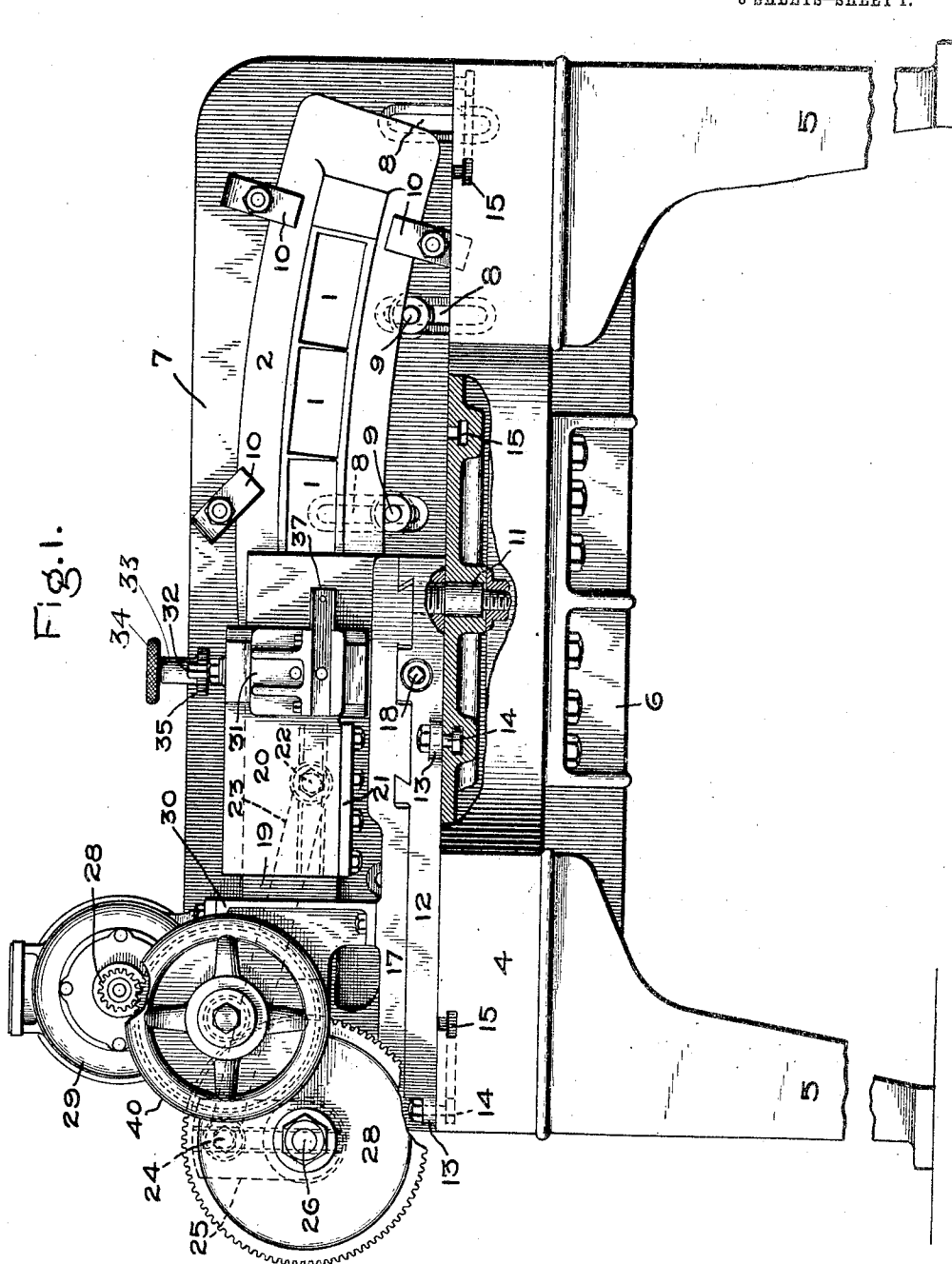


W. F. RICE.
NOZZLE PLANING MACHINE.
APPLICATION FILED JULY 8, 1909.

1,063,597.

Patented June 3, 1913.

