon through operation of the crank 45 and self-locking gear assembly so that the motor or object to be positioned may be rotated to any desired working position and securely locked therein. By positioning the motor in a balanced attitude relative to the stand supports 55 and 28, a safe and convenient mounting of the object is obtained.

While we have described the present stand as mounting an object and referred to the object basically as a motor, it will be understood that any type of machinery which may be physically accommodated by the stand and has mounting holes therein may be so positioned thereon. It will be recognized that changes in the shapes of the parts may be made within the scope of the invention and hence the invention should be limited only by the appended claims.

We claim:

1. A positioning stand, comprising in combination,
   (a) a frame member,
   (b) a first upstanding support integral with said frame member,
   (c) shaft means including slotted mounting plate means journalled in the free extremity of said first upstanding support,
   (d) a second upstanding support removably positioned on said frame member and horizontally spaced from said first named support,
   (e) elongated means included on said frame member for slidably mounting said second upstanding support with the axis of said ways means being positioned parallel to and in a vertical plane with the axis of rotation of said shaft means in said first named support,
   (f) second shaft means including slotted plate means rotatably carried in the free end of said second named support and being freely rotatable about an axis aligned with the axis of said shaft means in said first named support,
   (g) and a plurality of connecting arm means adjustably mounted on the slotted plate means of each of said shaft means in said supports, said connecting means each including a slidably connected shaft type member and a universal type adjusting member at the extremities thereof, the free ends of said connecting means being adapted to mount a work piece therebetween.

2. A positioning stand, comprising in combination,
   (a) a frame member,
   (b) a first upstanding support integral with said frame member,
   (c) shaft means including a flange plate at one extremity thereof journalled in the free end of said first 60 upstanding support,
   (d) means included in the free end of said support and connected to said shaft means for rotating said shaft means on said support about an axis normal to the extent of said upstanding support,
   (e) a second upstanding support removably positioned on said frame member and horizontally spaced from said first named upstanding support,
   (f) means included on said frame member for slidably mounting said second named upstanding support for movement along an axis parallel to the axis of rotation of said shaft in said first named support,
   (g) a journalled shaft with a slotted flange plate attached thereto rotatably carried by the free end of said second named support and being freely rotatable about an axis aligned with the axis of said shaft in said first named support,
   (h) a slotted adapter plate mounted on the flange of said shaf thereon in said first named support for rotation therewith,
   (i) and a plurality of connecting arm means each of which is mounted at one extremity on one of said plates of said support members and adapted to mount a work piece to be supported thereon, each of said arm means having five joint members providing movement which includes two axes of rotative movement on each extremity of said arm means separated with an axis of longitudinal sliding movement along the extent of said arm means.

3. The positioning stand of claim 2 in which the frame member is triangular in form and said first named upstanding support is integral with the apex of the triangular form.

4. The positioning stand of claim 2 in which the means mounted on said first named support for rotating said shaft and flange plate therein to the self-locking gear assembly and operating handle to provide for rotative movement of said shaft means about the axis normal to said first named support.

5. The positioning stand of claim 2 in which the joint members of said connecting arm means include means for clamping the arm means at all of said joint members after desired adjustment and movement.

6. The positioning stand of claim 2 in which the means included on the frame member are flange members secured to the triangular frame member having a way rigidly secured thereon with the sliding axis of the way being positioned parallel to and in a vertical plane with the axis of rotation of said shaft means in said first named support.

7. A positioning stand, comprising in combination,
   (a) a triangular frame member,
   (b) a first upstanding support integral with said frame member,
   (c) shaft means including slotted mounting plate means journalled in the free extremity of said first upstanding support,
   (d) a second upstanding support removably positioned on said frame member and horizontally spaced from said first named support,
   (e) elongated means included on said frame member for slidably mounting said second upstanding support with the axis of said ways means being positioned parallel to and in a vertical plane with the axis of rotation of said shaft means in said first named support,
   (f) second shaft means including slotted plate means rotatably carried in the free end of said second named support and being freely rotatable about an axis aligned with the axis of said shaft means in said first named support,
   (g) and a plurality of connecting means adjustably mounted on the slotted plate means of each of said shaft means in said supports, said connecting means each including a slidably connected shaft type member and a universal type adjusting member at the extremities thereof, the free ends of said connecting means being adapted to mount a work piece therebetween.
(d) a second upstanding support removably mounted on said frame member and horizontally spaced from said first named support,
(e) said second upstanding support including an upstanding portion and an elongated horizontal bar member carried by the lower end of said upstanding portion and extending normal to said upstanding portion and toward said first named support,
(f) elongated horizontal way means including on said frame member and accurately trued relative to the axis of rotation of said shaft means and slidably receiving said horizontal bar member in close-fitting relation,
(g) the axis of said way means extending parallel to and being positioned in a vertical plane with the axis of rotation of said shaft means in said first named support,
(h) said horizontal bar member being readily removable from said way means and constituting the sole support for said second named upstanding support upon said frame member,
(i) second shaft means including slotted plate means rotatably carried in the free end of said second named support and being freely rotatable about an axis aligned with the axis of said shaft means in said first named support, and
(j) a plurality of connecting means adjustable mounted on the slotted plate means of each of said shaft means in said supports and each having free ends adapted to mount a work piece therebetween.

9. A positioning stand, comprising:
(a) a frame member,
(b) a first upstanding support mounted with said frame member,
(c) shaft means including mounting adapter means journalled in the free extremity of said first upstanding support,
(d) a second upstanding support removably mounted on said frame member and horizontally spaced from said first named support,
(e) said second upstanding support including an upstanding portion and an elongated horizontal bar member carried by the lower end of said upstanding portion and extending normal to said upstanding portion and toward said first named support,
(f) elongated horizontal way means included on said frame member and accurately trued relative to the axis of rotation of said shaft means and slidably receiving said horizontal bar member in close-fitting relation,
(g) the axis of said way means extending parallel to and being positioned in a vertical plane with the axis of rotation of said shaft means in said first named support,
(h) said horizontal bar member being readily removable from said way means and constituting the sole support for said second named upstanding support upon said frame member,
(i) second shaft means including mounting adapter means rotatably carried in the free end of said second named support and being freely rotatable about an axis aligned with the axis of said shaft means in said first named support, and
(j) a plurality of connecting means adjustable mounted on the mounting adapter means of each of said shaft means in said supports and each having free ends adapted to mount a work piece therebetween.