

March 10, 1931.

I. L. WADE ET AL

1,795,323

SEATING TOOL

Filed May 18, 1929

2 Sheets-Sheet 1

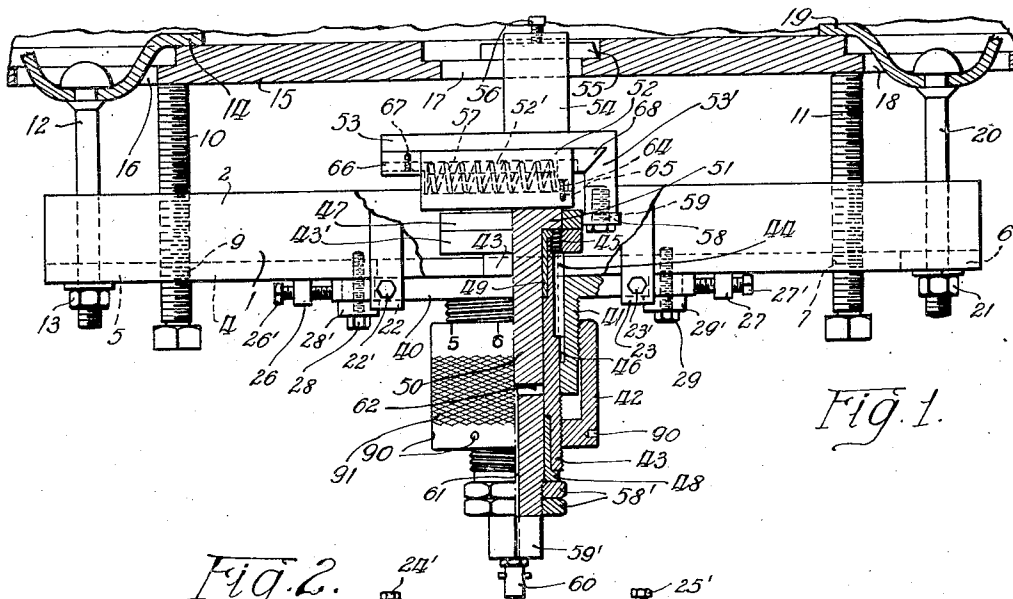


Fig. 1.

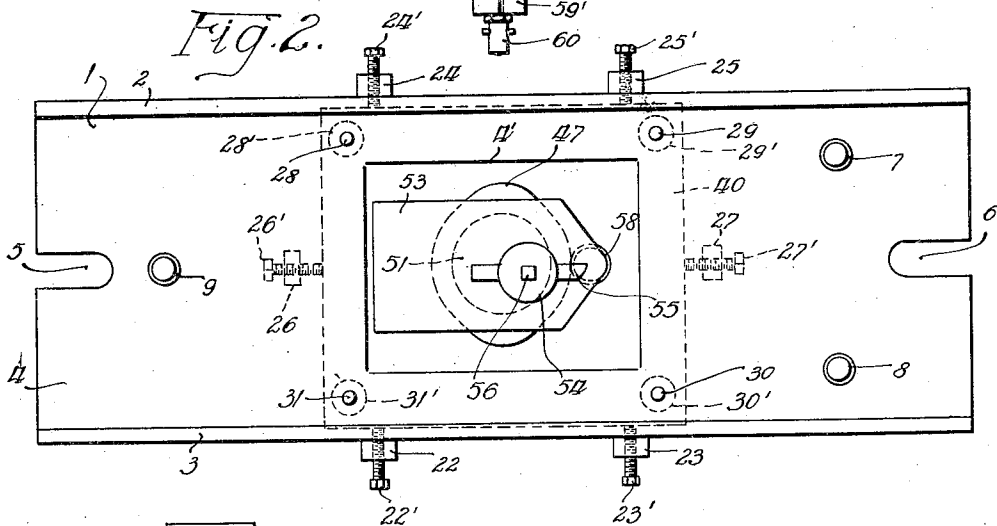


Fig. 2.