3 SHEETS—SHEET 1.



Witnesses:

Marcus L. Byng.
J. Ellis

Inventor:

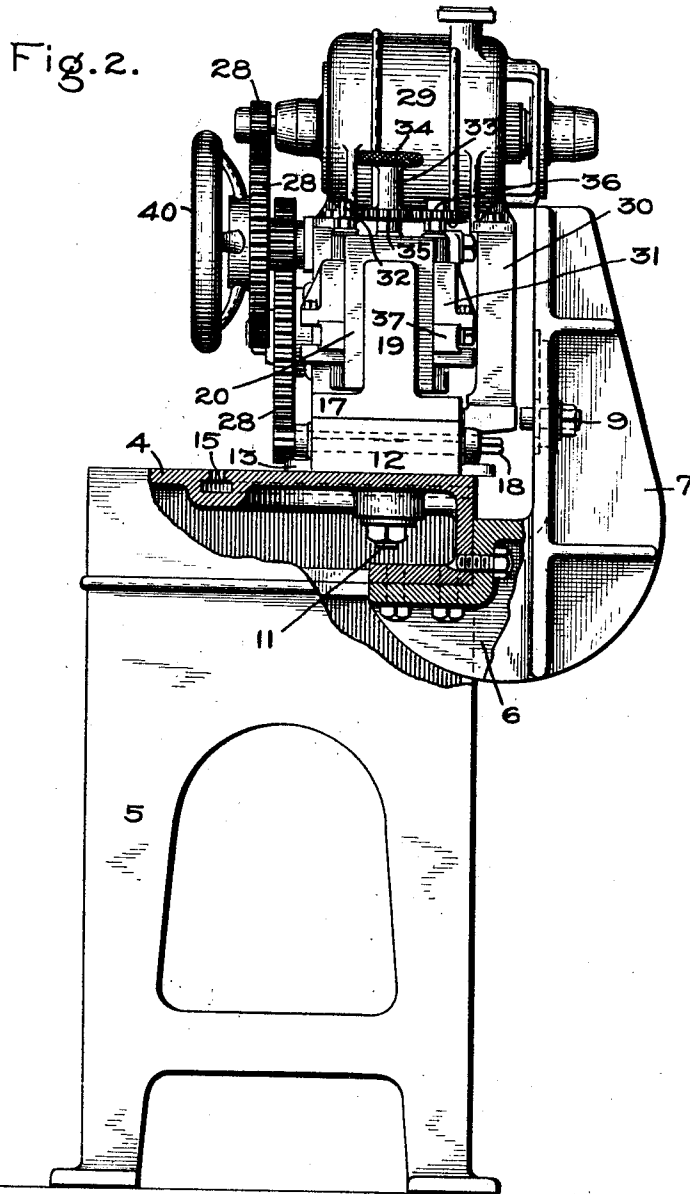
Walter F. Rice,
by *Alfred H. Davis*
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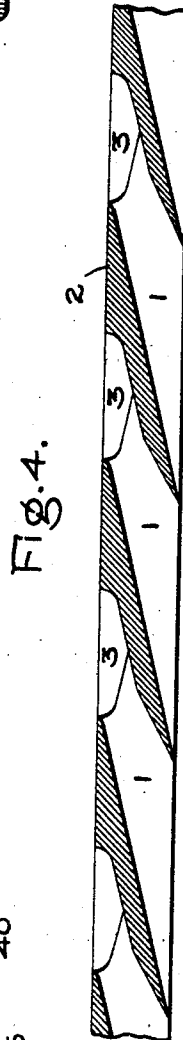
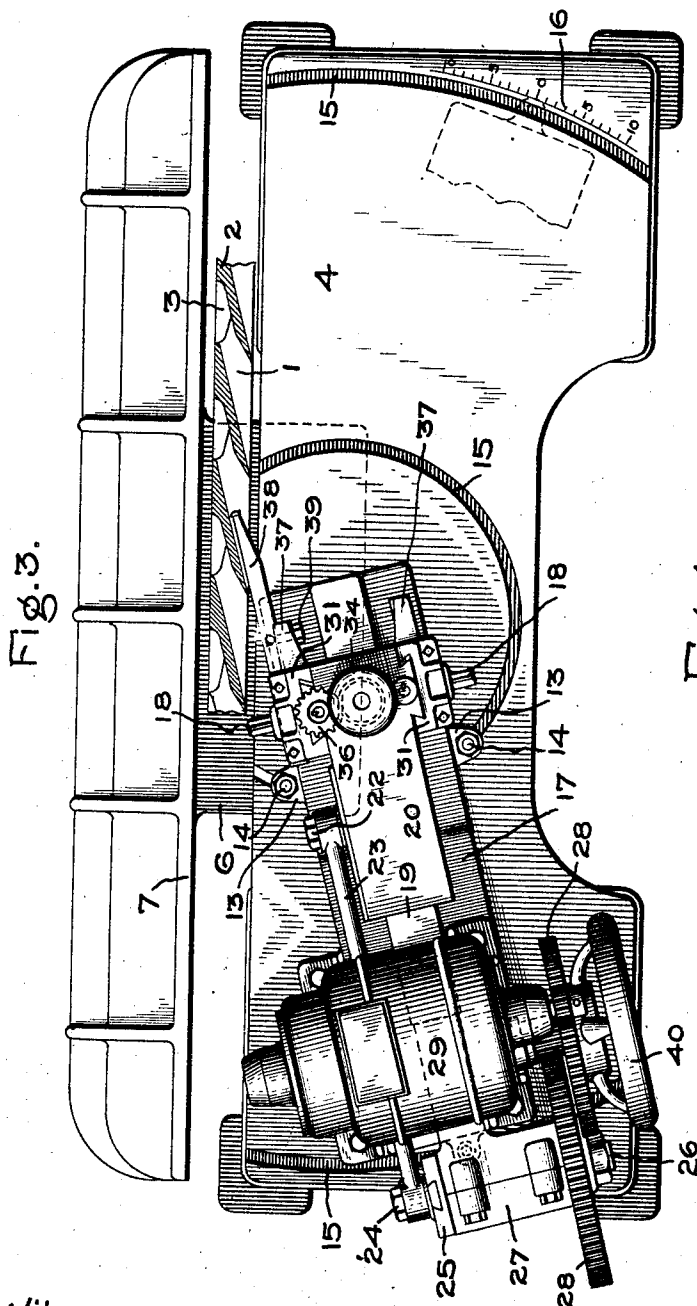


