(No Model.) 2 Sheets—Sheet 1.

M. HELBLING.

MACHINE FOR CUTTING ELLIPTICAL SHAPES.

No. 342,357. Patented May 25, 1886.

Fig. 6.

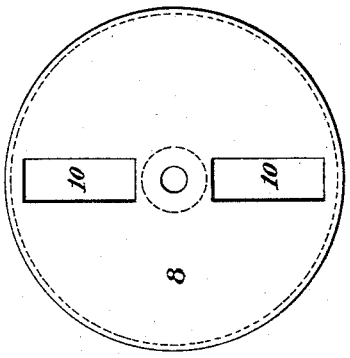

Fig. 1.

Witnesses.

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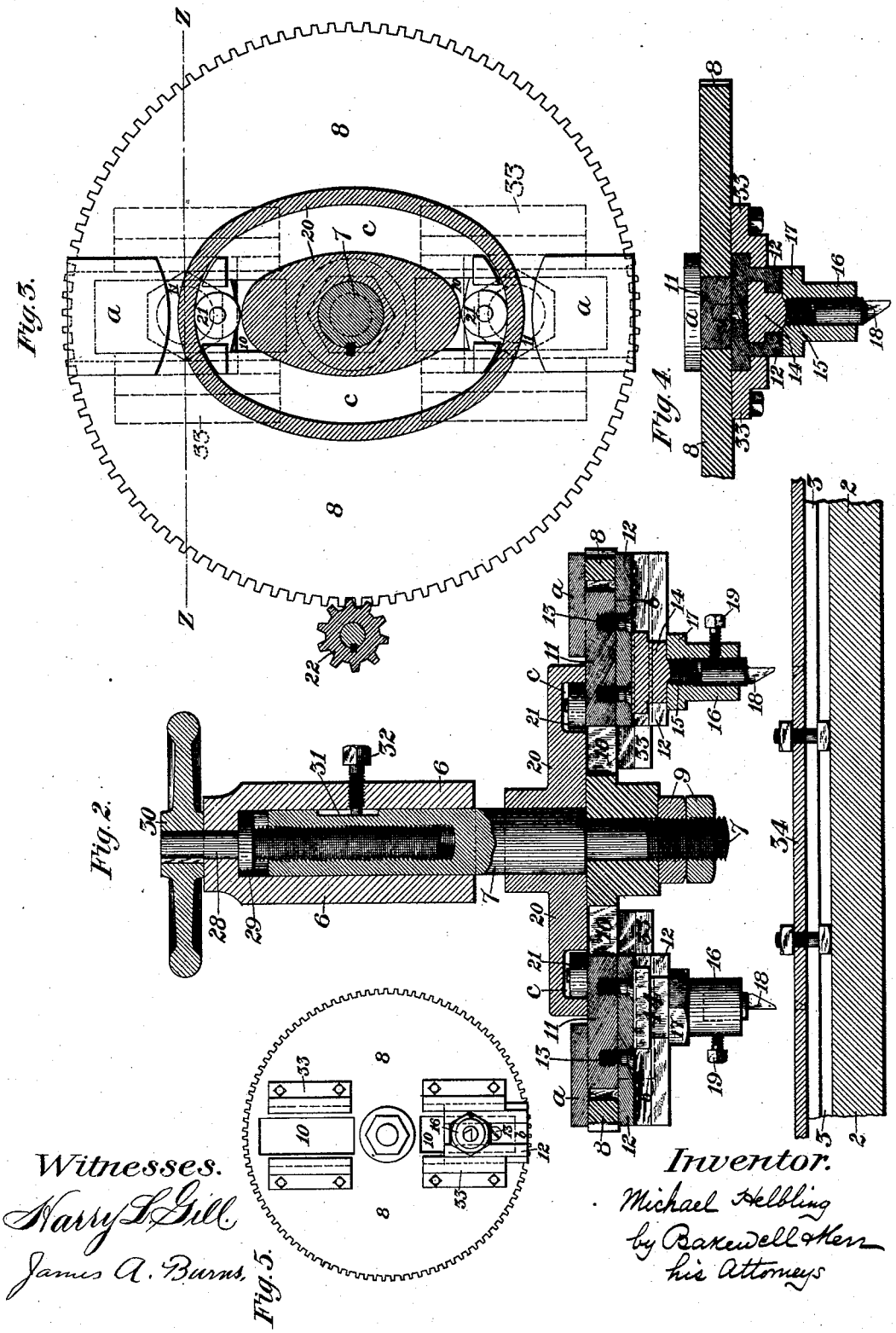

Fig. 3.

