Feb. 6, 1940. K. E. JONES 2,189,040

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Filed Dec. 27, 1938 4 Sheets-Sheet 1

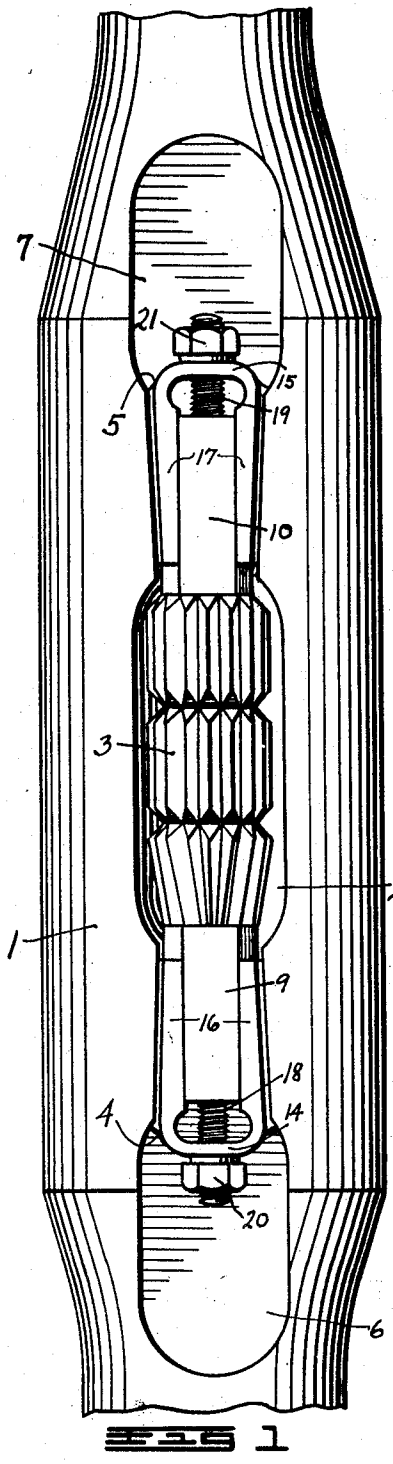


FIG 1

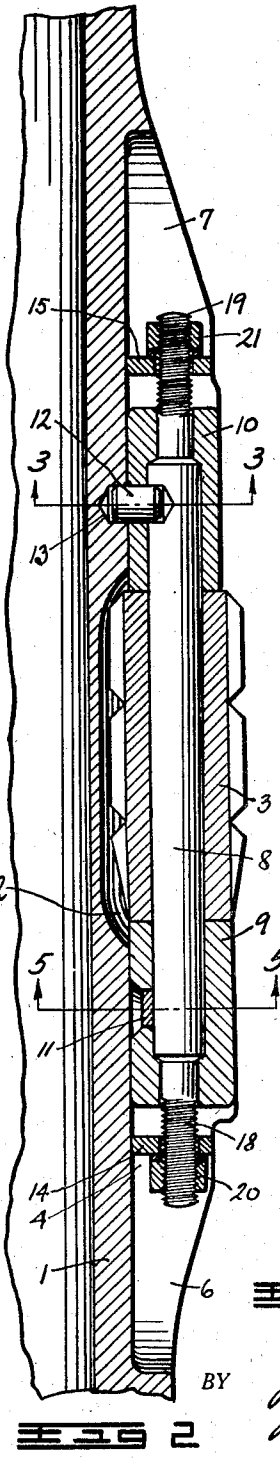


FIG 2

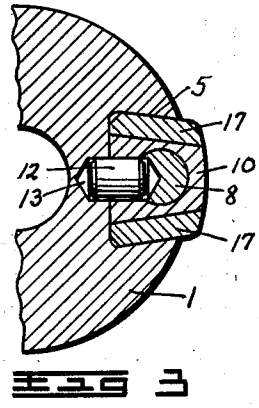


FIG 3

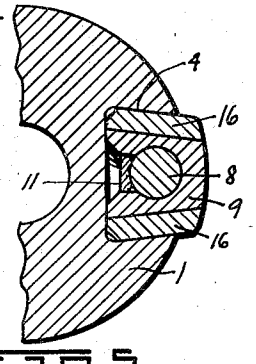


