Oct. 27, 1925. 1,559,359

F. O. PAHMEYER

MACHINE FOR DRILLING OR REAMING BOILER SHELLS

Filed May 18, 1923

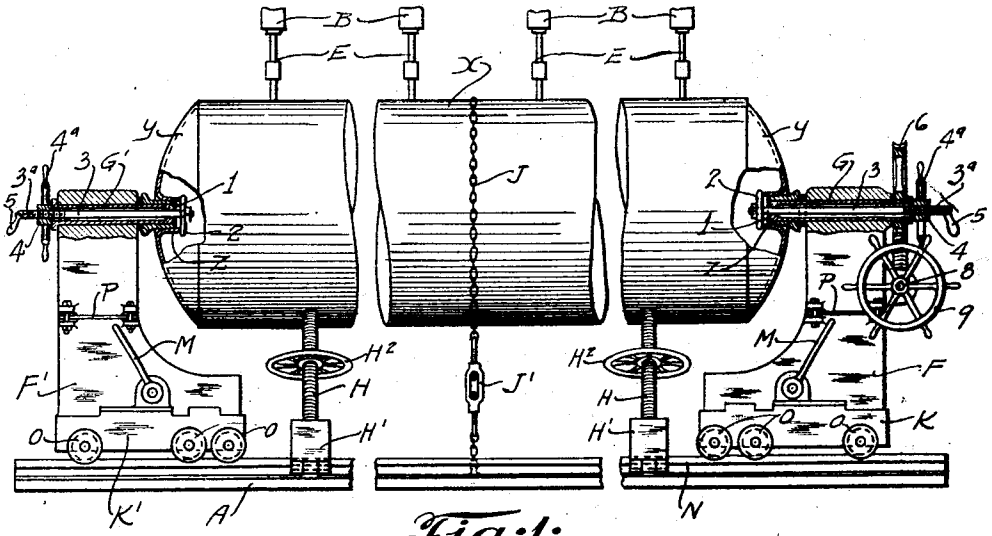


Fig. 1.

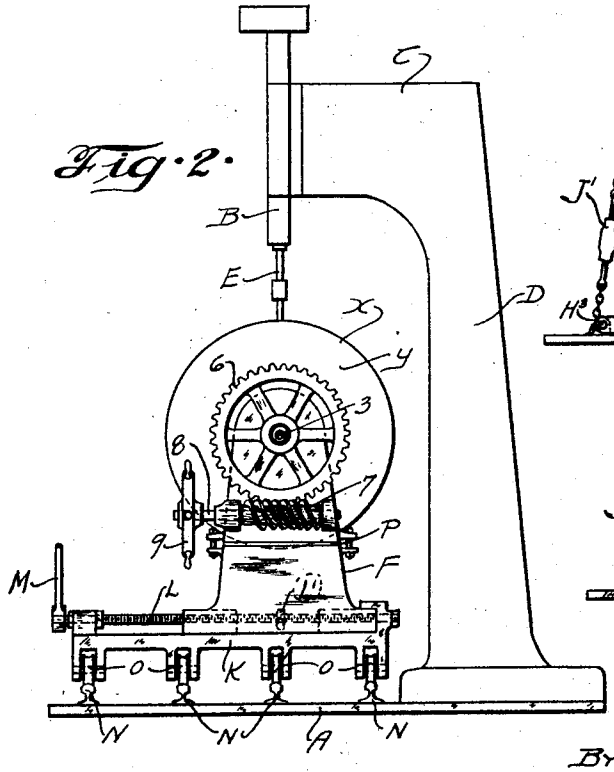


Fig. 2.

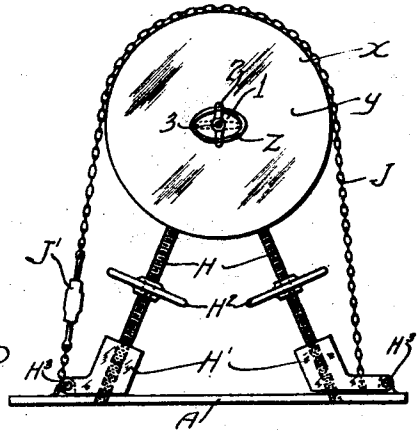


Fig. 3.

