F. O. WELLS.

CUTTER HEAD.

APPLICATION FILED MAR. 24, 1906.

947,319. Patented Jan. 25, 1910.

Fig. 1.

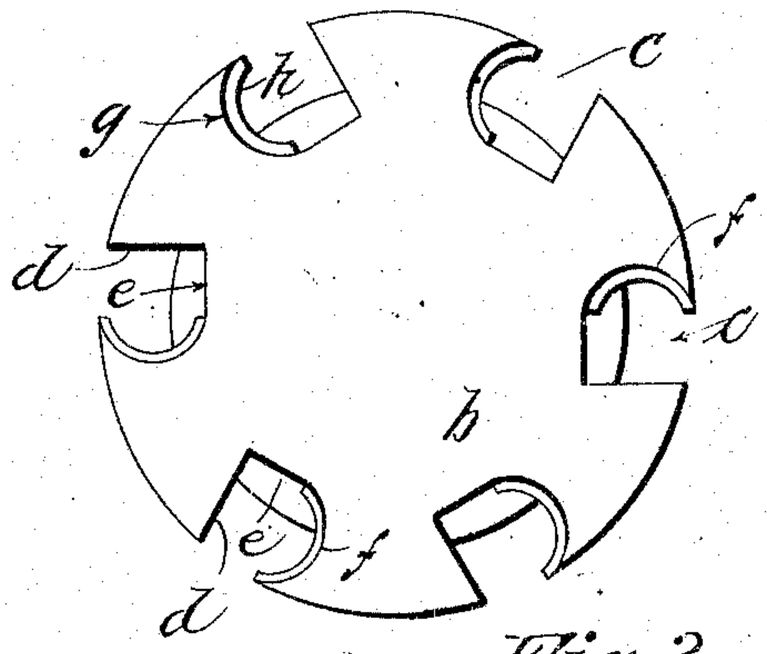


Fig. 2.