FIG 5

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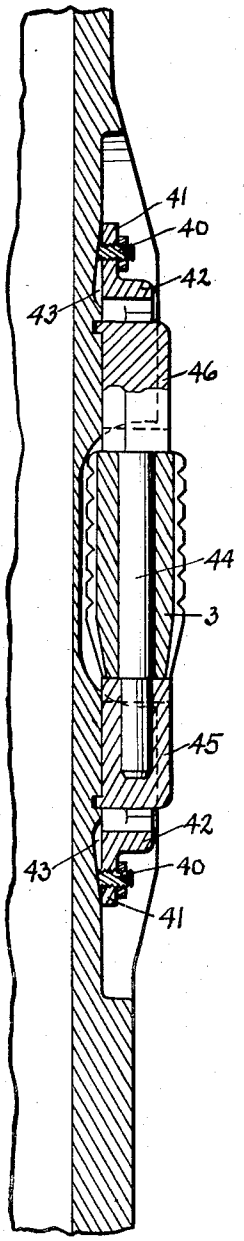


Fig. 14.

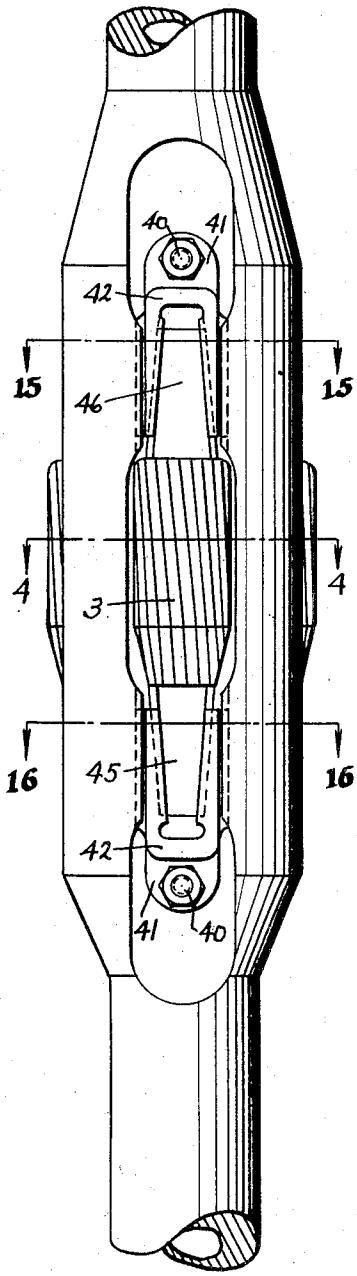


Fig. 13.

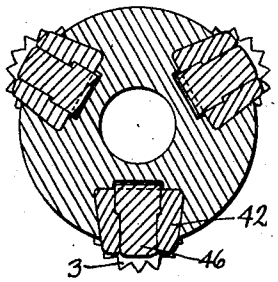


Fig. 15.

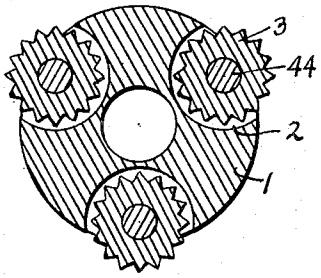


Fig. 4.

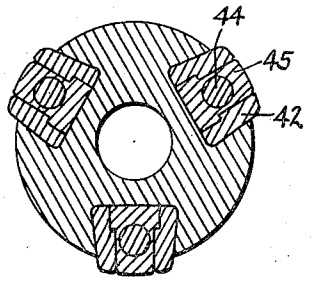


Fig. 16.