Witnesses:
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1,063,597.

3 SHEETS—SHEET 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

WALTER F. RICE, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

NOZZLE-PLANING MACHINE.

1,063,597.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed July 8, 1909. Serial No. 506,599.

To all whom it may concern:

Be it known that I, WALTER F. RICE, a citizen of the United States, residing at Quincy, county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Nozzle-Planing Machines, of which the following is a specification.

This invention relates to metal working machines, and its object is to provide mechanism for automatically planing the surfaces of nozzles for elastic fluid turbines. Such nozzles are usually made by casting segments of a circular ring in which the nozzles are cored out in the rough.

In order to afford smooth passageways for the steam or other elastic fluid, the inner surfaces of the nozzles must be machined, and my invention aims to provide a machine tool adapted to perform this work, the several parts being adjustable so that a variety of nozzles can be operated on.

The machine comprises a bed-plate on which is supported a bracket to which the nozzle blank is fastened. A base is swiveled on the bed-plate to swing in a horizontal plane, and on said base is mounted a laterally sliding frame carrying a longitudinally movable slide on which a tool block is mounted. An electric motor on the sliding frame drives a crank shaft whose crank is coupled by a connecting rod with the slide to reciprocate the planing tool. The swivel base enables the tool to work upon either right-handed or left-handed nozzles, as may be desired, while the laterally sliding frame and vertically adjustable tool-block enable the tool to be adjusted to work on any part of a nozzle and nozzles of various widths.

In the accompanying drawings, Figure 1 is a front elevation of my improved nozzle-planing machine, partly in section; Fig. 2 is an end elevation, partly in section; Fig. 3 is a top plan view, showing the swivel base set at an angle to the back plate; and Fig. 4 is an enlarged section of a portion of a nozzle segment.

Referring to Figs. 1 and 4, it will be observed that the nozzles 1 are rectangular in cross section and extend obliquely through the segment 2, their walls being straight plane surfaces which diverge slightly so that the steam can expand in passing through them from the bowls 3 at the inlet ends thereof. The machine for planing the

inside of these nozzles comprises a bed-plate 4 mounted on legs 5 and having secured along its rear edge a bracket 6 carrying a long wide upright back-plate 7 in which are several slots 8, preferably vertical, as shown. Studs 9 are adjustable along said slots and serve to support the nozzle segment 2. Clamping plates 10, bolted to the back-plate, secure the segment rigidly in place, with the wider ends of the nozzles outward. At the middle of the bedplate is a bearing for an upright stud 11 projecting downwardly from one end of a swivel base 12, which is a flat plate lying on the bedplate. The base has lugs 13 through which pass T-headed bolts 14 engaging with circular undercut grooves 15 in the bedplate concentric with the stud 11. Graduations 16 along one or more of these grooves enable the swivel base to be accurately adjusted to any desired angle with the rear edge of the bedplate. When properly adjusted the base can be rigidly clamped in place by the bolts 14. Mounted upon the swivel base is a slide-frame 17. The base and the frame have interlocking transverse grooves and guide ribs and the frame can be laterally adjusted on the base by means of a transverse feed screw 18, preferably provided at each end with squared portions to receive a wrench. The slide-frame comprises a heavy longitudinal beam 19 on which is mounted the inverted-U-shaped slide 20 secured by a gib 21 passing under the beam. On one side of the slide is a longitudinal undercut slot in which is adjustably secured a wrist-pin 22. A connecting rod 23 connects said pin with a crank pin 24 adjustably secured in a slot in a crank 25 on a shaft 26 journaled in a bearing 27 at one end of the slide-frame. A train of speed-reducing gears 28 connects said shaft with an electric motor 29 mounted on pedestals 30 erected on the slide-frames at either side of the beam 19. On each side of the slide is a vertical dovetail rib on which slides a tool-block 31, which can be adjusted up and down by a feed screw 32. Between the two blocks is an upright shaft 33 having a handwheel 34 and a gear-wheel 35. The latter meshes with a pinion 36 which can be secured upon either of the feed screws 32, depending upon the position of the swivel base and the particular tool-block in use. Each tool-block has means for securing thereto a cutting or planing tool,

such for instance as the grooved horn 37 in which the tool 38 is clamped by a bolt 39.

