March 14, 1950 H. BERG 2,500,653

LAYOUT COPIER WITH TRANSFER SCREWS AND GAUGING DRIVER

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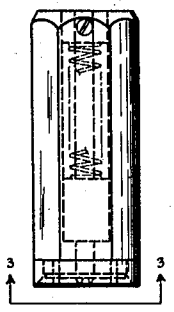


Fig. 1

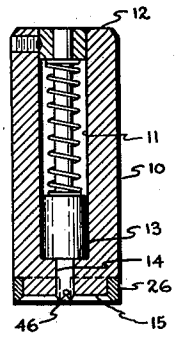


Fig. 2

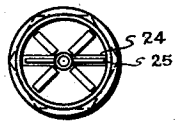


Fig. 3

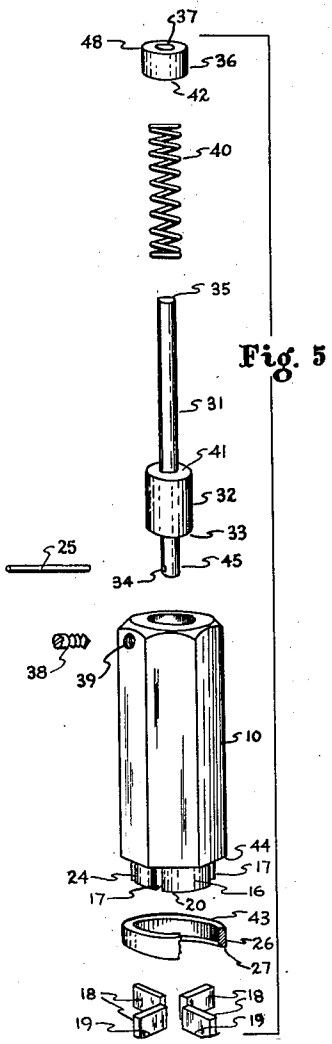


Fig. 5

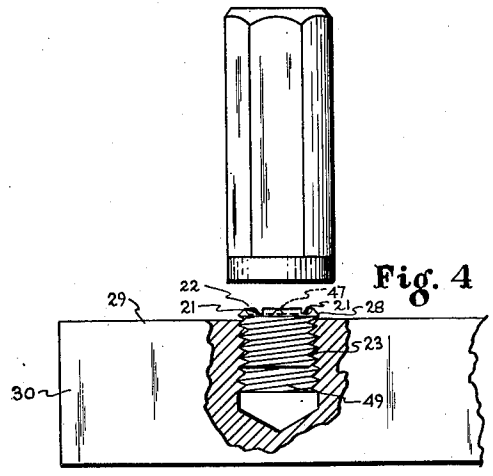


Fig. 4

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LAYOUT COPIER WITH TRANSFER SCREWS AND GAUGING DRIVER

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16 Claims. (Cl. 33—189)

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This invention relates to transfer screws and more particularly to a combination gage and driver for adjusting the cutting surfaces of transfer screws to a uniform height.

The necessity of accurately transferring the centers of one or more tapped holes from one piece of stock to another frequently arises in the manufacture of various types of tooling. Toolmakers commonly resort to the use of transfer screws as a simple and effective method of transferring the location of such centers especially in the case of so-called "blind" holes such as are frequently encountered in the manufacture of dies which are not provided with flanges or the like capable of receiving through holes for attaching the dies to their respective die shoes.

The transfer screws are commonly provided with a center punch and a concentric drill circle which permits location of a drill to be checked after starting the drilling operation.

While the use of transfer screws is an expedient and highly accurate means for transferring the centers of a group of tapped holes from one piece of stock to another, satisfactory results normally require that the marking edges of all screws used in a single transfer operation be accurately positioned in the plane of the surface of the stock to which the centers are to be transferred. Otherwise, when such piece of stock is tapped with a hammer or pressed down against the transfer screws by other means, one or more of the screws will fail to leave a clear impression. This is especially true where it is desired to use transfer screws having a concentric marking edge since the contact surface of a group of such screws is very much larger than in the case of a similar group of screws having only centering points.