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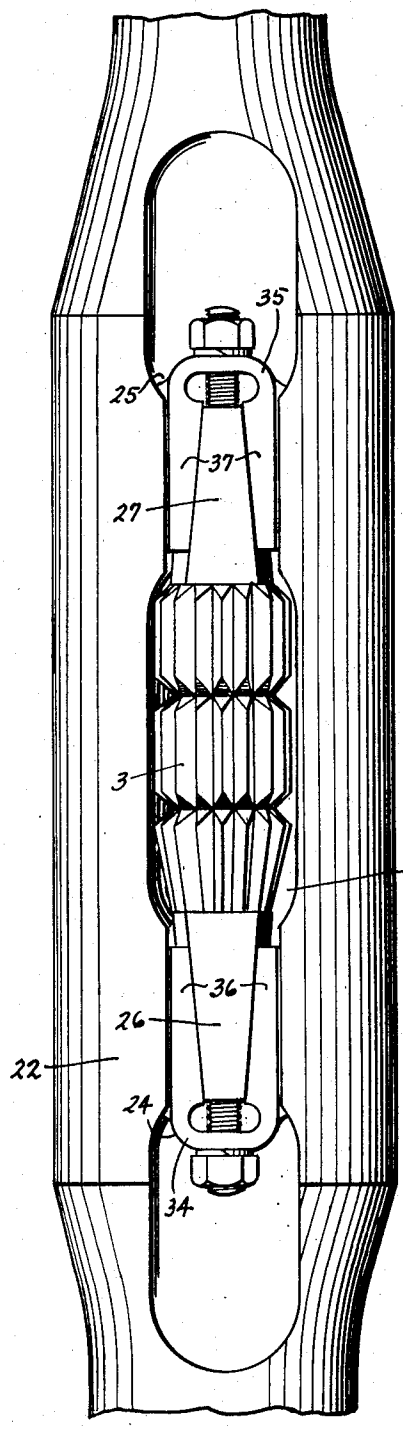


FIG. 6.

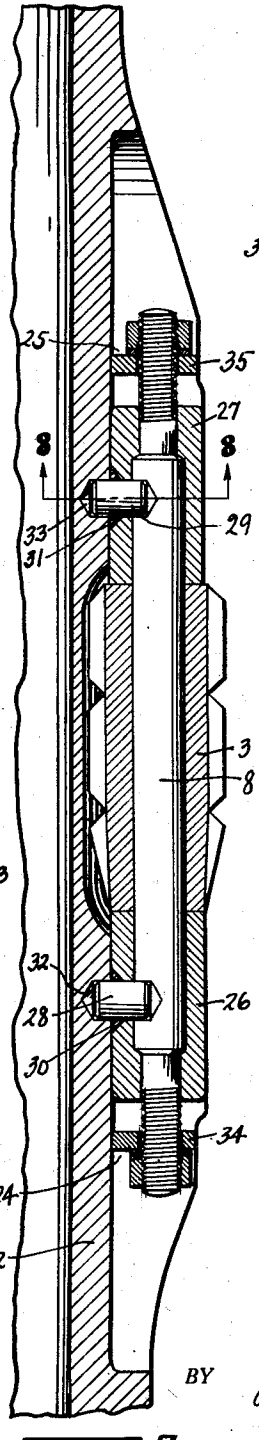


FIG. 7.

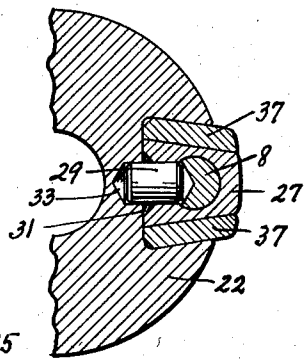


FIG. 8.

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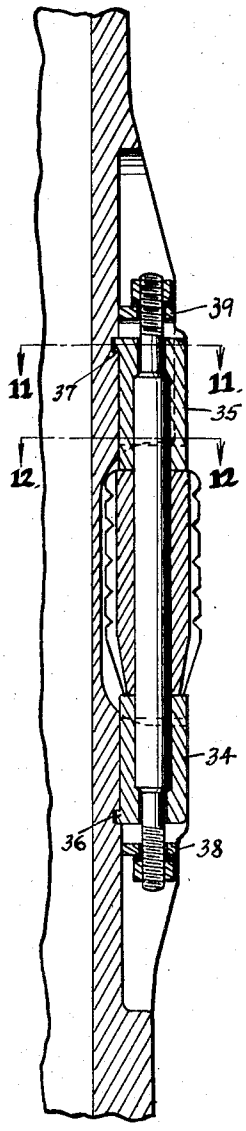


Fig. 10.