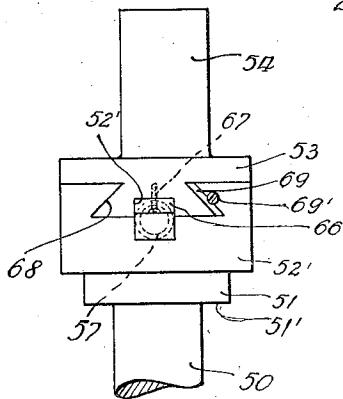


Fig. 3.

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2 Sheets-Sheet 2

Fig. 4.

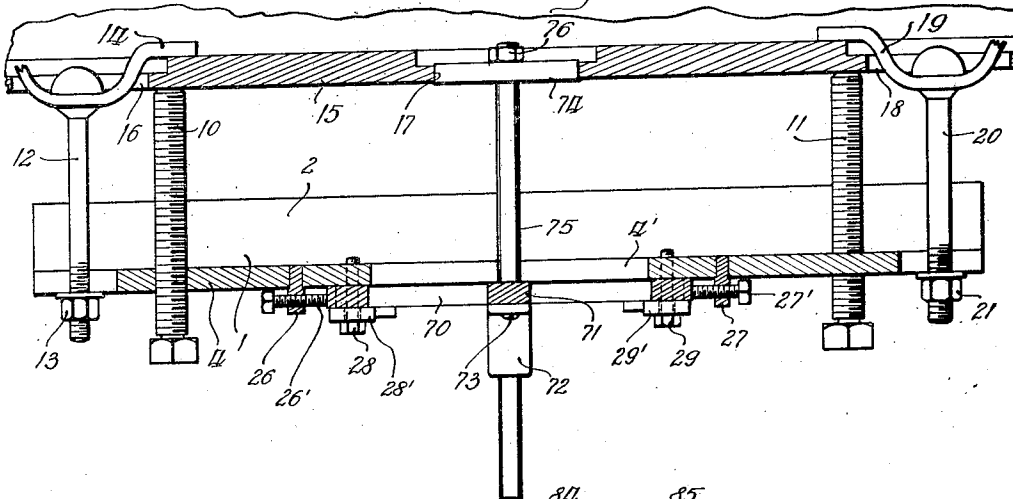
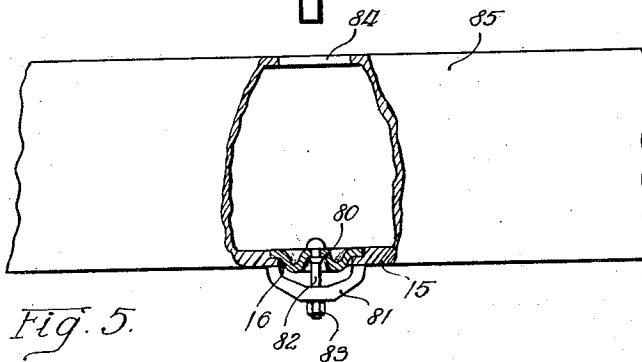


Fig. 5.

Fig. 6.

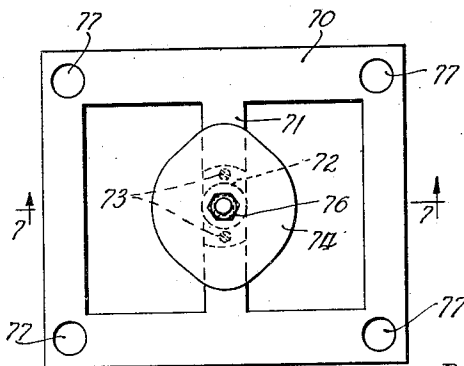
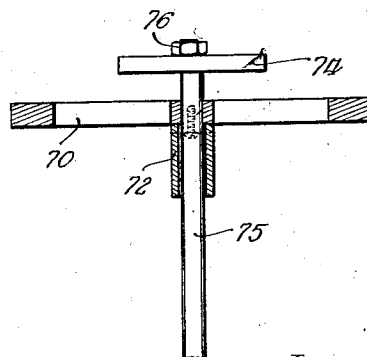


Fig. 7.



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UNITED STATES PATENT OFFICE

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SEATING TOOL

Application filed May 18, 1929. Serial No. 364,230.