Since a transfer of centers is normally required where two pieces of stock are required to be held together by common studs or bolts, the adjacent contact surfaces of such pieces most frequently lie in a flat plane. In such cases the positioning of the marking edges of a group of transfer screws at a uniform height relative to the plane surface of the piece in which the transfer screws are located will serve to cause all of such marking edges to lie in a plane corresponding to the surface of the piece to which the centers are to be transferred and when such piece is brought into contact with the transfer screws and tapped or otherwise pressed against them, each of the screws will leave a uniform and clear centering mark.

The problem of so adjusting each of a group of transfer screws to a proper height has hereto-

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fore presented considerable difficulty and has resulted in a great deal of lost time in marking and re-marking the pieces to which the centers are to be transferred. Various devices have been used in the past to automatically locate the projecting height of a transverse screw such as the provision of a shoulder on the screw to limit the threaded engagement to a predetermined maximum. To the best of my knowledge none of such devices have included any provision for compensating for wear in the cutting edges of the screw which naturally result in varying the dimensions of particular screws.

It is the principal object of the present invention to provide a transfer screw, gage and driver which will permit each of a group of transfer screws to be quickly and accurately leveled to a position such that each of their cutting edges will lie at a uniform distance from the surface of the piece in which the transfer screws are engaged.

Another object is to provide a transfer screw of the type having a central marking point and a concentric marking edge with a plurality of notches adapted to be drivingly engaged by driving lugs in the adjusting gage.

A further object is to provide a gage and driver for such transfer screw which is adaptable to screws having a variety of threaded and marking edge diameters.

Another object is to provide a gage having one surface for registering against the surface of the piece in which the screws are located, a yieldable surface for registering against the marking edge of the centering screw and a means for gaging the relative displacement of such surfaces while the screw is simultaneously being adjusted in height.

These and other objects will appear more clearly from the following detailed description of a particular embodiment of the invention and from an examination of the drawings forming a part hereof, wherein

Fig. 1 is a side elevation of the gage and driver assembly.

Fig. 2 is a sectional elevation of the gage and driver assembly.

Fig. 3 is an end elevation of the gage and driver assembly taken along the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional side elevation of a transfer screw engaged in a blind threaded hole, the gage and driver being shown adjacent thereto in near driving relationship.

Fig. 5 is an exploded perspective view of the various components of the gage and driver.

Referring to Figs. 2 and 5, it will be seen that the main body 10 comprises a hexagonal sleeve having a cylindrical bore 11 with a uniform diameter from the top surface 12 of the sleeve to the shoulder 13 and a reduced bore 14 extending from the shoulder 13 to the bottom surface 15 of such sleeve. As most clearly seen in Fig. 5, a reduced cylindrical section 16 at one end of the sleeve 10 is provided with radially extending slots 17 into which four rectangular lugs 18 are inserted with a press fit. The lower edges 19 of the lugs 18 project longitudinally beyond the lower edge 20 of the sleeve 10 by an amount sufficient to permit such lugs to engage corresponding notches 21 formed in the marking edge 22 of a transfer screw 23, as shown in Fig. 3. An additional transverse slot 24 is provided in the reduced end 16 of the sleeve 10 to accommodate a gaging pin 25 with sufficient clearance to permit such gaging pin to readily move within such slot.

A ring 26 is provided to fit over the end 16 of the sleeve 10 with a press fit. The lower edge 27 of the ring 26 extends longitudinally below the bottom edge 20 of the sleeve 10 and is provided with a sufficient internal diameter to overlie the edge 28 of the transfer screw 23, thereby permitting the edge 27 to contact the surface 29 of the piece 30 in which the transfer screw is located while the lugs 18 are simultaneously engaged with the notches 21 of the transfer screw 23. A rod 31 is provided with an enlarged cylindrical section 32 having a diameter somewhat smaller than the internal bore 11 of the sleeve 10 permitting the rod 31 to move downwardly within the bore 11 to the point where the lower shoulder 33 contacts the shoulder 13 of the sleeve 10. A hole 34 is provided at the lower end of the rod 31 having an axis perpendicular to that of the rod 31. The gaging pin 25 extends through the hole 34 and transmits any longitudinal movement along the axis of the gage to the end 35 of the rod 31. A short sleeve 36 having a diameter substantially equal to that of the section 32 of rod 31 is provided with a bore 37 just large enough to permit the end 35 of the rod 31 to slide therein. A lock screw 38 passes through a threaded hole 39 at the top end of the sleeve 10 to engage and lock the sleeve 36 in a fixed position, a spring 40 being interposed under compression between the shoulder 41 of the rod 31 and the shoulder 42 of the sleeve 36 thereby urging the lower shoulder 33 of rod 31 into engagement with the shoulder 13 of sleeve 10.