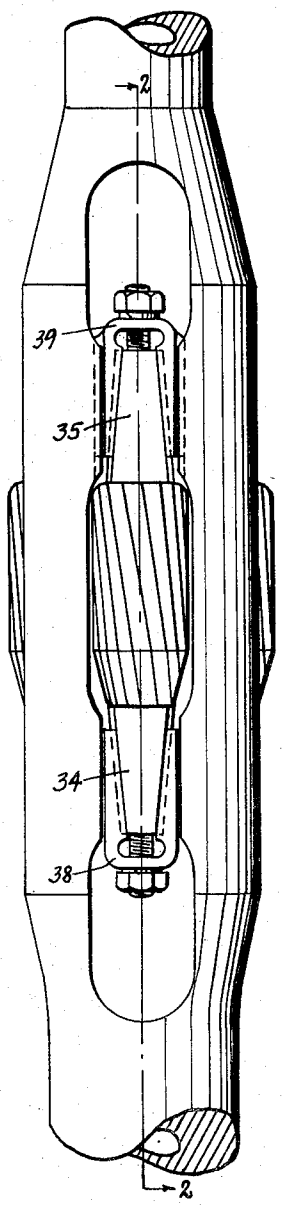


Fig. 9.

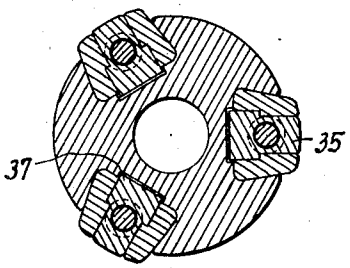


Fig. 11.

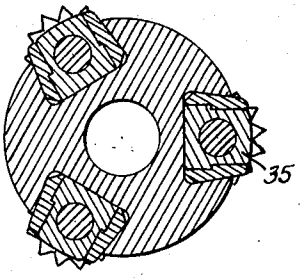


Fig. 12.

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Patented Feb. 6, 1940 2,189,040

UNITED STATES PATENT OFFICE

2,189,040

REAMER

Kenneth E. Jones, Houston, Tex., assignor to Reed Roller Bit Company, Houston, Tex., a corporation of Texas

Application December 27, 1938, Serial No. 247,785

8 Claims. (Cl. 255—73)

This invention relates to reamers for use in drilling wells. It has for its general object the provision of a structure whereby a reamer structure of the roller type may be firmly and securely mounted on a reamer body.

In mounting reamer cutters on reamer bodies it is essential that they be mounted firmly and securely and that all possible play between the parts constituting the mounting be eliminated. It is, furthermore, desirable that the reamer cutter be readily mounted or dismounted as and when desired without the necessity for any skill or for any special tools for accomplishing such mounting and dismounting of the cutters. It is further desirable that the structure be simple, easy to manufacture, and that it be as nearly fool proof and free from possible damage in use as it is possible to make it.

It is, therefore, an object of this invention to provide a structure for mounting a reamer cutter on a reamer body in such a manner as to give the greatest possible degree of rigidity to the mounting, prevent any play or lost motion between the parts of the mounting during operation, and to make the mounting as simple both to construct and to operate as is reasonably possible.

It is a further object of this invention to provide a structure which will make it possible to quickly and easily change cutters on a reamer body.

It is a further object of this invention to provide a structure which will make it possible for a reamer cutter assembly to be made up in a factory under skilled supervision and to then be transported to the scene where it is to be used and which can be substituted for other worn or broken reamer cutters and put into use.

Another object of this invention is to provide a mounting for reamer cutters which will positively prevent endwise movement of reamer cutters and take up end thrust on such cutters during their operation.

Other objects and advantages of this invention will become apparent from the following drawings taken in connection with the accompanying drawings, it being understood that the same are by way of illustration and example only.