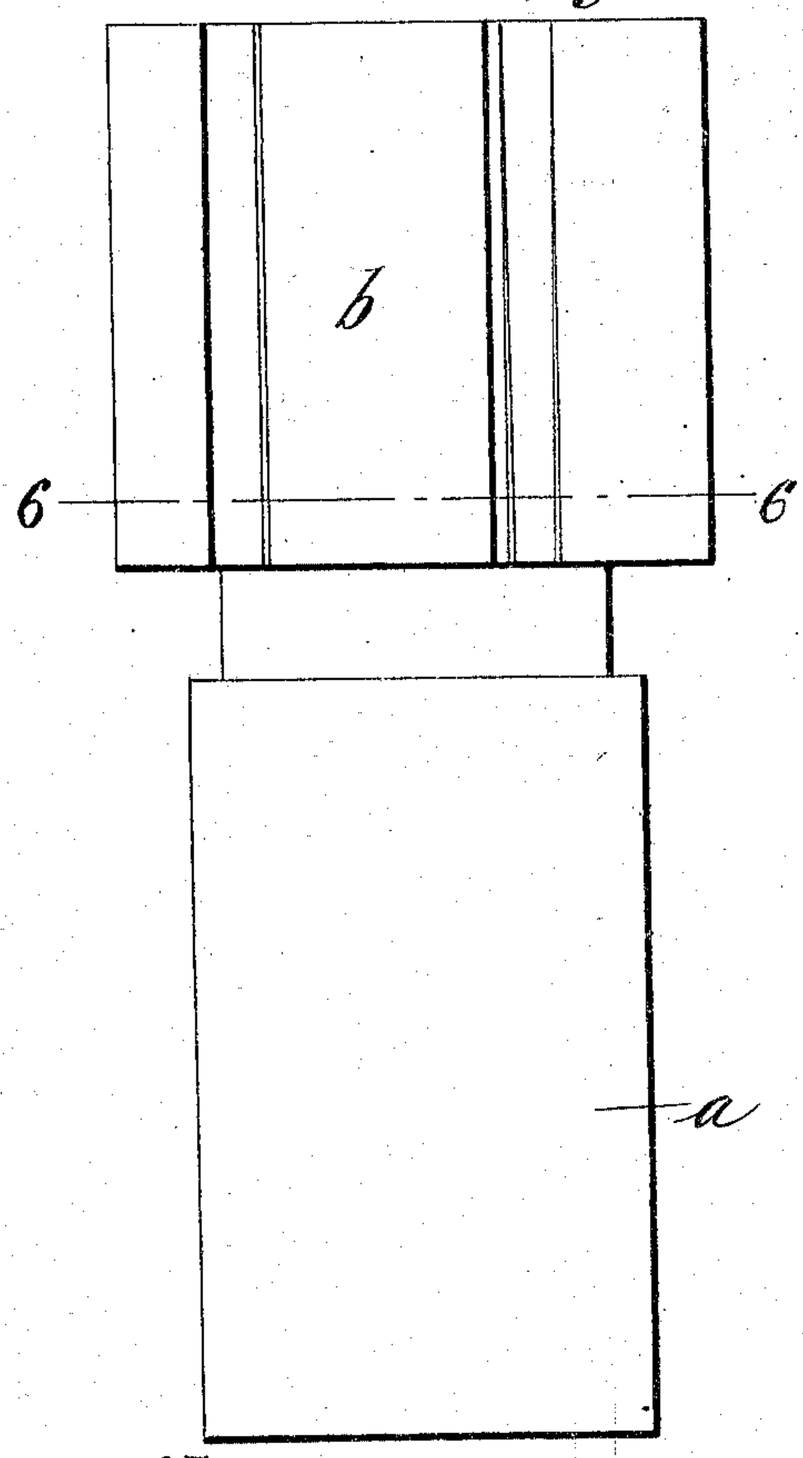


Fig. 3.

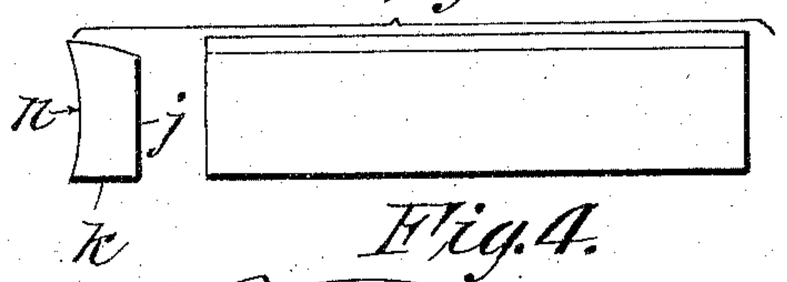


Fig. 4.

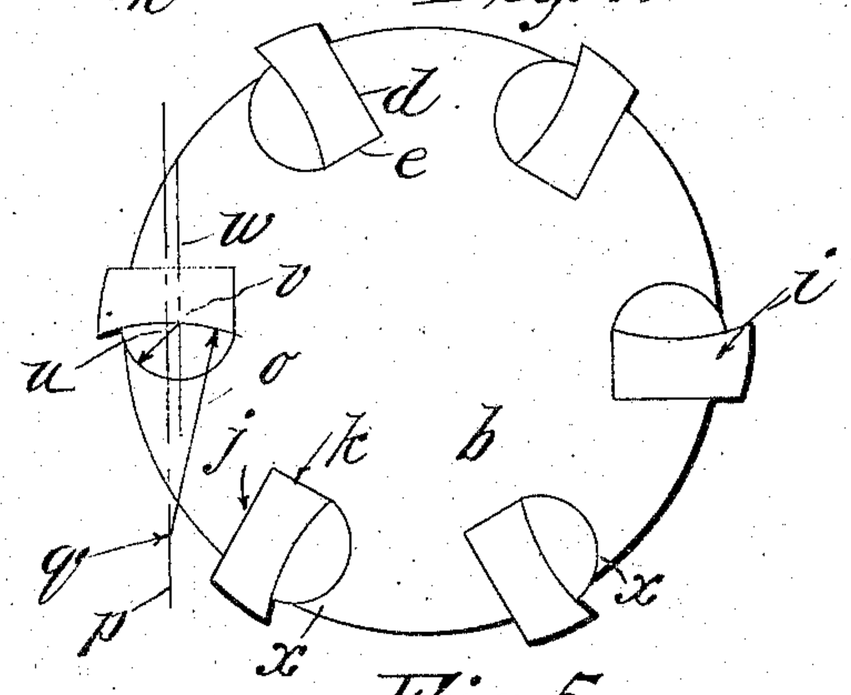


Fig. 5.