The respective parts of the gage and driver are normally assembled in the following manner: The lugs 18 are first pressed into their respective slots 17. The rod 31 is then dropped into the bore 11 whereupon the hole 34 is aligned with the pin slot 24. The pin 25 is next inserted through the hole 34 and moved to a position where its ends lie within the outer diameter of the reduced section 16 of the sleeve 10 whereupon the ring 26 is pressed onto the cylindrical section 16 to a position where its top edge 43 engages the shoulder 44 of the sleeve 10. In this position the lateral movement of the pin 25 is limited by the ring 26 and the longitudinal movement of the rod 31 is limited in one direction by the engagement of its shoulder 33 with the shoulder 13 of sleeve 10 and in the opposite direction by the contact of pin 25 with the upper end of its slot 24 coinciding with the shoulder 44 of the sleeve 10. The length of the lower end 45 of the rod 31 and the location of the hole 34 are such as to permit the pin 25 in its normal position to extend beyond

the lower surface 20 of the sleeve 10 in which position it may contact the concentric marking edge 22 of a transfer screw 23 at two points.

After the ring 26 has been positioned, the spring 40 is dropped onto the rod 31 and the sleeve 36 is then slipped over the end 35 of the rod 31 to a suitable position compressing the spring 40. The lock screw 38 is then tightened against the sleeve 36 completing assembly of the gage. The respective parts are dimensioned and positioned in assembly so that the end 35 of rod 31 will normally lie within the sleeve 36 somewhat below the upper surface 48 of such sleeve. The normal limits of the movement of rod 31 and the pin 25, as may be effected by the contact of the pin 25 with the marking edge of a transfer screw 23, permit the end 35 to move up beyond the surface 48 of the sleeve 36.

As shown in Figs. 2 and 3, the lower end 45 of the rod 31 is provided with an internal conical chamfer 46 which communicates with the hole 34, thereby providing clearance for the centering point 47 of the transfer screw 23, the apex of which normally lies in the plane of the marking edge 22.

As previously mentioned, the lower edge 27 of the ring 26, the lower edges 19 of the lugs 18, and the pin 25 in its normal position all extend longitudinally beyond the lower end 15 of the sleeve 10. In operation a transfer screw 23 is started into a threaded hole, such as the blind hole 49 shown in Fig. 4, by hand. The gage and driver is then brought into driving position over the screw with the lugs 18 engaged in the notches 21. At this point of full driving engagement, the marking edge 22 of a transfer screw 23 will have moved the pin 25 and rod 31 against the pressure of spring 40 to a position where the end 35 of the rod 31 will extend beyond the top surface 48 of the sleeve 36. The sleeve 10 is thereupon rotated by hand or by a tool if necessary until the lower edge 27 of the ring 26 contacts the upper surface 29 of the piece of stock 30. Continued rotation of the sleeve 10 will now produce several effects since the transfer screw will continue to move downward into its hole while the movement of the gage and driver is arrested by the contact of ring 26 with the surface 29. The lugs 18 will withdraw somewhat from the notches 21, not sufficiently however to prevent continued driving engagement for a certain limited distance. As the screw begins to move downward relative to the main body of the gage, the pin 25 will continue in contact with the marking edge 22 indicating such relative movement by a like relative movement between the top end 35 of the rod 31 and the upper surface 48 of the sleeve 36. The sleeve 36 will normally be adjusted to a position where the top surface 35 of rod 31 will become flush with the top surface 48 of the sleeve 36 when the marking surface 22 of the transfer screw 23 is at the desired height above the surface 29 of the piece 30. The depth of the notches 21 and the position of the bottom surfaces 19 of the lugs 18 are such as to permit driving engagement to be maintained while the surfaces 35 and 48 are brought into flush relationship.

