HAROLD BUTLER, HERBERT BUTLER, R. H. HAYHURST, AND W. ALDERSON.

SLOTTING, SHAPING, MILLING, DRILLING, AND OTHER LIKE MACHINE TOOLS.

APPLICATION FILED AUG. 23, 1920.

1,416,786. Patented May 23, 1922.

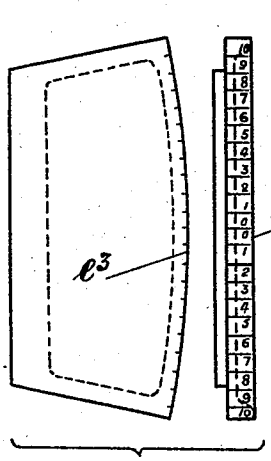



Fig. 3.

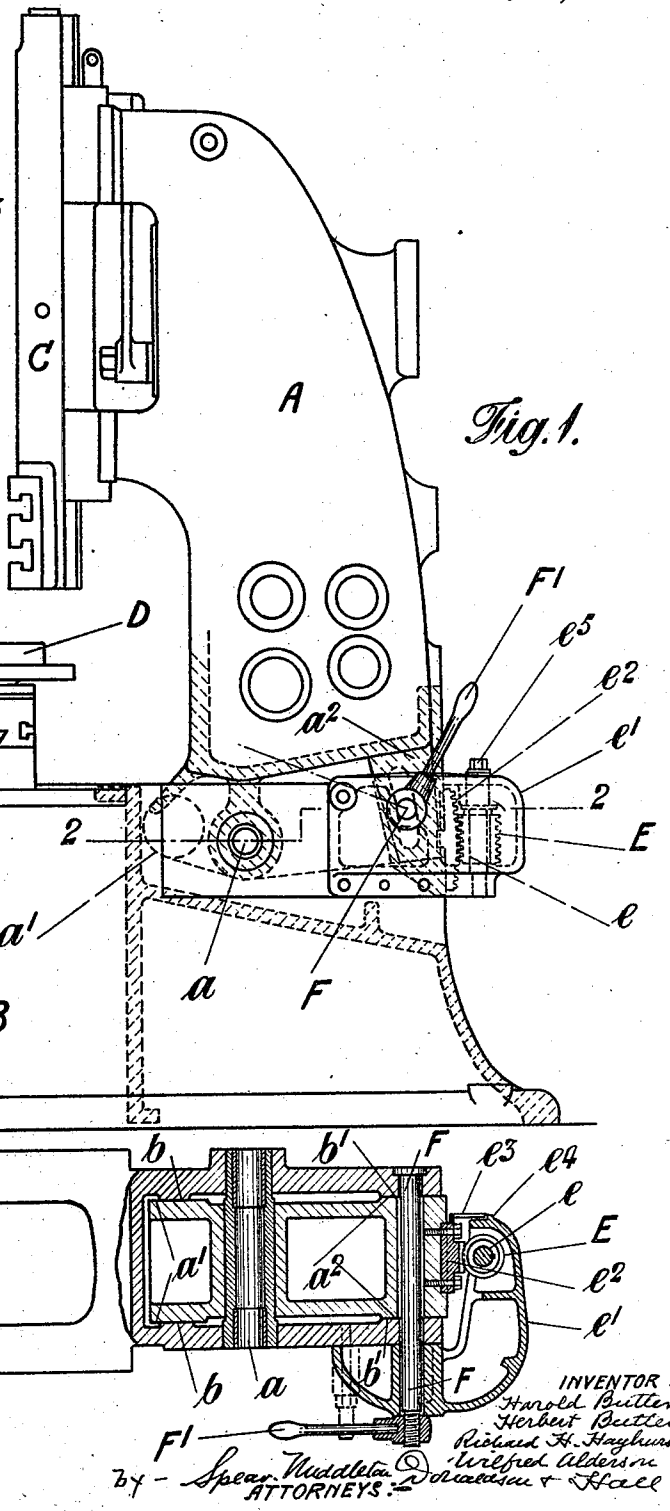



Fig. 1.

