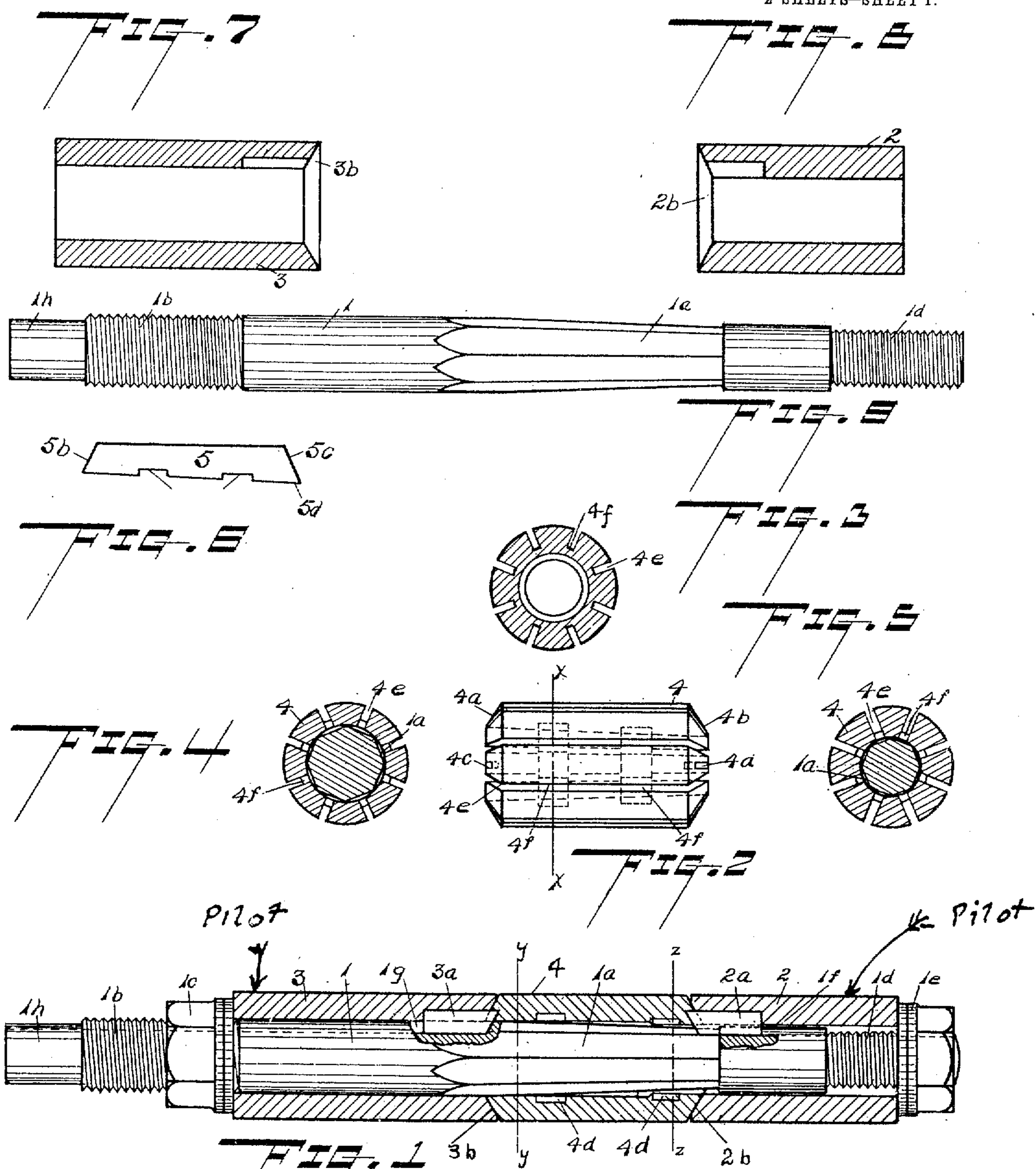


Eggs et al 1024399 77-76 pilot sleeve on front end.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.



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ADJUSTABLE REAMER.

APPLICATION FILED APR. 9, 1910.

976,212.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 2.