This invention relates to a tool for resurfacing hand hole seats and the like, and has for its principal object the production of a portable tool adapted for resurfacing the hand hole seat of a water tube boiler.

In high pressure water tube boilers, the hand hole covers in the headers are located on the inside of the header and seated against a flange seat formed in the header walls. To facilitate removing the covers from the header the hand holes are oval shaped. The joint between the cover and header wall must be pressure tight since the full pressure of the boiler is upon it, and consequently the seat on the header surface must be frequently redressed to remove nicks or other irregularities that may be placed in the seat during the operation of cleaning the boiler.

The preferred embodiment of our invention consists of a light yet sturdy portable dressing machine consisting of a stationary base adapted to be attached to the outside of the header and a tool head adapted for attaching to that base and containing a tool holder which is projected through the hand hole cover to bring the cutting edge of the tool into engagement with the surface that is to be resealed. The power for operating the cutting tool is applied manually to the tool head, and that head contains also an adjustment for regulating the depth of cut so that the surface can be quickly and economically reconditioned.

Obviously, the method of reseating the inside faces of the hand hole of a header thus enumerated is capable of being more quickly accomplished and, therefore, cheaper than the scraping and filing methods which have been used heretofore.

To acquaint those skilled in the art with the teachings of our invention, we have shown a preferred embodiment of it by way of example, in the accompanying drawings in which:

Figure 1 shows the reseating tool attached to the header of a boiler,

Figure 2 is a rear or boiler side view of the tool shown in Figure 1,

Figure 3 is a detailed view of the tool post and carriage therefor,

Figure 4 is a cross-sectional view of the tool bed attached to a boiler header with the locating plate or jig in place,

Figure 5 is a cut-away view of a boiler header showing the hand hole cap in place,

Figure 6 is a plan view of the locating plate, and

Figure 7 is a cross-sectional view of Figure 6 taken along the line 7—7.

Referring to Figure 5 in more detail it will be seen that the header 85 comprises a box-like structure easily made of either cast iron or wrought steel. The opening 84 is provided to receive one of the water tubes of the boiler. Directly opposite this hole in the front face 15 of the header is the hand hole 16 which is closed by the hand hole cover 80 which bears against the inside surface of the front plate 15 of the header. It is this bearing surface that must be maintained smooth and free from dents if the hand hole cover 80 is to seal the opening against the boiler pressure.

The hand hole cover 80 is held in place by the stirrup 81 through which passes the bolt 82, that bolt being permanently attached to the hand hole cover 80. A nut 83 bears against the outside face of the stirrup 81 and locks the cover in place. It will be noted that the seat of the stirrup 81 bears against the surface of the front face 15 of the header at points directly opposite to the bearing points of the cover 80. By this arrangement the tension put on the bolt 82 by the nut 83 does not add stresses to the walls 15 of the header 85 but rather compresses those walls beneath the seat of the stirrup 81 and the bearing surface of the cover 80.

As will be seen on pages 50 and 51 of the book "Steam and Generation and Use" published by the Babcock and Wilcox Company of New York and copyrighted 1920 by that company, the headers are of serpentine or sinuous form. That is, the centers of adjacent boiler tube openings and corresponding hand holes in the header are staggered with respect to each other. In effect there are two lines of these openings, and adjacent open-

ings are placed in opposite lines. By this arrangement the water tubes of the boiler are staggered thereby affording the gases in the combustion chamber better access to them.

5 In Figure 4 we show the tool bed 1 attached to a header of the type shown in the above referred to book. The hand holes 16, 17 and 18 are shown to be hand holes in one of the lines on the header, that is, there is a hand
10 hole disposed between the holes 16 and 17 but in the other line on the header and also there is another hand hole disposed between holes 17 and 18 it likewise being in the other line on the header.