In the drawings:

Fig. 1 is a side elevation of a reamer body constructed in accordance with this invention, showing the reamer cutter in place therein.

Fig. 2 is a vertical cross section through one wall of the reamer body illustrated in Fig. 1 and through one of the cutters mounted therein.

Fig. 3 is a partial horizontal cross section taken along the line 3—3 of Fig. 2.

Fig. 4 is a partial horizontal cross section taken along the line 4—4 of Fig. 13.

Fig. 5 is a partial horizontal cross section taken along the line 5—5 of Fig. 2.

Fig. 6 is a view similar to Fig. 1 but showing a slight modification.

Fig. 7 is a vertical cross section through one wall of the reamer body illustrated in Fig. 6 and through one of the cutters mounted therein.

Fig. 8 is a partial horizontal cross section taken along the line 8—8 of Fig. 7.

Fig. 9 is a view similar to Figs. 1 and 6 showing a still further modification.

Fig. 10 is a vertical cross section through one wall of the reamer body illustrated in Fig. 9 and through one of the cutters mounted therein.

Fig. 11 is a horizontal cross section taken along the line 11—11 of Fig. 10.

Fig. 12 is a horizontal cross section taken along the line 12—12 of Fig. 10.

Fig. 13 is a view similar to Figs. 1, 6 and 9 showing a still further modification.

Fig. 14 is a vertical cross section through one wall of the reamer body illustrated in Fig. 13 and through one of the cutters mounted therein.

Fig. 15 is a horizontal cross section taken along the line 15—15 of Fig. 14.

Fig. 16 is a horizontal cross section taken along the line 16—16 of Fig. 14.

In accordance with this invention, a reamer body 1 is formed with a major recess 2 adapted to receive a reamer cutter 3 and with auxiliary recesses 4 and 5, respectively, at the opposite ends of said major recess. Each of these auxiliary recesses consists of a part tapering toward a smaller dimension in a direction toward the major recess and toward a smaller dimension in a direction toward the outside contour of the reamer body, and a part of greater width than said tapering or wedge-shaped part, these latter parts being designated by the numerals 6 and 7, respectively. The reamer cutter 3 is rotatably mounted upon a shaft 8 having supporting blocks 9 and 10 at its opposite ends. In the present instance the supporting block 9 is shown as being secured to the shaft 8 by means of welding 11 and the supporting block 10 is prevented from longitudinal movement with respect to the shaft 8 by means of a dowel pin 12. The blocks 9 and 10 do not taper from end to end but do taper from their inner toward their outer surfaces as illustrated in Figs. 3 and 5. The dowel 12 in addition to preventing longitudinal movement

between the shaft 8 and the block 10 also is disposed within an opening 13 in the body 1 at the bottom of the recess 5 to prevent longitudinal movement between the shaft 8 and the block 10 on the one hand and the body 1 on the other hand. This, however, is only during the time that the cutter is being mounted in the reamer body, because as will presently be seen the operating thrust upon the reamer cutter will be taken directly to the reamer body by a different part of the mounting.

The part of the mounting just referred to is a U-shaped wedging device, two of which are employed, one at each end, these being designated by the numerals 14 and 15, respectively. These wedging devices are provided on their outer surfaces with tapering faces adapted to cooperate with and fit the tapering surfaces in the recesses 4 and 5. The inner surfaces of these U-shaped members are adapted to fit the outer surfaces of the blocks 9 and 10, and when these members are forced toward the major recess 2 they will be forced at the same time to wedge between the inner surfaces of the recesses 4 and 5 and the outer surfaces of the blocks 9 and 10. Each of these U-shaped members for this purpose has a pair of wedging parts extending between the walls of the recesses and the adjacent outer surfaces of the blocks 9 and 10, these parts on the member 14 being designated by the numeral 16 and these parts on the member 15 being designated by the numeral 17. Each of the members 14 and 15 has a cross part connecting the wedging parts referred to and this cross part is provided with an opening adapted to receive respectively the threaded ends 18 and 19 of the shaft 8. Nuts 20 and 21 are threaded onto the ends of this shaft as illustrated and tightened to draw the members 14 and 15 into tight wedging engagement and to firmly secure the cutter in place.