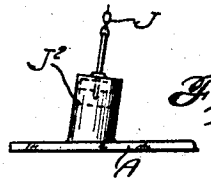


Fig. 4.

INVENTOR
F. O. Pahmeyer.
BY Bakewell & Church
ATTORNEYS

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UNITED STATES PATENT OFFICE.

FREDERICK O. PAHMEYER, OF ST. LOUIS, MISSOURI, ASSIGNOR TO HEINE BOILER COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

MACHINE FOR DRILLING OR REAMING BOILER SHELLS.

Application filed May 18, 1923. Serial No. 639,798.

To all whom it may concern:

Be it known that I, FREDERICK O. PAHMEYER, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Machines for Drilling or Reaming Boiler Shells, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to machines of the kind that are used for drilling or reaming boiler shells.

Boiler shells or drums vary in length from four ft. to thirty-six ft. and weigh as high as 20 tons each. The tube holes are formed in the cylindrical portion of the shell and are arranged in parallel rows that extend longitudinally of the shell. Heretofore it has been the usual practice to arrange a boiler shell or drum on rollers carried by the bed plate of a multiple spindle drill press, drill one row of longitudinal holes in the shell, then turn the shell so as to bring an imperforate portion of same into alignment with the drills and repeat the above operations in forming the other rows of holes in the shell. This same method is also used in the operation of reaming the holes in the shell. It is essential that the tube holes in the shell be disposed radially with respect to the center of the shell, and this causes considerable trouble when the shell is supported by rollers during the drilling or reaming operation, for when the butt straps on the exterior of the shell ride up onto the rollers arranged at one side of the longitudinal axis of the shell, the shell assumes an incorrect position, or, in other words, becomes so disposed with relation to the drills or reamers that the holes drilled or reamed in the shell when the butt straps are resting on the shell will not be absolutely radially disposed. Moreover, when the butt straps strike against the rollers that support the shell considerable power or pressure is required to turn the shell to cause the butt straps to ride up onto the rollers.

Another objection to the machines heretofore used for drilling or reaming boiler shells, is that the shell tends to revolve or turn after a large number of holes have been formed in one longitudinal section or half of the shell, due to the fact that the weight of the imperforate portion of the shell and the butt straps thereon is so much greater than the longitudinal section of the shell in which the holes are formed that the shell is unbalanced. It is, of course, necessary to move the shell longitudinally of the bed plate of the machine to bring the different transverse sections of the shell into position to be acted upon by the drills or reamers, and when the shell is supported by rollers, this adjustment of the shell is effected by manually sliding the shell on the supporting rollers lengthwise of the bed plate. If the shell being drilled or reamed is very long, it is often necessary to turn it end for end in order to bring all portions of same into the range of the spindles that carry the drills or reamers.

From the foregoing it will be seen that a boiler shell drilling machine of the type in which the shell is supported on rollers during the operation of forming holes in the shell requires the services of a large number of workmen to handle the shell, considerable time is required to change the position of the shell with relation to the tools that act on the shell, the butt straps on the exterior of the shell often cause the shell to assume such a position that the holes formed in the shell will not be absolutely radial and considerable care has to be exercised to prevent the shell from turning accidentally after it has become unbalanced, due to the formation of a large number of holes in one longitudinal section of the shell.

The main object of my invention is to provide a machine for drilling or reaming boiler shells which is constructed in such a manner that it is possible for a few workmen to drill or ream a large sized shell quickly and accurately.

Another object is to provide a machine of the kind referred to which is so constructed that the butt straps on the exterior of the shell do not interfere with the adjustment of the shell or cause it to assume an incorrect position with relation to the tools used in the operation of forming holes in the shell.

Another object is to provide a boiler shell drilling or reaming machine which is so constructed that the shell will be held securely against accidental rotary movement after the shell has become unbalanced, due to the formation of a large number of holes in one longitudinal section of the shell.

And still another object is to provide a machine of the character mentioned which is so constructed that there is no liability of the shell striking against the tools carried by the spindles of the machine during the operation of arranging the shell in a position to be acted upon by the tools and during the operation of removing the shell from the machine at the completion of the drilling or reaming operation.