15 The tool bed 1 comprises a piece of channel iron of suitable dimensions and length to span three hand holes in any one line on the boiler header. A channel iron is chosen for this purpose because of its greater resistance to bending for a given weight of metal.
20 The channel comprises the web section 4 and flanges 2 and 3 as will be seen in Figures 1, 2 and 4. At opposite ends of the web, section 4, we have cut slots 5 and 6 through which the bolts 12 and 20 respectively are
25 projected to lock the tool bed onto the face of the header. These bolts are provided with stirrups such as 14 and 19 which are similar to the stirrups employed to lock the hand hole covers in place on the header.
30 However, the stirrups 14 and 19 are somewhat longer than the hand hole cover stirrups, and bear against the inside surface of the header wall outside of the machined seat against which the hand hole cover bears.
35 This arrangement permits lodging the bolt 12 for example and the hand hole 16 which has been reseated without damaging the seat, since the stirrup bears against the metal disposed beyond the seated surface.
40

45 The tool bed is also provided with adjusting set screws 10 and 11 which are threaded through openings 7, 8 and 9 in the web of the channel. The ends of these set screws bear against the outside face of the header wall 15, and by proper adjustment of these set screws the web 4 of the bed can be aligned parallel to the walls of the header.

50 The tool bed 1 is provided with a rectangular opening 4' centrally located in the web portion 4, through which opening the cutting tool and the locating tool are projected into contact with the boiler header. Obviously, this opening 4' need not be square
55 nor need it be of the exact dimensions shown since its only purpose is to permit projection of the tools through the bed into engagement with the boiler header.

60 By drawing up on the nuts 13 and 21, attached to the bolts 12 and 20 respectively, the tool bed can be securely locked to the header away from which it is held by the set screws 10 and 11.

65 With the tool bed so located parallel to the walls of the header the locating plate or

70 jig 70, shown in detail in Figures 5 and 7, is attached to the tool bed 1 by the four bolts 28, 29, 30 and 31 which project through the holes 77 located in the corners of the plate 70. It will be noted that the diameter of these holes 77 is considerably greater
75 than the diameter of the screws 28 to 31 inclusive, and it will be obvious that by this arrangement the lateral movement of the plate on the mounting bed 1 is possible.

80 The locating plate 70 contains in addition the central web 71 upon which is fastened the bushing 72, that bushing being held by the screws 73 which are threaded into the web 71. A square opening extends through the bushing 72 and the web section 71, and a square shaft 75 projects through this opening. A cam 74 is attached to the end of this
85 shaft 75 by the bolt 76, that cam being oval shaped and designed to snugly fit into the hand hole in the boiler header.

90 After the locating plate 70 has been fastened onto the tool bed 1 by the bolts 28 to 31 inclusive, adjusting nuts 26', 27', 22', 23', 24' and 25' are turned as is necessary to move the plate 70 so that the cam 74 slides
95 into and out of the hand hole 17 in the header without binding.

100 Since the cam is mounted on a square shaft that is journaled in a square hole on the locating plate 70, the entire assembly must be rotated in order to bring the cam into proper alignment with the hand hole. This rotation is accomplished by variation in the adjustment of the locating screws 22' to 27' inclusive, which screws are also adjusted to move
105 the locating plate laterally in both directions on the tool bed 1.

110 After the locating plate has been properly positioned, clamping screws 28, 29, 30 and 31 are removed and the plate taken off of the mounting bed 1. If desired, the locating screws 22 to 27 inclusive may be provided with lock nuts to insure that they will not be moved after the locating plate has been properly set, however, we have not found that it is
115 necessary to add lock nuts to the screws.

120 The cutting head, shown in detail in Figures 1 to 3, is mounted on a base 40 which is of identically the same size as the locating plate 70, and if the cutting head plate 40 is fastened on to the tool mounting bed 1 without altering the adjustment of the locating screws 22' to 27' inclusive, that head will be properly located in four of the six directions
125 with respect to the header. The other directions, the in and out movement of the cutter blade with respect to the header, are adjusted by an adjusting collar on the cutting head.

130 By reference to Figure 1, 2 and 3 it will be seen that the cutting head comprises the mounting plate 40 in the center of which is attached the threaded collar 41.

135 The adjusting collar 42 is threaded to engage the collar 41, and also threaded to en-

gage the bushing 43 which is concentrically located within the collar 41 and lodged against rotation by the key 44 which fits into the keyway 46 in the collar 41 and is held therein by the screw 45.

