

No. 766,978.

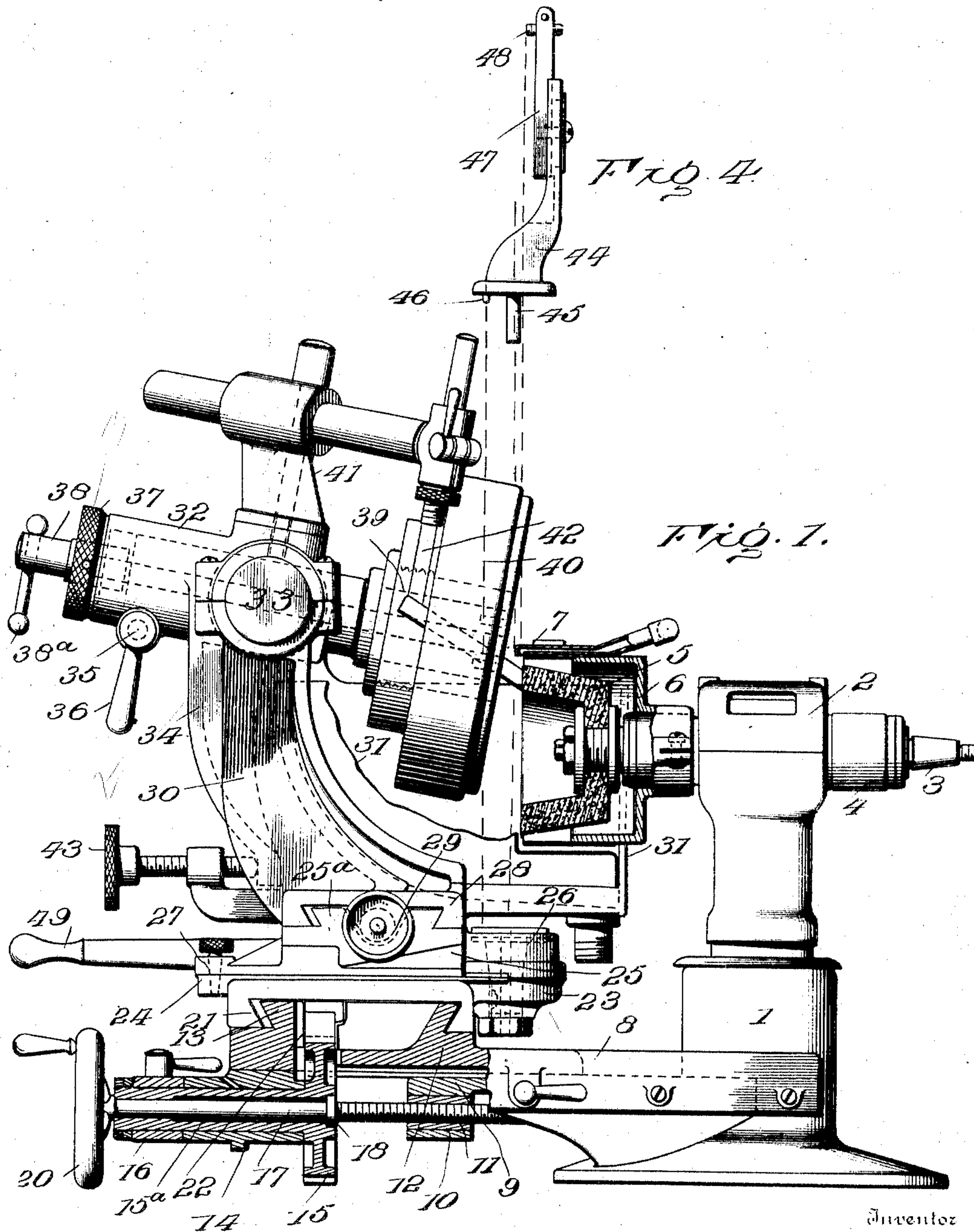
PATENTED AUG. 9, 1904.