It will be seen that when the cutter is mounted as just described any longitudinal force exerted upon the cutter tending to move it longitudinally with respect to the body 1 will be transmitted through the shaft 8 either to the nut 20 or the nut 21, as the case may be, and through such nut to the member 14 or the member 15. Inasmuch as these members are firmly wedged in tapering portions of the recesses 4 and 5 in the body member, they will positively prevent any longitudinal movement and will take directly the end thrust from the cutter 3. The dowel 12 will thus be called upon to bear no substantial end thrust but will simply serve as a locking dowel for use during the assembly of the device.

With reference to the device shown in Figs. 6 to 8, inclusive, this is very similar to the one just described, the principal difference being that the body 22 in this case is provided on opposite ends of the major recess 23 with minor recesses 24 and 25 which have portions tapering in a radially outward direction only and not tapering in a longitudinal direction. The blocks 26 and 27 which are mounted on the opposite ends of the shaft 8, as previously described, are tapered in a longitudinal direction, the smaller dimensions being the more remote from the major recess 23. In this form, two dowel pins 28 and 29 are employed, both of which are welded in position as shown at 30 and 31. The dowel pin 28 serves to prevent longitudinal movement between block 26 and the shaft 8 and secures these parts together and at the same time projects into the recess 32 in the body to prevent longitudinal movement of the block and shaft. Likewise, the dowel 29 serves to inter-connect the shaft 8 and the block 27 and projects into an opening 33 to prevent these members from longitudinal movement with respect to the body. The dowel pins 28 and 29 do take the end thrust from the cutter 3 in this instance because the wedge members 34 and 35 corresponding to the previously described members 14 and 15 do not fit within longitudinally tapering portions of the body. Instead, although they have wedge parts 36 and 37 wedging between the blocks 26 and 27 and their respective recesses, these parts serve simply to positively secure the blocks 26 and 27 in their recesses and prevent any play laterally between them and their recesses. The end thrust as heretofore stated is taken principally by the dowels 28 and 29.

The form shown in Figs. 9 to 12, inclusive, is likewise very similar, differing principally from the forms shown in Figs. 6 to 8, inclusive, in that instead of the blocks 26 and 27 with the dowel pins 28 and 29, there are employed in this form blocks 34 and 35. These blocks do not employ dowel pins as do the blocks 26 and 27 but instead employ integral flange-like parts 36 and 37 which project into grooves or recesses in the body member to prevent longitudinal movement. Also, these blocks 34 and 35 instead of having smooth, continuous, sloping lateral surfaces, have stepped surfaces as clearly shown in Figs. 11 and 12. The double wedging members 38 and 39 have correspondingly shaped inner wedging surfaces. The operation is substantially identical to that described in connection with Figs. 6 to 8, inclusive.

The one other modification shown in Figs. 13 to 16, inclusive, is substantially identical with that shown in Figs. 9 to 12, inclusive, except that the U-shaped double wedging members instead of being drawn into place by nuts threaded onto the ends of the cutter shaft are driven into place with a hammer or other suitable means, and are thereafter held by means of a set screw 40. This set screw is threaded through a tail portion 41 of the double wedging member 42 and engages a channel of tapering depth 43 in the bottom of the auxiliary recess. The cutter shaft 44 does not extend through the blocks 45 and 46, but in other respects said blocks are identical with the blocks 34 and 35 previously described.

It will be seen from the foregoing that in the case of each modification set forth the matter of mounting the cutter in the reamer body is extremely simple and may be carried out by any one by tools ordinarily available. At the same time, it is possible in any of the forms illustrated to first assemble the cutter with respect to its supporting blocks and shaft and to then mount and dismount such cutter assembly as a unit.