In the preferred embodiment of our invention the threads on the collar 41 are right hand threads and the threads on the bushing 43 are left hand threads so that a rotation of the collar 42 moves the bushing 43 longitudinally a distance equal to the sum of the pitch of the threads on the collar and bushing. Obviously, if desired, the threads on the collar 41 may be made right hand threads and the threads on the collar 43 may also be right hand threads of a different pitch so that a movement of the collar 42 through one complete revolution will move the bushing 43 with respect to the collar and mounting plate 40 a distance equal to the difference in the pitches of the two right hand screw threads. This, of course, would give a much finer adjustment particularly if the difference between the pitches of the threads on the collar 41 and on the bushing 43 is slight, however we have found that it is not necessary to have a micrometer adjustment of the cutting tool and since the lateral adjustment of this tool is more rapidly accomplished by a left and right hand thread as shown, we have employed that arrangement in the preferred embodiment of our invention.

The cutting tool 55 is held in the tool stock 54 by the set screw 56. The tool stock 54 is attached to the plate 53 which is dove-tailed into the head stock 52, as shown at 68 in the Figures 1 and 3.

The tool 55 is preferably made of tool steel of suitable size, and is ground with a cutting edge as shown. This cutting edge shears the metal from the seat without chattering and in addition the pressure of the metal so sheared exerts a force on the tool substantially along its axis. This force cooperates with the tension of spring 57 to keep the roller 58 firmly seated on the cam 47, so that the tool is accurately guided over its path by the cam.

It will be noted in Figure 3 that the tool post 54 is off-set from the center of the plate 53, and that the tool point coincides with the axis of the roller 58. This adjustment insures that the seat will be cut accurately as the contour of the cam, since the extreme point of the tool accurately coincides with the axis of the roller which moves around the cam as the tool is turned.

The tool 55 as shown in the preferred embodiment of our invention, is designed to cut a flat seat. Obviously the invention is not limited to this type of tool and by suitable design of the tool any preferred form of seat can be cut. Since the tool moves in a concentric path around the seat, the tool may be shaped to cut a groove on a ledge in

the seat if desired. The particular shape of the tool is not of the essence of our invention and we are not, therefore, to be limited by the shape shown.

A plate 69 is held in the head stock by the screw 69', to adjust the tool post plate 53 therein.

The head stock 52 is mounted upon the shaft 50 which fits snugly but rotatably in the bushing 43. Preferably bronze bearings 48 and 49 are fitted into the bushing 43 to afford a proper bearing for the shaft 50.

The shaft 50 is locked in the bushing assembly by the lock nuts 58' which are threaded onto the shaft and brought to bear against the bushing 48.

On the boiler end of the bushing 43 is located a round shaped head 43'. A hardened steel cam 47 is attached to the plate 43' by screws or bolts, that cam serving to guide the cutting tool around the periphery of the hand hole. Within the cam 47 is a circular opening 51 located concentrically with the axis of the shaft 50 into which the circular part 51 of the head stock 52 fits and rotates. The face 51' of this circular portion 51 bears against the end of the bushing 49 and cooperates with the nuts 58' to lock the shaft therein.

Attached to a projection 53' of the tool stock bed 53 is a roller 58 which bears against the cam 47 to guide the tool 55. This roller is held onto the member 53' by a shoulder screw 59 threaded therein to permit free rotation of the roller 58 about the screw as an axis.

Within the dove-tail portion of the head stock 52 is a generally rectangular cavity 52' in which is disposed a spring 57, one end of which is fixed with respect to the head stock 52 by the clamp 64 which is attached to the head stock by the screw 65. The opposite end of the spring 57 is held definitely with respect to the tool post base 53 by the bracket 66 which is held thereon by the screw 67. The spring 57 is tensioned so that it tends to move the tool post 54 to the left, as seen in Figure 1, thereby insuring that the roller 58 will securely bear against the cam 47. When the cutting head is being placed on the tool bed 1, the adjusting collar 42 is rotated so that the cutting tool 55 is disposed back of and away from the face 15 of the header. After the cutting head has been secured by tightening the bolts 28' to 31' inclusive the collar 42 is readjusted by a spanner wrench, not shown, which is inserted in the holes 90 to turn the cutter in the proper direction to bring the cutting head into engagement with the back surface of the header wall. The outer face of the collar 42 is knurled, as shown at 91, so that in so far as possible the adjustment may be made by hand without the use of a spanner wrench since that method affords a more rapid adjustment of the cut-

ter. However, the spanner will have to be used for the final adjustment when the cutter 55 is brought into cutting relation with the plate 15.