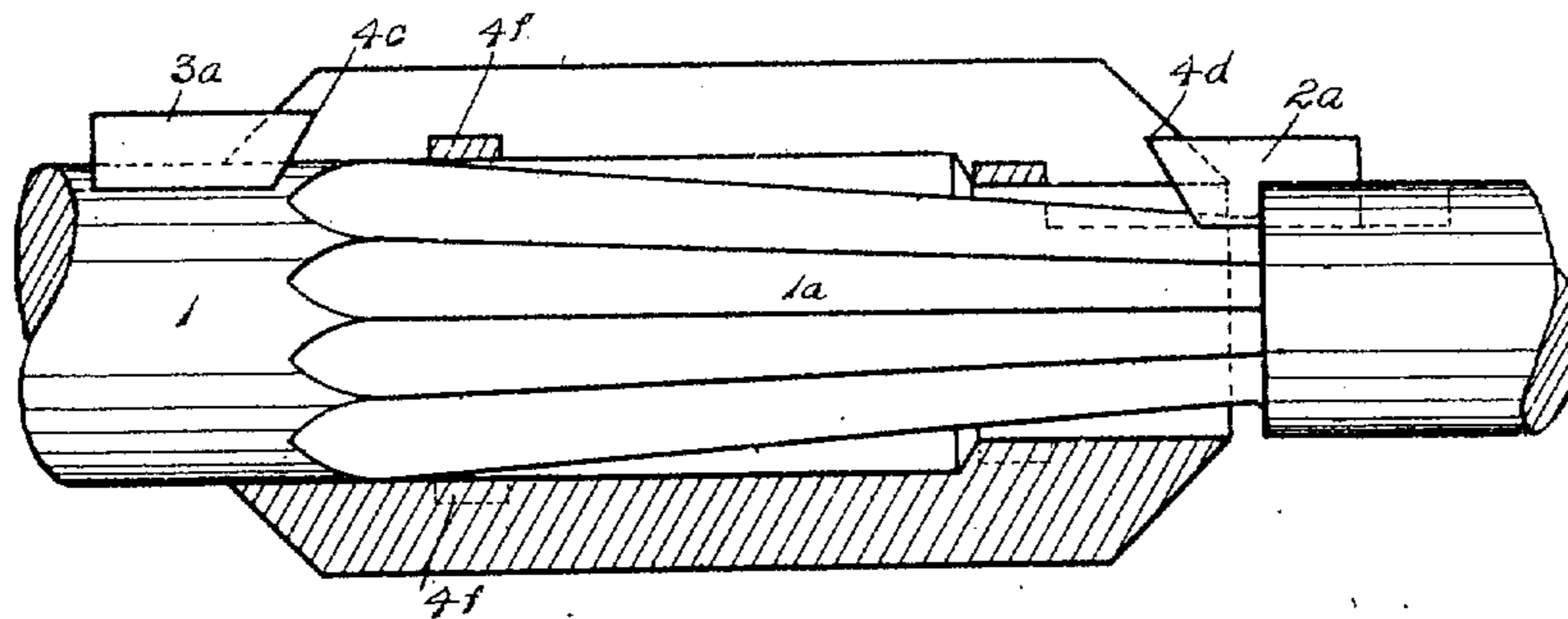


FIG. 10

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# UNITED STATES PATENT OFFICE.

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## ADJUSTABLE REAMER.

976,212.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed April 9, 1910. Serial No. 554,562.

*To all whom it may concern:*

Be it known that we, WILLIAM H. PUGH and JOHN A. ETZOLD, respectively, citizens of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Adjustable Reamers; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is an adjustable reamer having adjustment by which the cutting diameter of the reamer may be increased or decreased by very small increments, the reamer being provided with means for reading the increase or decrease of diameter in minute fractions of an inch.

The objects of the invention are to provide the reamer with means for expanding the cutting diameter, by simultaneously setting out from the center line of the reamer a plurality of cutting blades, all of the blades being set out exactly the same amount, and means for retaining the blades in their adjusted position and locking them against endwise movement and against further radial movement either inward or outward.