To this end I have devised a machine for drilling or reaming boiler shells, that comprises a base or bed plate, a gang of rotatable spindles arranged above the bed plate, supporting structures mounted on said base in such a way that they can be adjusted longitudinally of same, and means on said supporting structures adapted to be engaged with the ends or the heads of the shell for supporting the shell in such a way that the shell can be turned or revolved about its longitudinal axis, thus producing a boiler shell drilling machine that is distinguished from the conventional boiler shell drilling machines, in that the shell is supported from its center instead of at its lower side. Various means may be used for rotatably mounting the shell on said supporting structures, but I prefer to equip said supporting structures with horizontally-disposed shafts provided with devices that are adapted to be inserted in the manholes in the heads or ends of the shell and securely clamped to same, and provide one of said supporting structures with an operating mechanism for turning the shaft thereon so as to revolve the shell to bring different portions of same into position to be acted upon by the tools used to form holes in the shell. In order to eliminate the possibility of the shell striking against the tools when the shell is being mounted on the means that sustains same during the operation of forming holes in the shell, I construct said supporting structures in such a way that they can be adjusted transversely of the base or bed plate of the machine, as well as longitudinally of said base, thereby enabling the shell to be arranged in approximately the correct horizontal position on said supporting structures when said supporting structures are positioned at one side of the bed plate, and said supporting structures thereafter moved transversely of the bed plate so as to carry the shell into alignment with the tools.

Figure 1 of the drawings is a side elevational view, partly broken away, of a boiler shell drilling or reaming machine constructed in accordance with my invention.

Figure 2 is an end view of said machine.

Figure 3 is a vertical, transverse sectional view, illustrating one means that may be used for sustaining the intermediate portion of the shell and preventing it from vibrating and turning when the tools are acting on the shell; and

Figure 4 illustrates an air jack that may be used instead of a turn-buckle for tightening the flexible member that extends over the top side of the shell.

Referring to the drawings, A designates a base or bed plate that is arranged horizontally under a gang or plurality of rotatable spindles B that are adapted to be equipped with drills or reamers that are used to drill or ream holes in a boiler shell x, said base A being of considerably greater length than the portion C of the machine which carries the spindles B, and the upright D of the machine which carries the portion C being arranged at the rear side of the base A so that it will not interfere with the adjustment of the shell longitudinally of the base A, thus enabling a long shell to be operated on by the tools E of the machine without the necessity of turning the shell end for end. The base A is equipped with two supporting structures F and F′ that are provided with horizontally-disposed shafts G and G′ that carry the shell x, means being provided for enabling said shafts to be detachably connected to the ends or heads y of the shell in such a way that the shell serves to connect the two supporting structures F and F′ together, but is capable of being revolved or turned relatively to said supporting structures by turning one or the other of said shafts G or G′. It is immaterial, so far as my invention is concerned, what means is employed to connect the shell to the shafts G and G′, but I prefer to provide each of said shafts at its inner end with a non-circular-shaped member 1, shown in Figure 3, that conforms to and which is adapted to be inserted in the manhole in the head y of the shell with which it co-operates, and hold said member 1 clamped tightly against the shell head by a clamping device 2 arranged on the inside of the shell in engagement with the flanged portion of the shell head that surrounds the manhole, as shown in Figure 1. The clamping device 2 may be formed conveniently by a bar arranged transversely at the inner end of a rotatable rod 3 which extends through the shaft of the member 1 with which said clamping device co-operates, said rod being provided adjacent its outer end with a screw-threaded portion 3^a that passes through a nut 4 which bears against the outer end of said shaft. In mounting the shell on the shafts G and G′ the rods 3 are turned into such a position that the clamping devices 2 thereon will be disposed horizontally, thus permitting said clamping devices 2 and the manhole engaging members 1 on the shafts G and G′ to be inserted in the manholes in the heads y of the shell. The nuts 4 are then turned in a direction to cause the rods 3 to