5 We have found that it is not often necessary to take a heavy cut off of these plates to resurface the seats, as in most instances a cut of from six to eight thousandths of an inch is all that it is necessary to take. The cutting
10 may be accomplished by attaching a wrench or hand wheel, neither shown, to the square portion 59' of the shaft 50, and thereby rotating that shaft in the proper direction to cause the tool 55 to shave the metal off of the
15 plate 15. As the shaft 50 is rotated, the roller 58 follows the contour of the cam 47. Since the cam 47 is shaped exactly as the periphery of the hand hole 17, the cutter will follow the periphery of the hand hole exactly
20 and refinish the seat around that periphery. usually these seats are approximately a quarter of an inch wide, and the cutter 55 is so shaped that it will surface the entire seat at one cut.

25 The hand holes of various makes of boilers vary both in shape and size, however, all of a generally oval shape. Obviously, by suitably designing the cam 47 the cutter disclosed in Figure 1 can be made to resurface the seat
30 of any hand hole within the limits of lateral movement made possible by the tool post slide 53 and the head 52. With the head proportioned as shown, the machine is capable of surfacing a hand hole having approximately four inches as its maximum
35 dimension, that size being sufficient for the majority of boilers now in common use.

Obviously the head stock 52 and tool post slide 53 can be suitably designed for a larger
40 lateral movement and the cam 47 can be correspondingly designed so that larger hand holes, or even man holes, can be resurfaced in this manner if desired.

After the seat of hand hole 17 has been
45 resurfaced the cutting head is removed from the tool bed 1 by removing the screws 28' to 31' inclusive and the bed is then removed from the header by removing bolts 12 and 20, and the assembly can be set up on adjacent
50 hand holes if desired. Since the bearing seat of the stirrups 14 and 19 do not bear against the portion of the header wall 15 that has been seated by the tool, either of the stirrups can be inserted in the hole 17
55 without damage to the seat that has just been repaired.

In order to permit lubrication of the main drive shaft 50 in the bearings 48 and 49 and the bushing 43, we have provided the pressure
60 grease cup 60 which communicates through the channels 61 and 62 to the bearing surface of the shaft. Preferably this grease cup 60 is an alemite high pressure grease cup, although another suitable type of greasing
65 arrangement might be employed. The

grease is forced into the channel 61 through this cup and enters the bearing surface of the shaft through the duct 62 and lubricates the shaft to insure that it will rotate freely in the bushings.

From the foregoing description, it will be
70 apparent that we have devised an improved tool for resurfacing the hand hole seats of the headers of a water tube boiler, or for other similar cutting operations, a tool that
75 permits a performance of this operation at a greater speed than has been possible heretofore with a consequent reduction in the cost of the operation.

While we have chosen to show a preferred
80 embodiment of our invention, we have done so by way of example only, as we are aware that there are many modifications and adaptations which can be made by one skilled in the art without departing from the teachings
85 of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of our invention, what we consider
90 new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a hand hole cap seating device, the combination of a bed plate, means for attaching said plate to a body on which a cap
95 is to be seated, said means being adjustable to align said plate parallel to said body, a tool head removably fastened to said bed and adjustable thereon, and means on said
100 tool head for moving a cutter over a non-circular path in a plane parallel to said bed plate.

2. In a hand hole cap reseating device, the combination of a bed plate, means for attaching said plate to a body on which a cap
105 is to be seated, said means being adjustable to align said plate parallel to said body, a tool head removably fastened to said bed and adjustable thereon, means on said tool head for moving a cutter over a non-circular path
110 in a plane parallel to said bed plate, and means for adjusting the distance between the plane, in which said cutter moves, and said bed plate.