T. H. SYMINGTON.
GRINDING MACHINE.

APPLICATION FILED DEC. 7, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Inventor

T. H. Symington

Witnesses

per mine
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By

Stewart & Stewart

Attorneys

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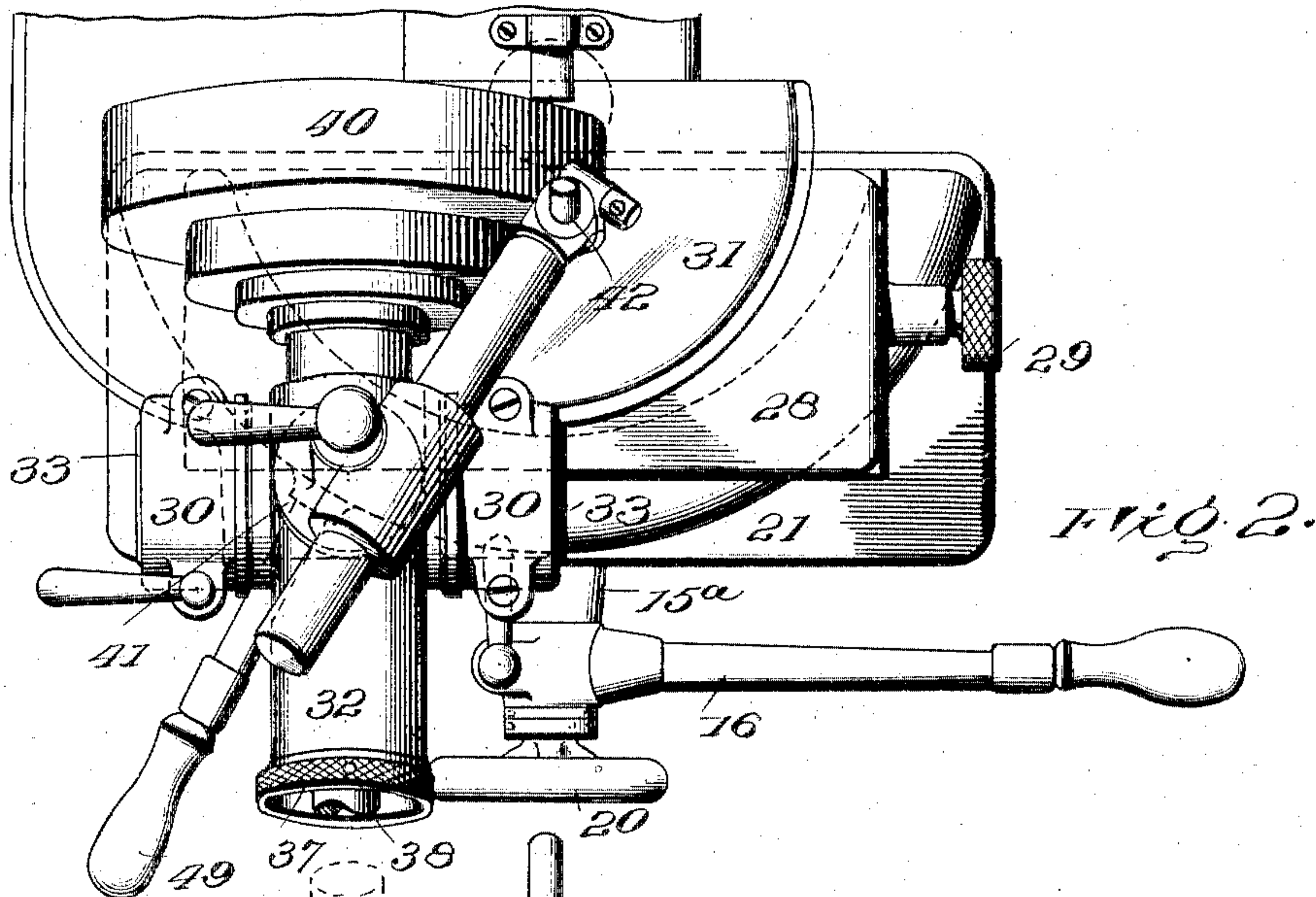


Fig. 2.