move inwardly, and when said rods reach such a position that the clamping devices 2 on the inner ends of same are positioned within the shell beyond the flanged portions z on the heads of the shell that surround the manholes, said rods are then turned by manipulating handles 5 on the outer ends of same so as to arrange the clamping devices 2 in a vertical position or at right angles to the longitudinal axis of the manholes which are oval-shaped, as shown in Figure 3. The clamping devices 2 are then held at rest by pressure applied to the handles 5 on the outer ends of the rods 3, and the nuts 4 are revolved in the opposite direction so as to move the rods 3 outwardly, thus causing the oval-shaped manhole engaging members 1 on the shafts G and G′ to be drawn tightly into the manholes in the heads y of the shell. As shown in Figure 1, each of the nuts 4 is preferably provided with a hand wheel 4^a, so as to facilitate turning said nuts during the operation of connecting the shafts G and G′ with the heads y of the shell. After the members 1 on the shafts G and G′ have been drawn into snug engagement with the flanged portions z of the shell heads that surround the manholes in said heads, the shell can be revolved easily by turning one or the other of said shafts and the shell will combine with the supporting structures F and F′ in such a way that it joins said structures together.

In the form of my invention herein illustrated the shaft G is provided with a worm gear 6 that co-operates with a worm 7 on a shaft 8 carried by the supporting structure F and provided with a hand wheel 9. When it is desired to turn the shell so as to bring an imperforate portion of same into position to be acted upon by the tools E, this can be effected easily by turning the hand wheel 9, thereby imparting rotary movement to the shaft G and to the shell to which it is connected. Moreover, as the shaft G is provided with a worm gear 6 that meshes with a worm 7, said shaft and the boiler shell x to which it is connected will be prevented from turning accidentally when the shell becomes unbalanced, due to the formation of a large number of holes in one longitudinal section of the shell.

In order to prevent the shell or drum x from deflecting or vibrating when the tools are operating on same, I provide the machine with supports arranged intermediate the ends of the shell that are adapted to be moved into engagement with the underside of the shell, and a means for holding the shell securely on said supports while the tools E are operating on the shell. The particular type or kind of supports that are used is immaterial, but I prefer to equip the base A with supports that can be moved into engagement with the underside of the shell after the shell has been positioned on the shafts G and G′ and which are so mounted or arranged that they will not interfere with the longitudinal adjustment of the supporting structures F and F′. In the form of my invention herein illustrated the base A is equipped with two pairs of supports H consisting of screws arranged on the base under the portion C of the standard D of the machine that carries the tool spindles B, each of said screws being rotatably mounted in an internally screw-threaded block H′ and being equipped with a hand wheel H^2 that is used to move the screw into and out of engagement with the underside of the shell. The blocks H′ are preferably pivotally mounted on the base A so that the screws H can be swung laterally into and out of engagement with the shell x when said shell is positioned on the shafts on the supporting structures F and F′, and in order that said blocks may be bodily removed from the base A so as to not interfere with the longitudinal adjustment of said supporting structures, removable pins H^3, shown in Figure 3, are used to connect said blocks to the base A. After the screws or supports H have been adjusted upwardly into engagement with the underside of the shell, a flexible member J, preferably a chain, is passed over the shell and tightened so as to hold the shell down securely on the supports H, the opposite ends of said chain being connected in any suitable way to the base A and means being provided for tightening said chain. Said means may consist of a turn-buckle J′, as shown in Figures 1 and 3, or one or more air jacks J^2, shown in Figure 4, can be combined with the chain J, so as to tighten same when it is desired to clamp the shell against the supports H. In order that the shell x may be mounted on the shafts G and G′ and removed from said shafts without liability of the shell striking against the tools E of the machine, I construct the supporting structures F and F′ in such a way that the portions of same in which the shafts G and G′ are mounted can be adjusted transversely of the base A, thereby enabling the shell to be mounted on said shafts when said shafts are positioned at one side of the tools E. This can be accomplished in various ways, such, for example, as by mounting the supporting structures F and F′ on carriages K and K′ and providing means for adjusting said supporting structures transversely of said carriages so as to shift the shell into and out of vertical alignment with the tools E of the machine. As shown in Figures 1 and 2, each of the carriages K and K′ is provided with a transversely-disposed operating screw L that passes through an internally screw-threaded bore on nut L′ on the supporting structure mounted on the carriage,

the rotary movement of said screw in one direction causing said supporting structure to move transversely of the carriage towards the rear of the base A of the machine and the rotary movement of said screw in the opposite direction causing said supporting structure to move transversely to the carriage towards the front of the base A. A pawl and ratchet mechanism comprising an operating handle M is combined with each of the screws L, so as to enable said screw to be rotated easily.