3. In a hand hole cap seating device, the combination of a bed plate, means for attaching
115 said plate to and aligning it parallel to a body on which a cap is to be seated, a tool head removably fastened to said bed and adjustable thereon, a shaft on said tool head, a cutter on said shaft, a cam on said tool head
120 for guiding said cutter over a path determined by the shape and position of said cam as the shaft is rotated, and means for adjusting the distance between said cutter and bed
125 plate.

4. In a hand hole cap seating device, the combination of a bed plate, means for attaching
130 said plate to and aligning it parallel to a body on which a cap is to be seated, a

tool head removably fastened to said bed and adjustable thereon, a shaft on said tool head, a cutter on said shaft, a cam on said tool head for guiding said cutter over a path determined by the shape and position of said cam as the shaft is rotated, and means including a right hand thread on said tool head and a left hand thread associated with said shaft for adjusting the distance between said cutter and said bed plate.

5. In combination with a tool for resurfacing the hand hole cap seats of a boiler, a bed plate for mounting said tool on the boiler, stud screws in said plate for adjustably holding it away from the surface of the boiler, bolts for holding the bed on the boiler, and stirrups on said bolts, said stirrups projecting through the hand holes of said boiler and bearing against the inside surface thereof at points beyond the cap seats.

6. A tool for reseating the hand hole cap seats of a water tube boiler which comprises the combination of, a tool bed plate, means for holding it on the boiler, a tool mounted on said plate, a cam associated with said tool and fixed against rotation with respect to said plate, means for rotating said tool around the periphery of said cam and means for adjusting said tool at right angles to the planes of said cam and bed plate to thereby regulate the depth of cut taken by the tool.

7. A hand hole cap reseating tool comprising, a bed plate, means for attaching said bed plate on the header in which the cap seat is to be cut, a tool head mounted thereon, means for adjusting the position of said head on said base, a tool carrier attached to said head, a cam attached to said head in fixed relation with respect thereto, a roller mounted on said carrier and engaging said cam, a shaft on said tool carrier projecting through said head, threads on said head, a collar cooperating with said threads to adjust the position of said tool head and tool carrier with respect to said bed plate, a cutter mounted in said carrier, means for rotating said shaft to thereby move said carrier and cutter over a path defined by said cam to cut the cap seat in said header.

8. In a hand hole cap seating tool, a shaft, means for attaching the tool to a header, means for locating the tool with the axis of the shaft coinciding with the center of the cap opening, a cam concentric with said shaft, said cam being of the same shape as the cap opening, a cross head on said shaft, a tool post slidably mounted on said cross head, a roller attached to said tool post, means for retaining said roller against said cam to guide the tool post as the shaft is rotated, and means for rotating the shaft.

9. In a hand hole cap seating tool, a shaft, a tool post including means for holding a cutting tool, a tool post slide, a cam, means on said tool post engaging said cam to guide the

movement of said tool post in said slide, means for attaching said seating tool on a header with the shaft axis coinciding with the center of the hand hole and with the periphery of said cam coinciding with the periphery of the hand hole, means for adjusting the tool post along the axis of said shaft and means for rotating the shaft to cause said tool post to follow the periphery of the shaft and the cutting tool to smooth the inside face of the header wall around said hand hole.

10. In a tool for reseating hand hole caps of a boiler, a shaft, a cam concentrically located around said shaft, a cutter mounted on said shaft, a roller associated with said cutter and engaging the cam to guide the cutter, a base plate, means for mounting said shaft on said plate in fixed relation thereto, said means including means for moving the shaft cutter and cam longitudinally with respect to the base plate, a bed plate, means for mounting said bed plate on a header, said means including means for locating the plane of the bed parallel to the face of the header, means for mounting the base plate on the bed plate, and means for adjusting the base on the bed to bring the axis of said shaft into coincidence with the center of a hand hole in the header to thereby locate the path of travel of said cutter in a plane parallel to the face of said header.