Fig. 4.

Fig. 2.

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

MICHAEL HELBLING, OF ALLEGHENY CITY, PENNSYLVANIA.

MACHINE FOR CUTTING ELLIPTICAL SHAPES.

SPECIFICATION forming part of Letters Patent No. 342,357, dated May 25, 1886.

Application filed March 13, 1886. Serial No. 195,086. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL HELBLING, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machines for Cutting Elliptical Shapes; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side view of the machine. Fig. 2 is a vertical section thereof on the line *x x* of Fig. 1. Fig. 3 is a horizontal cross-section on the line *y y* of Fig. 1. Fig. 4 is a vertical cross-section on the line *z z* of Fig. 3. Fig. 5 is a plan view of the bottom of the disk 8, some of the parts being omitted for clearness of illustration. Fig. 6 is a diagram plan view of the disk 8, shown detached from its driven parts. Figs. 5 and 6 are on a smaller scale than the remaining figures.

Like symbols of reference indicate like parts in each.

The purpose of my machine is to provide a machine for cutting elliptical or otherwise irregularly curved shapes in sheet metal, and especially for cutting the elliptical man-holes in boiler-heads. This work has heretofore commonly been done by drilling, at the expense of much labor and time.

In the drawings, 2 is a bed, on which is placed the metal plate to be operated on. It is provided with slots 3, in which bolts are arranged for holding the plate in position.

4 is the bed-plate of the machine, underlying the bed 2.

5 is a standard, which extends upward from the bed-plate 4, projects horizontally over bed 2, and at its end has a vertical hollow bracket-arm, 6. A rod, 7, is arranged in the arm 6 so as to be movable vertically therein, and on the lower end of the rod, which projects below the hollow arm 6, is a horizontal plate or disk, 8, which supports and moves the cutting-tools. This disk is loosely journaled on a contracted neck on the bottom of the shaft, and is secured in position by a nut or nuts, 9, Fig. 2. The disk 8 is provided with radial slots 10, Fig. 6, which are made diametrically opposite to each other. The tool-carriers, which are arranged in these slots, I prefer to make in several pieces. Each has a block, 11, made of the same width as the slot and arranged to slide longitudinally therein. This block has a flange or head, *a*, which rests upon the surface of the disk 8 and supports the tool-carrier. A flanged foot, 12, is fastened to the under side of the block 11 by screws 13, and projecting to each side of the slot 10 on the under side of the disk 8, together with the head *a*, holds the block in position. The block 11 is further guided and held in place by angular slide-bearings 33, bolted to the under side of the disk 8 and bearing against the flanges of the foot 12. The foot 12 is provided with a longitudinal T-shaped groove or slideway, *b*, on its under face, which, when the foot is in position, is radial relatively to the disk 8. A T-shaped block or slide, 14, is mounted in the groove *b*, and is movable longitudinally therein. A screw-threaded shank, 15, projects downward from the slide 14, and on this is screwed the tool-head proper, 16, which has a flanged head, 17, at its upper end. The cutting-tool 18 is set in a hollow bore in the head 17, and is there held by a set-screw, 19. It will be noticed that the tool-head may be set in any part of the groove *b* in the foot 12 by loosening the tool-head on the screw 15, moving it with the slide 14 to the desired position in the groove, and then rescrewing the head until its flange engages the bottom of the foot 12, whereby it is clamped in place. It will be understood that the cutting-tool and the auxiliary parts just described are duplicated, the sets being arranged on opposite sides of the rod 7, to work in conjunction with the opposite slots, 10. The disk 8 is surmounted by a plate, 20, which is rigidly secured to the rod 7, and which has on its under side an elliptical groove, *c*, extending around the plate. The blocks 11 are provided with friction wheels or rollers 21, journaled horizontally on their upper sides and lying within the elliptical groove *c*. The disk 8 is made revoluble on the axis 7, preferably by the means shown in the drawings, the periphery of the disk being cogged and meshing with a pinion, 22, whose shaft 23 is stepped at the base on the bed-plate 4, and at its upper end is provided with a beveled gear-wheel, 24, which meshes with and is driven by a pinion, 25, on the main shaft 26 of the machine. The latter shaft is driven by a belt-pulley, 27, and as it rotates

it is obvious that it will also turn the cogged disk 8 with the cutters and their auxiliary parts around the central shaft, 7. As the disk 8 rotates the rollers 21, moving with it in the elliptical groove *c*, will be acted upon by the sides of the groove as by a cam, and will move the blocks 11 in and out in the slots 10, projecting them to their farthest extent when the rollers are coincident with the major axis of the ellipse and retracting them most when they lie in the minor axis. The cutters 18, being connected with the blocks 11, will partake of their motion, and as the disk 8 revolves will describe a single ellipse supposing the cutters to be set at equal distances from the axis of the disk.