Owing to the fact that the shell is of considerably greater length than the portion C of the machine which carries the tool spindles B, the supporting structures F and F′ have to be adjusted longitudinally of the base A to bring the various transverse sections of the shell into position to be acted upon by the tools carried by said spindles. In order to accomplish this adjustment of the shell easily, I equip the base or bed plate A with rails N that extend longitudinally of same and provide the carriages K and K′ with grooved wheels or rollers O that travel on said rails, thereby producing a supporting means for the shell that can be easily adjusted longitudinally of the base.

Boiler shells or drums vary in diameter. Accordingly, when a shell of small diameter is being operated on it is necessary that the shafts G and G′ be arranged at a higher level than when a shell of maximum diameter is being operated on. Consequently, I prefer to construct the machine in such a way that the shafts G and G′ can be raised and lowered easily. In the form of my invention herein illustrated this is accomplished by equipping the supporting structures F and F′ with filler blocks P that can be removed and replaced by filler blocks of different thickness when it is desired to vary the level of the shafts G and G′.

In using my improved machine the carriages K and K′ are spaced apart far enough to permit a boiler shell or drum to be arranged between the shafts G and G′ on the supporting structures mounted on said carriages, said supporting structures at this time being arranged adjacent the front ends of the carriages. The shell is lifted or moved upwardly to such a height that the members 1 on the shafts G and G′ can be inserted in the manholes in the heads *y* of the shell, and thereafter, the clamping devices 2 are manipulated so as to draw the members 1 into snug engagement with said manholes, thus causing the shell to be firmly clamped to the shafts G and G′. The ratchet levers M are then actuated so as to rotate the screws L and move the supporting structures F and F′ transversely of the carriages K and K′ into such a position that the shell will be positioned in vertical alignment with the tools E, care being taken to cause the tools to be positioned in absolutely longitudinal alignment with the longitudinal axis of the shell. The supports H are then adjusted upwardly into engagement with the underside of the shell and the chain J is thereafter passed over the shell and tightened so as to hold the shell firmly down on said supports H. The tools E are then operated in such a way as to form one longitudinal row of holes in the top side of the shell, and after said row has been formed, the hand wheel 9 is rotated so as to turn the shell into position to bring an imperforate portion of same directly under the tools E. After the required number of longitudinal rows of holes have been formed in this transverse section of the shell the carriages K and K′ are moved longitudinally of the base A, so as to bring the next transverse section of the shell into the range of the tools E, the hand wheel 9 being manipulated so as to turn or revolve the shell to bring the imperforate portions of same into alignment with the tools E. After the holes have been formed in the shell, or after the holes have been reamed, the supporting structures F and F′ are moved transversely of the carriages K and K′ towards the front of the base A by operating the ratchet levers M so as to position the shell in front of the tools E, thus enabling the shell to be removed from the shafts G and G′ without liability of striking against the tools E.

In view of the fact that the shell is supported at its center by shafts which are engaged with the manholes in the heads of the shell or in temporary heads that are inserted in the end portions of the shell, the butt straps on the exterior of the shell do not interfere with the adjustment of the shell or cause it to assume an incorrect position with relation to the tools used in the operation of forming holes in the shell. As the shell is firmly clamped to two shafts, one of which is combined with a mechanism for turning the shaft, the shell can be rotated easily, and as the shell is carried by supporting structures which are mounted on carriages, it is a simple matter to move the shell longitudinally of the base to bring the various transverse sections of same into alignment with the portions of the machine in which the tool spindles are mounted. Even after the shell has become unbalanced, due to the formation of a large number of holes in one longitudinal section or half of the shell, there is no liability of the shell turning accidentally, owing to the fact that the shaft G is locked by a worm 7 and worm gear 6. While I have herein illustrated my invention embodied in a machine in which the worm 7 is operated by a hand wheel 9, it will, of course, be obvious that an electric motor or other suitable means could be used in place of the hand wheel 9 to rotate the