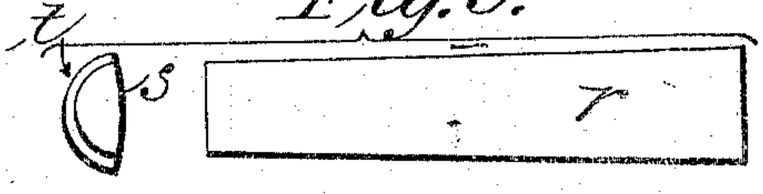
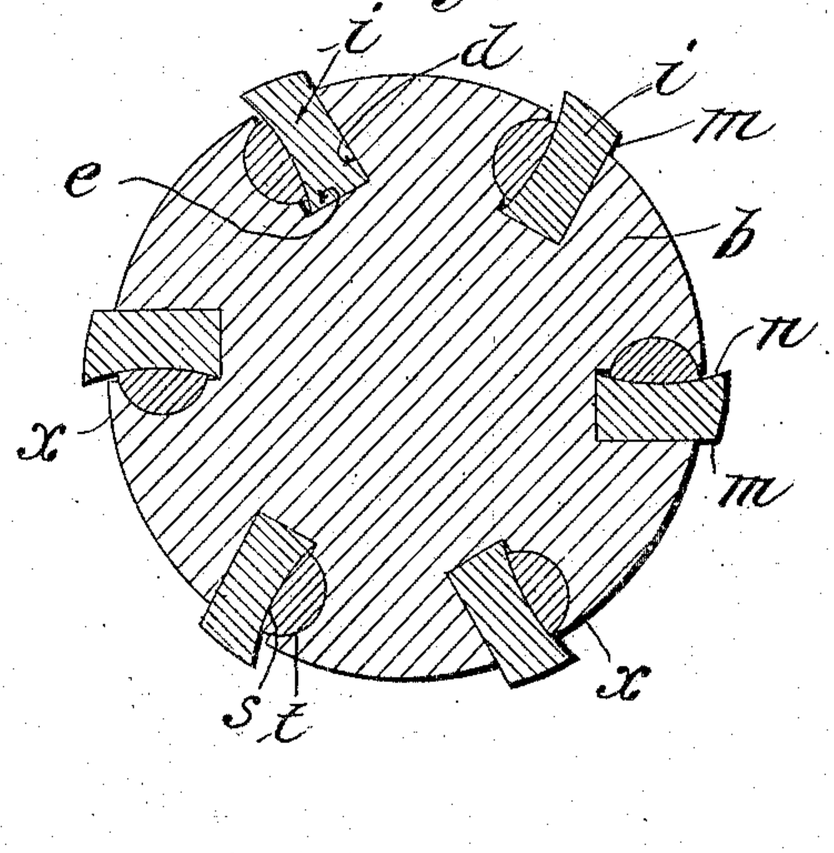


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANK O. WELLS, OF GREENFIELD, MASSACHUSETTS, ASSIGNOR TO WELLS BROTHERS COMPANY, OF GREENFIELD, MASSACHUSETTS, A CORPORATION.

CUTTER-HEAD.

947,319. Specification of Letters Patent. **Patented Jan. 25, 1910.**

Application filed March 24, 1906. Serial No. 307,859.

To all whom it may concern:

Be it known that I, FRANK O. WELLS, a citizen of the United States of America, residing at Greenfield, in the county of Franklin and State of Massachusetts, have invented new and useful Improvements in Cutter-Heads, of which the following is a specification.

This invention relates to cutters and more particularly to means for securing the cutters to the cutter-head.

Broadly, the invention consists in one of its forms in providing a wedge having two curved surfaces for locking the cutter in radial grooves in the cutter-head,—one of the curved surfaces of the wedge being of the same curvature as the advancing or cutting face of the cutter, while the other curved surface of the wedge is of greater curvature and struck from a center having a shorter radius. By the term "cutters" I wish to be understood to include cutters of all kinds, as milling cutters, taps, or reamers.

Referring to the drawings forming part of this application,—Figure 1 is an end elevation of the cutter-head showing the radial grooves therein. Fig. 2 is a plan view of the cutter-head showing the shank and longitudinal grooves therein for receiving the cutter-bars and wedges. Fig. 3 is a side and end elevation of one of the cutter-blades, Fig. 4 is an end elevation of the cutter-head showing the cutter-blades and securing wedges in place. Fig. 5 is a side and end elevation of the securing wedge. Fig. 6 is a section on line 6—6, Fig. 2.

Referring to these drawings in detail, *a* designates the shank of the cutter, *b* the cutter-head, and *c* the radial and longitudinal grooves cut in the head *b*. These grooves have two plane surfaces *d* and *e* at right angles to each other for receiving the flat surfaces of the cutters, and arranged parallel to the axis. The surface *f* of the groove opposite the surface *d* is a curved semi-circular one and slightly inclined, as indicated by the two concentric lines *g* and *h*. This surface may be described as that of a cone. The cutters *i* have two surfaces *j* and *k* at right angles to each other and are adapted to engage the shoulders or plane surfaces *d* and *e* respectively, as shown in Figs. 4 and 6, the width of the surface *j* being greater than that of the surface *d* so that the cutter projects beyond the periphery of the cutter-head as shown at *m* when in place.

The forward or cutting surface *n* of the cutters *i* is formed as a curved surface, the radius of the curvature being indicated by the line *o*, and the center at the point where the line *o* intersects the line *p* at *q*.