The disk 8, the guide-plate 20, and the cutters with their auxiliary parts are arranged to be lowered or raised toward or from the bed 2 by the following mechanism: The upper part of the shaft 7 is provided with an axial screw-threaded core into which fits a threaded spindle or shaft, 28. The latter has a collar, 29, situate within the bore of the arm 6, and arranged to prevent upward motion of the spindle, and a collar, 30, bearing on the upper end of the arm 6, prevents downward motion thereof. The collar 30 is shown in the drawings as constituted by a hand wheel or lever keyed to the spindle and designed to be used in rotating it.

31 is a longitudinal groove or keyway made in the circumference of the shaft 7, and 32 is a key or stud traversing the side of the arm 6 and entering this keyway, so as to permit longitudinal motion of the shaft, while preventing its rotation. Thus constructed, it is clear that if the lever 30 be turned it will raise or lower the shaft 7 with its connected parts accordingly as the lever is turned in one direction or the other.

The operation is as follows: The plate of metal to be cut is placed on the bed 2, as at 34, and the lever 30 is turned until the cutters 18 are brought into contact with the plate. The machine is then set in motion, and as the cutters 18 travel around the axis of motion of the disk 8 they will cut an elliptical channel or kerf in the plate. As the cutting proceeds, the operating parts are gradually depressed by means of the lever 30, thus deepening the cut until it extends through the plate and entirely cuts out the elliptical piece of metal.

I have reduced my invention to actual practice, and have found that the machine does the work speedily and well, making a clean cut, the edges of which need little, if any, subsequent trimming.

The advantages and economy of the machine will be appreciated by those skilled in the art.

The dimensions of the ellipse cut may be regulated by the adjustment of the cutter-heads at the desired distance from the center of the disk 8, in the manner which I have already explained.

I do not desire to limit myself strictly to the arrangement of the parts which I have shown and described. For example, the so-called "disk" 8 need not be made circular, and may be driven otherwise than by a pinion acting on its cogged periphery; nor need there be two cutters employed, since the machine will operate, though possibly not so well, if there be only one.

I have described my invention as applicable to the cutting of elliptical shapes; but it is obvious that by a simple change of form of the guide-groove *c* the cutters may be made to cut oval or other irregularly-curved shapes. I desire to include all such modifications by the use of the words "elliptical" and "ellipse," used by me in the specification, and in the following claims.

I claim as my invention—

1. In a machine for cutting elliptical shapes, the combination of a traveling cutter and an elliptical guide which guides the cutter and causes it to describe an ellipse, substantially as and for the purposes described.

2. In a machine for cutting elliptical shapes, the combination of a rotary disk or plate, a cutter secured thereto and movable radially thereon, and an elliptical guide bearing on and guiding said cutter, substantially as and for the purposes described.

3. In a machine for cutting elliptical shapes, the combination of a rotary disk or plate, a cutter secured thereto and movable radially thereon, an elliptical guide bearing on and guiding said cutter, and mechanism, substantially as described, for elevating and depressing said plate or disk and the cutter, as and for the purposes specified.

4. In a machine for cutting elliptical shapes, the combination of a rotary disk or plate, an elliptical guide, a block, 11, mounted on said disk or plate, movable radially thereon and bearing on said guide, and a cutter-head secured to said block and movable and adjustable thereon toward and away from the center of rotation of said disk or plate, substantially as and for the purposes described.

5. In a machine for cutting elliptical shapes, the combination of a cutter mounted in slideways and an elliptical guide which bears on and guides the cutter, causing it to move back and forth in its slideways correspondingly to the shape of the guide, whereby it produces an elliptical cut, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 2d day of March, A. D. 1886.

MICHAEL HELBLING.

Witnesses:

W. B. CORWIN,

THOMAS W. BAKEWELL.