worm 7 to turn the shell x. In addition to the desirable features above pointed out, a machine of the construction above described makes it possible to use short drills or reamers, because the supporting structures F and F′ are mounted in such a way that it is not necessary to have a considerable clearance between the top side of the shell and the tools mounted in the portion C of the machine that hangs over the shell. In other words, by mounting the supporting structures F and F′ in such a way that they can be moved transversely of the carriages K and K′, the shell can be arranged in approximately correct horizontal position on the shafts G and G′ when the supporting structures F and F′ are positioned at one side of the tools E or at the front of the base A, and thereafter, said supporting structures can be moved rearwardly so as to arrange the shell in longitudinal alignment with the tools E. Accordingly, even if the machine is equipped with short tools E, there is no liability of the shell striking against said tools when the shell is being mounted on or removed from the means that supports same during the operation of forming holes in the shell.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, and means for supporting a boiler shell at the centers of the heads or end pieces of the shell during the operation of forming holes in the shell with the tools on said spindles.

2. A machine for drilling or reaming boiler shells, comprising a gang of rotatable tool spindles, supporting structures arranged at the ends of the shell being operated on, and means carried by said supporting structures and adapted to be engaged with the centers of the heads or end pieces of the shell for supporting and sustaining the shell in a stationary position while it is being acted upon by the tools on said spindles.

3. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated on, horizontally-disposed shafts carried by said supporting structures, and means for enabling said shafts to be detachably connected to the heads or end pieces of the shell so as to sustain said shell and hold it stationary while the tools of said spindles are operating on the shell.

4. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated on, shafts on said supporting structures provided with members that are adapted to be inserted in the manholes in the heads or end pieces of the shell, and means for clamping the heads to said members so as to cause the shell to be sustained by said shafts while the tools of said spindles are operating on the shell.

5. A machine for drilling or reaming boiler shells, comprising a base or bed plate, tool spindles arranged above said base, longitudinally-adjustable supporting structures on said base provided with means for supporting a boiler shell at its center, and means for enabling said supporting structures to be adjusted transversely of the base to bring the shell into and out of operative relationship with the tools on said spindles.

6. A machine for drilling or reaming boiler shells, comprising a base or bed plate, a plurality of rotatable tool spindles arranged above said base, longitudinally-movable carriages mounted on said base, supporting structures on said carriages, means for adjusting said supporting structures transversely of the carriages, and means on said supporting structures adapted to be engaged with the heads or end pieces of a boiler shell for supporting the shell at its center and holding it in a horizontal position beneath said spindles.

7. A machine for drilling or reaming boiler shells, comprising a base or bed plate, a plurality of rotatable tool spindles arranged above said base, supporting structures on said base, devices on said supporting structure adapted to be engaged with the heads or end pieces of a boiler shell for supporting the shell, means for rotating said shell to bring imperforate portions of same into position to be acted upon by the tools on said spindles, and means whereby said supporting structures can be adjusted longitudinally of the base and transversely of the base, for the purpose described.

8. An apparatus for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated upon, horizontally-disposed shafts carried by said supporting structures and adapted to be connected with the heads or end pieces of said shell to sustain it in operative relationship with said spindles, and mechanism for rotating one of said shafts to turn or revolve the shell about its longitudinal axis so as to bring imperforate portions of the shell into position to be acted upon by the tools of said spindles.

9. An apparatus for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated upon, horizontally-disposed shafts carried by said supporting structures and adapted to be connected with the heads or end pieces of the shell to sustain the shell while it is being operated upon by the tools on said spindles,

and a mechanism for rotating one of said shafts comprising a worm gearing.

10. An apparatus for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated upon, devices on said supporting structures adapted to be engaged with the heads or end pieces of the shell to support the shell while it is being operated upon by the tools of said spindles, and removable elements associated with said devices so as to enable said devices to be raised or lowered to adapt the machine to shells of different diameters.