With these and other objects in view which will be more fully set forth in the specification, our invention consists in the devices illustrated in the accompanying drawings, in which—

Figure 1 is a part sectional longitudinal view of the assembled reamer, Fig. 2 is a side view of the slotted barrel in which the reamer blades are mounted, Fig. 3 is a transverse section on the line  $x-x$  of Fig. 2, Fig. 4 is a transverse section on the line  $y-y$  of Fig. 1, Fig. 5 is a section on the line  $z-z$  of Fig. 1, Fig. 6 is a detail of one of the removable blades, Fig. 7 is a longitudinal section of one of the sliding pilot sleeves, Fig. 8 is a longitudinal section of the other pilot sleeve, Fig. 9 is a detached view of the reamer spindle, and Fig. 10 is an enlarged detail of the floating barrel that carries the blades.

As is clearly shown in the drawings, the reamer consists in a tapered spindle 1 having a plurality of flatted faces 1<sup>a</sup>, said faces being tapered to conform with the taper of the spindle 1. The spindle 1 has

one end threaded as at 1<sup>b</sup>, to receive the threaded nut 1<sup>c</sup>, and the small end of the spindle is threaded as at 1<sup>d</sup> to receive a second nut 1<sup>e</sup>. A sliding pilot sleeve 2 is slipped over the small end of the spindle 1 and is prevented from turning thereon by a key 2<sup>a</sup> rigidly fixed to the sliding sleeve 2, but adapted to slide lengthwise in the key-way 1<sup>f</sup> of the spindle 1, the forward movement of the sliding pilot sleeve 2 being regulated by the nut 1<sup>e</sup>. One end of the sliding pilot sleeve 2 is beveled as at 2<sup>b</sup>, for a purpose that will presently be explained. A second sliding pilot sleeve 3 is slidably mounted on the large end of the tapered spindle 1, as shown in Fig. 1, and is also provided with a key 3<sup>a</sup> slidably mounted in the key-way 1<sup>g</sup> of the spindle 1. The longitudinal movement of the sleeve 3 is regulated by means of the nut 1<sup>c</sup>. One end of the sleeve 3 is beveled as at 3<sup>b</sup>.

Between the sliding sleeves 2 and 3 and surrounding the tapered and flatted part 1<sup>a</sup> of the spindle 1, is slidably mounted a hollow cylindrical member 4, which we term a "floating barrel", because the end (4<sup>b</sup>) of the barrel is not in contact with the spindle 1<sup>a</sup>, the end (4<sup>a</sup>) only being slidably supported by the large end of the spindle 1. The bore of the barrel is preferably made in two sizes, as shown in Fig. 10, the smaller diameter being slightly larger than the small diameter of the tapered part 1<sup>a</sup> of the spindle 1, so that the end 4<sup>b</sup> of the barrel "floats".

As illustrated in Figs. 1 and 2, the ends 4<sup>a</sup> and 4<sup>b</sup> are beveled to fit the beveled ends 2<sup>b</sup>, 3<sup>b</sup> of the sleeves 2 and 3. Key-ways 4<sup>c</sup> and 4<sup>d</sup> are provided in the ends 4<sup>a</sup> and 4<sup>b</sup> of the floating barrel, to receive the projecting ends of the keys 3<sup>a</sup> and 2<sup>a</sup>, thereby locking the barrel 4 and the sleeves 2 and 3 together and locking them against rotation with reference to the spindle 1, so that rotating the spindle 1 by means of its projecting shank 1<sup>h</sup>, will rotate the floating barrel 4. The function of the floating barrel is to receive the cutting blades, to space them, and to support them against any torsional strain which might, if the barrel were omitted, cause the blades to tilt.

The construction of the floating barrel 4 is illustrated in Figs. 2, 3, 4, 5 and 10, from which it will be seen that the cylindrical barrel is provided with a plurality of lon-

longitudinal slots 4<sup>e</sup> around its periphery. While we have illustrated the slots as placed parallel with the axis of the barrel, it is obvious that they may be arranged at a slight angle thereto if desired. Each of the said slots extends from the outer periphery of the barrel to its bore, except at certain places in the length of the barrel as at 4<sup>f</sup>, at which place the slot 4<sup>e</sup> is made to extend from the outer periphery of the barrel not quite to its bore, thereby leaving the bridges 4<sup>f</sup> across the slot 4<sup>e</sup>. These bridges hold the barrel 4 intact and also form guides to keep the removable reamer blades in proper alinement with reference to the barrel 4 while permitting the blades to be moved in and out radially by the longitudinal adjustment of the tapered spindle.