In this manner an extremely accurate adjustment in the level of the marking edge 22 can very quickly be made with the combination driver and gage. It will be noted that since the marking edge itself is used as a gaging surface, compensation for any wear in such edge will automatically be made in leveling the transfer screws. It will also be noted that the use of four driving lugs

and four notches in the transfer screw causes the gage and driver to be self-centering when brought into engagement with the transfer screw. This arrangement permits a single gage and driver to be used in adjusting transfer screws having a variety of diameters as long as they are within the maximum diameter determined by the size of the ring 26.

This combination gage and driver has been thoroughly tested in practice and found to be a highly effective answer to the long existing need for an accurate and efficient means for leveling transfer screws.

While a particular embodiment of the present invention has been described in detail, it will be understood that numerous changes in the design and construction details could be made without departing from the spirit of the invention, as set forth in the following claims.

I claim:

1. A transfer screw gage for adjusting a plurality of transfer screws to a uniform level relative to the plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface characterized by a gage surface for registering with said plane surface, a yieldable member for registering with a portion of said transfer screws indicative of the height of the marking portion of said transfer screws relative to said plane surface, means for gaging the position of said yieldable member relative to said registering surface, and a screw driving element for drivingly engaging one of said screws while said respective gage surface and yieldable member remain in contact with said plane surface and transfer screw.

2. In combination, a transfer screw provided with a notched face adapted to be drivingly engaged by a driving tool, a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface comprising a gage surface for registering with said plane surface, a yieldable member for registering with a portion of each of said transfer screws indicative of the height of the marking portion of said transfer screw relative to said plane surface, means for gaging the position of said yieldable member relative to said registering surface, and driving means for simultaneously engaging said notched face.

3. A transfer screw gage for use in adjusting a plurality of transfer screws to a uniform level relative to the plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface characterized by a gage surface for registering with said plane surface, a yieldable member for registering with a marking portion of said transfer screw, means for gaging the position of said yieldable member relative to said registering surface, and a screw driving element for drivingly engaging one of said screws while said respective gage surface and yieldable member remain in contact with said plane surface and transfer screw.

4. A transfer screw gage for use in adjusting each of a plurality of transfer screws of the type having a central marking point and a concentric marking edge to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage being characterized by a gage surface for registering with said plane surface, a yieldable member for registering with the concentric marking edge of said transfer screws, means for gaging the position of said yieldable member relative to said registering surface, and a screw driving element for drivingly engaging one of said screws while said respective gage surface and yieldable member remain in contact with said plane surface and transfer screw.

5. A transfer screw gage, as set forth in claim 4, wherein the means for gaging the position of said yieldable member relative to said registering surface comprises a sleeve having a fixed relationship with said registering surface, and a rod having a fixed relationship with said yieldable member and slidably received within said sleeve, said rod normally extending to a point within said sleeve adjacent the outer end thereof and being movable through the contact of said yieldable member with said transfer screw marking edge to a point beyond said end of the sleeve.

6. A transfer screw gage for use in adjusting each of a plurality of transfer screws of the type having a central marking point and a concentric marking edge to a uniform level relative to the plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage comprising an annular ring of sufficient diameter to permit it to overlie the said marking edge of a transfer screw, a sleeve in fixed relationship with said ring, a crosspin fitting within said ring for contacting said concentric marking edge of a transfer screw at two points, a rod having a fixed relationship with said crosspin and slidably received within said sleeve, said rod and crosspin being movable between fixed limits within and relative to said sleeve and ring, and means for urging said rod and crosspin toward one of said limits, said rod normally extending to a point within said sleeve adjacent the outer end thereof and being movable through the contact of said crosspin with said transfer screw marking edge to a point beyond said end of the sleeve.

7. In combination, a transfer screw of the type having a central marking point and a concentric marking edge, a plurality of notches in said marking edge adapted to be drivingly engaged, and a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage and driver comprising a gage surface for registering with said plane surface, a yieldable member for registering with a portion of each of said transfer screws indicative of the height of the marking portion of said transfer screw relative to said plane surface, means for gaging the position of said yieldable member relative to said registering surface, a plurality of lugs for engaging said notches, and a gripping surface in fixed relationship with said lugs adaptable to be grasped and turned by hand or suitable tool.