11. An apparatus for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated upon and provided with means for supporting the shell at its center, and means arranged between said supporting structures for preventing the shell from vibrating or turning when holes are being formed in same by the tools of said spindles.

12. An apparatus for drilling or reaming boiler shells, comprising rotatable tool spindles, supporting structures arranged at the ends of the shell being operated upon and provided with means for supporting the shell at its center, supports between said supporting structures that are adapted to be engaged with the underside of the shell, and means for clamping the shell securely on said supports.

13. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, a base or bed plate, longitudinally-adjustable supporting structures on said base, shafts on said supporting structures, means for connecting said shafts to the heads or end pieces of a boiler shell so as to sustain said shell in operative relationship with said spindles, vertically-adjustable supports on said bed plate adapted to be moved into engagement with the underside of the intermediate portion of the shell, and means for clamping the shell down on said supports.

14. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, a base or bed plate, longitudinally-adjustable supporting structures on said base provided with means for rotatably supporting a boiler shell at its center and holding it in operative relationship with said spindles, and vertically-adjustable supports on said base, adapted to be moved into engagement with the underside of the intermediate portion of the shell and arranged so as to not interfere with the longitudinal adjustment of said supporting structures.

15. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, a base or bed plate, longitudinally-movable carriages on said base, transversely-movable supporting structures mounted on said carriages, horizontally-disposed shafts on said supporting structures, means for detachably connecting the shafts to the heads or end pieces of a boiler shell, vertically-adjustable supports on the base adapted to be engaged with the underside of the intermediate portion of the shell, a flexible member that is adapted to be passed over the shell to hold it firmly on said supports, and means for tightening said flexible member.

16. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, two spaced supporting structures between which a boiler shell is adapted to be arranged, means on said supporting structures adapted to be engaged with the manholes in the heads or end pieces of the shell to support the shell while it is being acted upon by the tools on said spindles, and means for turning or revolving the shell so as to bring imperforate portions of same into position to be acted upon by said tools.

17. A machine for drilling or reaming boiler shells, comprising rotatable tool spindles, two spaced supporting structures between which a boiler shell is adapted to be arranged, means on said supporting structures adapted to be engaged with the manholes in the heads or end pieces of the shell to support the shell while it is being acted upon by the tools on said spindles, means for turning or revolving the shell so as to bring imperforate portions of same into alignment with said tools, and means whereby the supporting structures can be adjusted longitudinally with respect to the tools on said spindles.

18. A machine for drilling or reaming tube holes in boiler shells, comprising a base or bed plate, an upright on said bed plate, vertically-disposed tool spindles mounted in a laterally-projecting portion on said upright, and longitudinally-adjustable supporting structures on said base provided with means adapted to be engaged with the heads or end pieces of the shell to support the shell in a horizontal position beneath said spindles while it is being acted upon by the tools carried by said spindles.

19. A machine for drilling or reaming tube holes in boiler shells, comprising a base or bed plate, an upright at one edge of said bed plate, vertically-disposed tool spindles mounted in a laterally-projecting portion on said upright, longitudinally-adjustable supporting structures on said base provided with means adapted to be engaged with the heads or end pieces of the shell to support the shell in a horizontal position beneath said spindles while it is being acted upon by the tools carried by said spindles, a manually-operable means for turning the shell to bring imperforate portions of same

into alignment with said tools when said tools are not operating on the shell, and means for preventing the shell from vibrating or turning while it is being acted upon by said tools.

20. A machine for drilling or reaming tube holes in boiler shells, comprising a base or bed plate, an upright at one edge of said bed plate, vertically-disposed tool spindles mounted in a laterally-projecting portion on said upright, longitudinally-adjustable supporting structures on said base provided with means adapted to be engaged with the heads or end pieces of the shell to support the shell in a horizontal position beneath said spindles while it is being acted upon by the tools carried by said spindles, a manually-operable means for turning the shell to bring imperforate portions of same into alignment with said tools when said tools are disengaged from the shell, means for preventing the shell from vibrating or turning while it is being acted upon by said tools, and means whereby said supporting structures can be adjusted longitudinally of the base and also transversely of the base, for the purpose described.

FREDERICK O. PAHMEYER.