One of the reamer blades is illustrated in Fig. 6, the blade 5 having on its lower edge slots 5<sup>a</sup> adapted to fit over the bridges 4<sup>f</sup> of the barrel 4, the ends 5<sup>b</sup> and 5<sup>c</sup> of the blade 5 being beveled to conform with the bevels 3<sup>b</sup> and 2<sup>b</sup> of the sliding pilot sleeves 2 and 3. The lower edge 5<sup>d</sup> of blade 5 projects a short distance into the bore of the floating barrel 4 when the parts are assembled, so that the flattened faces 1<sup>a</sup> of spindle 1 bear against the inner edge 5<sup>d</sup> of each of the blades 5. By moving the spindle lengthwise, the blades 5 are forced out or allowed to retract, the ends 5<sup>b</sup> and 5<sup>c</sup> of each blade 5 being guided by the ends 3<sup>b</sup> and 2<sup>b</sup> of the sliding pilot sleeve. The pilot sleeves are adapted to tighten against the ends of the blades. After long continued use, when the scraping edges of the blades have been worn away and have been set out to compensate for such wear, the lower edge, being the greatest length of the blade, in rising, causes a slight opening or clearance between the ends of the floating barrel and the ends of the pilot sleeves, all the binding effect being between the ends of the pilot sleeves and the ends of the blades.

To expand the reamer it is only necessary to first loosen the threaded nut 1<sup>e</sup>, and to tighten the second nut 1<sup>e</sup>, the tightening of nut 1<sup>e</sup> forcing forward pilot sleeve 2, blades 5, floating barrel 4, and pilot sleeve 3. The blades 5, in their longitudinal movement up the flattened faces 1<sup>a</sup> of the spindle 1, carry with them the floating barrel, and the cutting edges of the blades 5 are forced outwardly while the ends 5<sup>b</sup> and 5<sup>c</sup> of the blades are simultaneously locked against the beveled ends 3<sup>b</sup> and 2<sup>b</sup> of the pilot sleeves. To decrease the diameter of the reamer, it is

only necessary to loosen the nut 1<sup>e</sup> and tighten nut 1<sup>e</sup>.

Having described our invention, what we claim and desire to secure by Letters Patent, is:—

1. In an adjustable reamer, the combination with a tapered spindle, of a pair of oppositely placed pilot sleeves slidably mounted on said spindle, means for preventing rotation of said sleeves relative to said spindle, the opposing ends of said sleeves being beveled, a floating barrel having beveled ends received in the beveled ends of said sleeves, slots in said barrel, blades mounted in said slots, the inner edges of said blades contacting with said tapered spindle, and means for adjusting said sleeves and barrel longitudinally with reference to said spindle.

2. In an adjustable reamer, the combination with a tapered spindle having a plurality of flattened faces, of a pair of oppositely placed pilot sleeves slidably mounted on said spindle, means for preventing the rotation of said sleeves relative to said spindle, the opposing ends of said sleeves being beveled, a floating barrel having beveled ends received in the beveled ends of said sleeves, slots in said barrel, blades mounted in said slots, the inner edges of said blades contacting with the flattened faces of said tapered spindle, and means for adjusting said sleeves and barrel longitudinally with reference to said spindle.

3. An adjustable reamer comprising, in combination with a tapered spindle having a plurality of flattened faces, said spindle being formed with threaded ends and provided with longitudinal key-ways, a pair of oppositely placed pilot sleeves, each having a key engaging one of said key-ways, each of said sleeves being formed with a beveled end, a floating barrel received on said sleeve and provided with longitudinal slots, and bridges, said floating barrel being formed with beveled ends, a plurality of blades removably inserted in said slots, said blades formed with beveled ends and having their inner edges formed with slots to engage said bridges, and nuts on the threaded ends of said spindle adapted to engage the outer ends of said pilot sleeves.

In testimony whereof, we affix our signatures in presence of two witnesses.

WILLIAM HENRY PUGH.  
 JOHN ALBERT ETZOLD.

Witnesses:

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 EUNICE COMER.