8. In combination, a transfer screw provided with a marking face adapted to be drivingly engaged and rotated by a driving tool, a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage being provided with a surface for registering with said plane surface, a yieldable member for registering with a portion of each of said transfer screws indicative of the height of the marking portion of said transfer screw relative to said plane surface,

means for gaging the position of said yieldable member relative to said registering surface, and driving means for simultaneously engaging said marking face.

9. In combination, a transfer screw provided with a marking face adapted to be drivingly engaged and rotated by a driving tool, a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage being provided with a surface for registering with said plane surface, a yieldable member for registering with a marking portion of said transfer screw, means for gaging the position of said yieldable member relative to said registering surface, and driving means for simultaneously engaging said marking face.

10. In combination, a transfer screw of the type having a central marking point and a concentric marking edge, said transfer screw being provided with a marking face adapted to be drivingly engaged and rotated by a driving tool, a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage being provided with a surface for registering with said plane surface, a yieldable member for registering with the concentric marking edge of said transfer screw, means for gaging the position of said yieldable member relative to said registering surface, and driving means for simultaneously engaging said marking face.

11. In combination, a transfer screw of the type having a central marking point and a concentric marking edge, said transfer screw being provided with a marking face adapted to be drivingly engaged and rotated by a driving tool, a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage and driver comprising an annular ring of sufficient diameter to permit it to overlie said marking edge of a transfer screw and to register with said plane surface, a crosspin fitting within and movable relative to said ring for contacting said marking edge at two points, means for gaging the position of said crosspin relative to said annular ring, and driving means for simultaneously engaging said marking face.

12. In combination, a transfer screw of the type having a central marking point and a concentric marking edge, a plurality of notches in said marking edge adapted to be drivingly engaged, and a transfer screw gage and driver for adjusting a plurality of said transfer screws to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes substantially normal to said plane surface, said gage and driver comprising an annular ring of sufficient diameter to permit it to overlie said marking edge of a transfer screw and to register with said plane surface, a crosspin fitting within and movable relative to said ring for contacting said marking edge at two points, a plurality of lugs for engaging said notches, and a gripping surface in fixed relationship with said lugs adapted to be grasped and turned by hand or suitable tool.

13. In combination, a transfer screw of the type having a central marking point and a concentric marking edge, a plurality of notches in said marking edge adapted to be drivingly engaged by a rotary driving tool, and a combination gage and driver for adjusting the marking edges of a plurality of said transfer screws, the size of which may vary in diameter, to a uniform level relative to a plane surface of a piece of stock having a plurality of threaded holes of corresponding diameter substantially normal to said plane surface, said gage and driver comprising an annular ring of sufficient diameter to permit it to overlie the marking edge of the largest of said transfer screws and to register with said plane surface, a gage sleeve having a fixed relationship with said ring, said sleeve being provided with a plurality of driving lugs located within said ring for engaging said notches in each transfer screw, a rod slidable within said sleeve, a crosspin located within said ring and connected to said rod for contacting said marking edge of each transfer screw, said rod and crosspin being movable between fixed limits within and relative to said sleeve and ring, spring means for urging said rod and crosspin toward one of said limits, said rod normally extending to a point within said sleeve adjacent the outer end thereof and being movable through the contact of said crosspin with said transfer screw marking edge to a point beyond the end of said sleeve.

14. A device for the continuous and simultaneous adjustment and gaging of the level of the marking edge of a transfer screw above the surface of a part into which said screw is threaded comprising a member adapted to continuously register against the surface of said part, a member adapted to continuously register against the marking edge of said screw, gaging elements associated with each of said members for indicating their relative position, and a screw driving element forming a part of said device for drivingly engaging said screw while said members remain respectively in registration with said surface and edge.

15. A device as set forth in claim 14 wherein said screw driving element has a fixed relationship with said first mentioned member.

16. A device as set forth in claim 14 wherein a bore is provided within the gaging element associated with said first mentioned member, the gaging element associated with said second mentioned member being slidably housed within said bore, and wherein end surfaces of the respective gaging elements are adapted to indicate by both sight and feel the relative position of said members.

HARRY BERG.

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