Having described my invention, I claim:

1. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses tapering to a smaller dimension in a directon outwardly from the center of said reamer body, a block in each of said auxiliary recesses, a reamer pin having its end portions carried by said blocks and the ends thereof extending through and beyond said blocks, the central portion of said pin extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, and U-shaped wedging members having parts adapted to engage said pin portions and wedgingly engage between the walls of said auxiliary recesses and the side surfaces of said blocks to wedgingly hold said blocks in said auxiliary recesses.

2. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses tapering toward a smaller dimension in a direction outwardly from the center of said reamer body, a block of substantially uniform cross section throughout its length in each of said auxiliary recesses, a reamer pin having its ends carried by said blocks, respectively, the central portion of said pin extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, and double wedging members having parts adapted to wedgingly engage between the walls of said auxiliary recesses and the side surfaces of said blocks to wedgingly hold said blocks in said auxiliary recesses.

3. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses tapering toward a smaller dimension in a direction outwardly from the center of said reamer body, a block in each of said auxiliary recesses, a reamer pin having its end portions carried by said blocks and the ends thereof extending through and beyond said blocks, the central portion of said pin extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, and U-shaped wedging members having parts adapted to engage said pin portions and wedgingly engage between the walls of said auxiliary recesses and the side surfaces of each of said blocks to wedgingly hold said blocks in said auxiliary recesses, said blocks having parts projecting laterally into said body to transfer to said body the end thrust from said reamer cutter.

4. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses being narrower at the outer surface of said body than at a position inwardly from said outer surface, a block in each of said auxiliary recesses, a reamer pin having its ends carried by said blocks, the central portion of the pin extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, a pair of U-shaped wedging members having parts adapted to wedgingly engage between the walls of said auxiliary recesses and the side surfaces of said blocks to wedgingly hold said block in said auxiliary recess, said pin extending through said wedging members, and means engaging the portions of said pin projecting through said wedging members and said wedging members for urging said wedging members into tight wedging engagement with said blocks and auxiliary recesses.

5. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at one end of said major recess, said auxiliary recess being narrower at the surface of said body than at a position inwardly from such surface, a block in said recess, a reamer pin having one of its end portions carried by said block and extending through and beyond said block, the central portion of said pin extending into said major recess, a reamer cutter rotatably carried by said pin within said major recess, and a U-shaped wedging member adapted to engage said pin portion and wedgingly engage between the walls of said auxiliary recess and the side surfaces of said block to wedgingly hold said block in said auxiliary recess.

6. In a reamer construction, a reamer body having a major recess in its outer surface, and an auxiliary recess at one end of said major recess, said auxiliary recess being narrower at the surface of said body than at a position inwardly from such surface, a block in said recess, a reamer pin having one of its end portions carried by said block and having the end thereof extending through and beyond said block, the central portion of said pin extending into said major recess, a reamer cutter rotatably carried by said pin within said major recess, and a pair of wedges having parts adapted to wedgingly engage between the opposite walls of said auxiliary recess and the opposite surfaces of said block, respectively, to wedgingly hold said block in said auxiliary recess.

7. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses being narrower at substantially the surface of said body than at a position remote from said surface, a block in each of said auxiliary recesses, a reamer pin having its ends carried by said blocks, and its central portion extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, and U-shaped wedging members having parts adapted to wedgingly engage between the walls of said auxiliary recess and the side surfaces of said blocks to wedgingly hold said blocks in said auxiliary recesses, said auxiliary recesses being of substantially uniform shape in cross section from end to end thereof and said blocks tapering in width from one end to the other thereof.

8. In a reamer construction, a reamer body having a major recess in its outer surface and an auxiliary recess at each end of said major recess, each of said auxiliary recesses being narrower at substantially the surface of said body than at a position remote from said surface, a block in each of said auxiliary recesses, a reamer pin having its ends carried by said blocks, and its central portion extending through said major recess, a reamer cutter rotatably carried by said pin within said major recess, and U-shaped wedging members having parts adapted to wedgingly engage between the walls of said auxiliary recess and the side surfaces of said blocks to wedgingly hold said blocks in said auxiliary recesses, said auxiliary recesses being of tapering width from one end to the other thereof and said blocks being of substantially uniform shape in cross section from one end to the other thereof.

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