11. A tool for reseating hand hole caps of a boiler which comprises, a channel bed plate having slots disposed at its opposite ends in its web, bolts projecting through said slots, stirrup heads on said bolts for engaging the inside surface of the header containing the hand holes, set screws threaded through the web of said channel into engagement with the outside face of the header, said screws being adjusted to position said bed plate parallel with the header, a tool head having a base, bolts passing through holes in said base to attach it to said bed plate, said holes being large enough to permit lateral adjustment of the base on the bed, a shaft carried on said tool heads, means on said bed for adjusting said base laterally to position said shaft so that its axis coincides with the center line of said hand hole, a cutter mounted on said shaft and means for moving said cutter around the periphery of said hand hole and in a plane parallel to that of the bed plate as said shaft is rotated.

12. A tool for reseating hand hole caps of a boiler which comprises, a channel bed plate having slots disposed at its opposite ends in its web, bolts projecting through said slots, stirrup heads on said bolts for engaging the inside surface of the header containing the hand holes, set screws threaded through the web of said channel into engagement with the outside face of the header, said screws being adjusted to position said bed plate parallel with the header, a tool head having a

base, bolts passing through holes in said base to attach it to said bed plate, said holes being large enough to permit lateral adjustment of the base on the bed, a shaft carried on said tool head, means on said bed for adjusting said base laterally to position said shaft so that its axis coincides with the center line of said hand hole, a cutter mounted on said shaft, and means on said tool head for adjusting the distance between the plane in which the tool travels and the plane of the bed plate.

13. In a tool for reseating hand hole caps of a boiler, a rectangular base plate, a threaded collar centrally located on said base, a bushing disposed within said collar and extending beyond it and said base, a keyway on the inside face of said collar, a key on said bushing fitted in said keyway to prevent rotation of the bushing in the collar, a feed nut engaging said collar threads on said bushing to move said bushing in and out with respect to said base, a cam secured to that portion of the bushing extending beyond said base, a shaft extending through said bushing, the axis of said shaft passing through the center of said cam, a circular recess in said cam concentric therewith, a shoulder on said shaft fitted into said recess, threads on said shaft, lock nuts threaded thereon and engaging the opposite end of said bushing to lock said shaft therein, a tool post mounted on said shaft, a roller mounted on the tool post and engaging the cam to guide the movement of the tool post as said shaft is rotated, a squared shank on said shaft on which a tool for rotating the shaft may be placed, a bed plate on which said base is mounted, means on said bed plate for attaching it into a header of a boiler and for aligning it parallel thereto, and means on said bed plate for moving said base laterally thereon to align the axis of shaft with the center of the hand hole to be reseated.

14. The combination of a tool base, a tool head mounted on said base and rotatable thereabout, said head being adjustable with respect to said base along the axis of said rotation and also at right angles to said axis, and means on said tool head for moving a cutter over a non-circular path in a plane parallel to said base.

15. The combination of a tool base, a tool head mounted on said base and rotatable thereabout, said head being adjustable on the base in the plane of the base, and means for adjusting the distance between the plane on which said cutter moves and said base.

16. The combination of a bed plate, a tool head removably fastened to said bed and adjustable thereon in the plane thereof, and means on said tool head for moving a cutter over a non-circular path in a plane parallel to said bed plate.

17. The combination of a bed plate, a tool

head removably fastened to said bed and adjustable thereon in the plane thereof, means on said tool head for moving a cutter over a non-circular path in a plane parallel to said bed plate, and means for adjusting the distance between the plane, in which said cutter moves, and said bed plate.

18. The combination of a bed plate, a tool head removably fastened to said bed and adjustable thereon in the plane thereof, a shaft on said tool head, a cutter on said shaft, a cam on said tool head for guiding said cutter over a path determined by the shape and position of said cam as the shaft is rotated, and means for adjusting the distance between said cutter, and bed plate.

19. The combination of a bed plate, a tool head removably fastened to said bed and adjustable thereon in the plane thereof, a shaft on said tool head, a cutter on said shaft, a cam on said tool head for guiding said cutter over a path determined by the shape and position of said cam as the shaft is rotated, and means including a right hand thread on said tool head and a left hand thread associated with said shaft for adjusting the distance between said cutter and said bed plate.

In witness whereof, we hereunto subscribe our names this 15th day of May, 1929.

IRVING L. WADE.
COLIN B. ROBERTSON.