Fig. 2.

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# UNITED STATES PATENT OFFICE.

HAROLD BUTLER, HERBERT BUTLER, RICHARD HENRY HAYHURST, AND WILFRED ALDERSON, OF HALIFAX, ENGLAND.

## SLOTTING, SHAPING, MILLING, DRILLING, AND OTHER LIKE MACHINE TOOLS.

1,416,786. Specification of Letters Patent. Patented May 23, 1922.

Application filed August 23, 1920. Serial No. 405,299.

*To all whom it may concern:*

Be it known that we, HAROLD BUTLER, HERBERT BUTLER, RICHARD HENRY HAYHURST, and WILFRED ALDERSON, of Victoria Ironworks, Halifax, England, have invented certain new and useful Improvements in Slotting, Shaping, Milling, Drilling, and Other like Machine Tools, of which the following is a specification.

This invention relates to slotting machines, or vertical shaping machines, but it may also be applied to milling and drilling machines and it consists in providing means whereby work may be machined either at right angles to the table, or at an angle greater or less than 90° at either side of the perpendicular.

For this purpose instead of the frame or body of the machine being formed in one piece, the portion (hereinafter referred to as the upper part) which carries the ram or other tool actuating device is hinged to the portion (hereinafter referred to as the lower part) which carries the work table and means are provided for preserving the alignment of the aforesaid parts in a lateral direction.

In the accompanying drawings:—

Fig. 1 is a side elevation of a slotting machine constructed in accordance with this invention.

Fig. 2 is a horizontal section taken approximately on line 2—2 of Fig. 1, and

Fig. 3 shews a side and edge view of an angle indicator detached from the machine.

A indicates the upper part, B the lower part, C the ram and D the work table. The upper part is hinged to the lower part at $a$ and is accurately fitted into such part by faced surfaces $a^1$ $a^2$ which fit between faced surfaces $b$ $b^1$ in the lower part. The upper part is capable of being turned to either side of the perpendicular, say, for example, through a distance of 10°. In the example shown in the drawings this is effected by a worm E keyed on a stud $e$ in a bracket $e^1$ that is attached to the lower part B and such worm gears with a toothed segment $e^2$ attached to the upper part A. By the side of this segment is a graduated angle indicator $e^3$ which operates in conjunction with a tooth or setting mark $e^4$ on the bracket $e^1$. The stud $e$ is provided with a hexagonal head $e^5$ for engagement with a spanner or key, or it may be provided with a handle, or hand wheel. When the upper part has been adjusted to the required angle, it is securely locked to the lower part by a draw bolt F and operating handle $F^1$. A positive stop may be provided to facilitate setting the upper part vertically to the work table D.

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. In a vertical shaping machine, an upper frame part hinged to a lower frame part, the said upper frame part having faced surfaces fitting accurately between faced surfaces on the lower part, a worm sector mounted on the upper part, a worm mounted on the lower part and gearing with the worm sector, means for actuating the worm, means for indicating the angle to which the upper part has been moved and a draw bolt for securing the upper part in any adjusted position.

2. In a vertical shaping machine, an upper frame part hinged to a lower frame part, an axle passing through such parts and constituting a hinge pin for the upper part, the said upper part having faced surfaces at opposite sides of the axle fitting accurately between similarly placed faced surfaces on the lower part, a worm sector mounted on the upper part, a worm mounted on the lower part and gearing with the worm sector, means for indicating the angle to which the upper part has been moved and a draw bolt mounted in the lower part and passing through a slot in the upper part and means for actuating said draw bolt to secure the upper part in any adjusted position.

In testimony whereof, we affix our signatures.

HAROLD BUTLER.
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RICHARD HENRY HAYHURST.
WILFRED ALDERSON.