The operation is as follows: The nozzle segment is clamped to the back-plate and the swivel base is swung to the proper position to cause the tool to cut the surface of one side of the nozzle on the predetermined angle of inclination of said nozzle. The graduations on the bedplate enable the machinist to set the swivel base very accurately. The motor is then started, reciprocating the slide and the tool and planing the surface of the nozzle. The depth of cut can be regulated by the transverse feed screw 18. After one side has been finished, the swivel base can be re-adjusted to the proper angle for the other side of the nozzle, the tool being reversed in the holder. The top and bottom surfaces can also be finished by giving the tool a quarter turn in its holder; the tool shank being made square for this purpose. When one nozzle has been finished, the segment 2 must be released, shifted to a new position, and clamped anew, in order to bring another nozzle into position for machining. As the segment is a portion of a circular ring, it can be readily shifted by moving it endwise on the studs 9 after they have been once located for a segment of a given radius. Successive nozzles can be finished exactly alike by setting the swivel base to the same graduations for similar surfaces to be machined. If nozzles facing in the other direction are to be finished, the swivel base is swung to the opposite end of the bedplate, and a similar series of operations is carried out. A handwheel 40 enables the tool to be moved slowly when setting it to the desired angle of cut.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. A nozzle planing machine comprising a bedplate having concentric grooves, a bracket secured thereto, an upright back-plate rising from said bracket and provided with slots, studs adjustable along said slots, a swivel base pivoted concentric with said grooves and having clamping bolts engaging therewith, a motor-driven tool supported on said base and reciprocating parallel therewith, and means for adjusting said tool transversely and vertically.

2. A nozzle-planing machine comprising a bedplate, a base swiveled thereon, a slide frame adjustable transversely on said base, a slide movable lengthwise of said frame, and a vertically-adjustable tool-block on each side of said slide.

3. A nozzle-planing machine comprising a bedplate, a swivel base thereon, a slide frame adjustable transversely on said base, and comprising a longitudinal beam, a slide movable on said beam, means for reciprocating

said slide, and a vertically adjustable tool-block on each side of said slide. 65

4. A nozzle-planing machine comprising a bedplate, a swivel base thereon, a slide frame adjustable transversely on said base and comprising a longitudinal beam, a power-driven crank shaft on said frame, a slide on said beam, a connecting rod pivoted to the slide and the crank, and a vertically adjustable tool-block on each side of said slide. 70

5. A nozzle-planing machine comprising a bedplate, a swivel base thereon, a slide frame adjustable transversely on said base and comprising a longitudinal beam, an inverted-U-shaped slide on said beam, a crank shaft on said frame connected to said slide, a motor on said frame geared to said shaft, and a vertically adjustable tool-block on each side of said slide. 80

6. A nozzle-planing machine comprising a bedplate, a back plate or support thereon to which the nozzle is secured, a base mounted on the bedplate and adapted to be swung horizontally and clamped at any desired angle to said back plate, a reciprocating member mounted on the base, a tool holder slidably mounted on said member to move rectilinearly, a tool carried by the holder and extending in the direction of reciprocation, said tool being adapted to be turned to operate on all the surfaces of a nozzle, and means for feeding the tool across said surfaces in two planes at an angle to each other. 95

7. A nozzle-planing machine comprising a bedplate, a base pivotally mounted thereon, a reciprocable member mounted on the base, means for reciprocating the member, a tool holder slidably mounted on said member, a tool mounted on the holder and extending in the direction of reciprocation, and means for feeding the tool across the surfaces of a nozzle in two planes at an angle to each other. 100

8. A nozzle-planing machine comprising a bedplate, a base pivotally mounted thereon, a sliding member mounted on the base to move rectilinearly, means for reciprocating the sliding member, a tool holder slidably mounted on said member, a tool mounted in the holder and extending in the direction of reciprocation of the sliding member, and means for feeding the tool across the surfaces of a nozzle lying in planes, some of which are parallel to the axis of the pivot and others transverse to said axis. 110

In witness whereof, I have hereunto set my hand this seventh day of July, 1909. 120

WALTER F. RICE.

Witnesses:

LUCY C. HOLLIS,
ESTELLA CANNON.