For the purpose of securely locking the cutter *i* into the slots *c* of the cutter-head, I have found that by employing a wedge-shaped piece having two curved surfaces one having the same radius of curvature as the cutting face *n* of the cutters, and the other being struck from a center of less radius, the cutters are prevented from working loose and slipping out radially of the grooves *c* when the parts are assembled and driven together. Referring to Figs 4, 5, and 6 of the drawings, this wedge is indicated by *r*. The surface *s* is of the same curvature as the surface *n* of the cutter *i* while the surface *t* is formed on a shorter radius, as indicated by *u*, Fig. 4, the center of the curved surface *t* being at the point *v*, and on a line parallel with the line *p* but located a short distance back of the line *p* and toward the center of the cutter *b*, as indicated at *w*. The parallel lines *p* and *w* are perpendicular to the surface or face *d* of the groove *c*. It will be apparent that after the cutter *i* is placed in the groove *c*, and the wedge *r* is driven in against the same, that the cutter will be securely locked in place in the groove, it being understood of course that the surfaces *s* and *n* are placed together and the rear curved surface *t* of the wedge *r* engages the conical surface *f* of the groove *c*. The wedge *r* acts so as to force the cutters *i* against the plane surfaces *d* and *e* of the groove *c*, and at the same time prevent the cutter from working out of the groove radially by reason of the fact that the surface *t* of the wedge engages the overhanging portion *x* of the cutter-head while the curved surfaces *n* and *s* will also prevent any radial movement of the cutter *i* relative to the wedge *r*. The wedge or plug imparts a transverse pressure on the cutter by reason of the inclined curved surface of the grooves *c* and a downward pressure toward the center of the cutter-head as well, thus securely locking the parts in place.

It will be apparent that by reason of the wedge *r* having two curved surfaces *s* and *t* of different radii, and the centers of these

curves being in lines perpendicular to the face *d* and parallel with each other, that the action of the wedge *r* on the cutter *i*, (which has a curved surface of the same radius as the curved surface *s* of the wedge) will have a tendency to cause the cutter *i* to move radially separating the perpendiculars *p* and *w* until the cutter *i* rests firmly on the bottom of the groove. In other words there will be a relative lateral motion of the curved surfaces *n* and *s* when assembling the wedge and cutter. The center lines *p* and *w* in Fig. 4 of the drawings simply represent the distance the centers of the two curves *n* and *t* are from each other measured on the surface of the wall *d*. Therefore there is always a constant tendency to lock the cutter *i* in the part *b* by reason of the location of the centers of curvature of the conical surface *t* of the wedge and the curved surface *n* of the cutter, the same being laterally spaced from each other in the cutter-head *b*, with the center of the smaller curve inward of the center of the larger curve and will always maintain the cutter firmly seated against the surfaces *d* and *e* of the radial grooves *c*.

By reason of the construction and arrangement of the wedge and cutter, and since the center of the curved surface *t* is at one side of the center of the curved surface *s*, as measured along a line parallel to the wall *d* and in a direction toward the wall *e*, the lines of resultant forces exerted by the wedging action passing through the center of the smaller curve will fall within or at one side of the lines of resultant forces passing through the center of the larger curve, whereby the cutter is securely locked by the wedge *r* to the cutter-head.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:—

1. A cutter-head having a slot therein, the slot having two flat surfaces at right angles to each other and parallel with the axis of the cutter, a surface of the slot opposite one of the flat surfaces being conical, a cutter located in the slot and having two flat surfaces engaging the rectangular surfaces of the slot and also a curved surface merging into the cutting edge and facing the conical surface of the slot, a wedge or key retaining the cutter in the head, said key having a conical surface engaging the conical surface of the cutter-head, and a curved surface corresponding in curvature with the curved surface of the cutter.

2. As an improvement in means for securing cutters in cutter-heads including a radial slot in the head formed with a conical surface and two flat surfaces, the conical surface producing an over-hanging lip, the cutter having a curved surface merging into a cutting edge and protruding beyond the periphery of the cutter-head, and locking means engaging the curved surface of the cutter and the conical surface, as described.

3. In a cutter, a body having a groove, provided with a side wall having its face curved in cross-section, a cutter-blade seated in the groove having a face curved in cross-section opposed to the curved face of the groove, the curve of the cutter face being of larger radius than the curve of the wall face and the space between said faces being tapered, in combination with a wedge, adapted to fit said tapered space, the form and arrangement being such that the lines of resultant force exerted by the wedging action passing through the center of the smaller curve will fall within the lines of resultant force passing through the center of the larger curve, substantially as described.

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