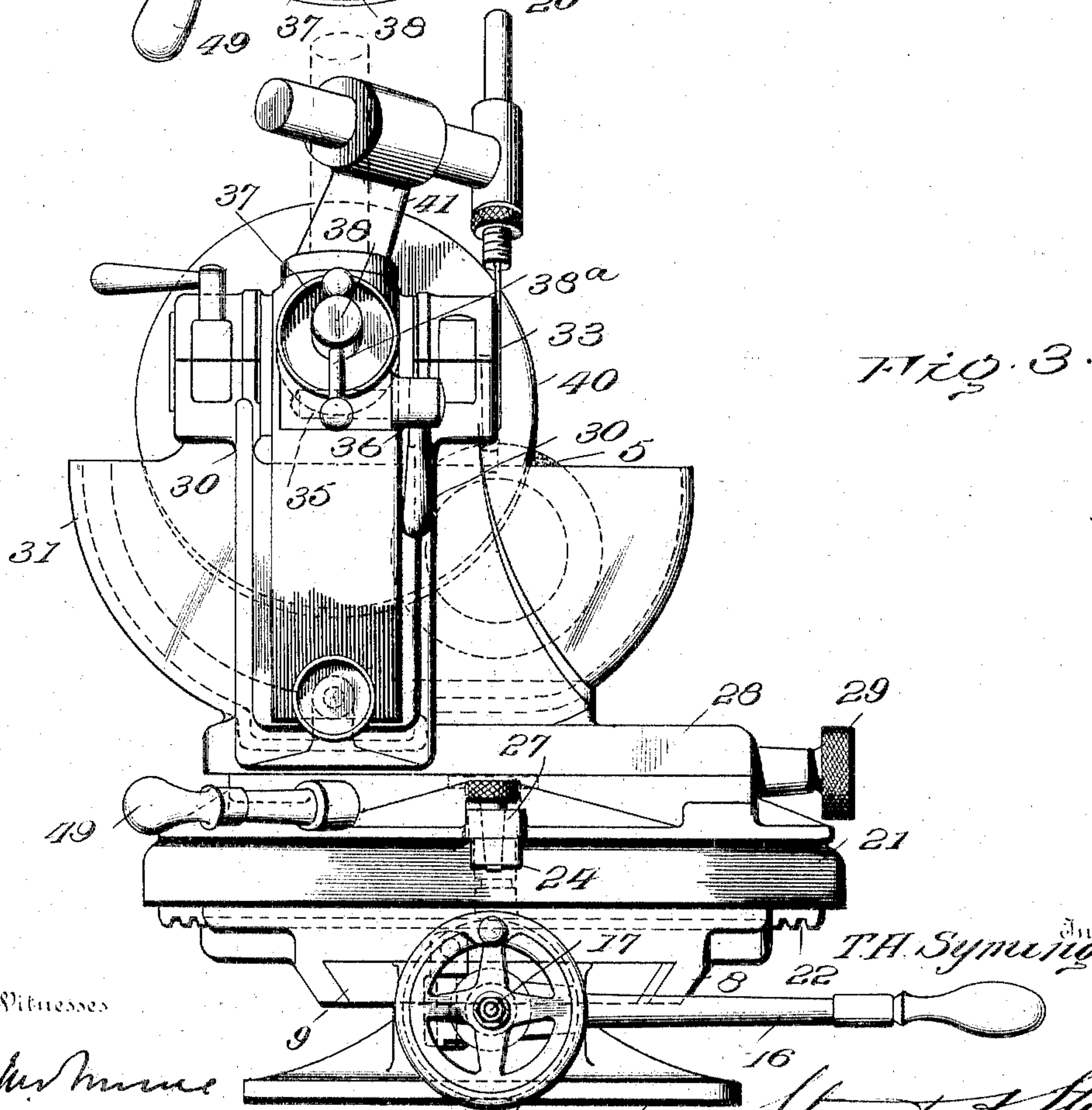


Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

THOMAS HARRISON SYMINGTON, OF BALTIMORE, MARYLAND, ASSIGNOR
TO THE T. H. SYMINGTON COMPANY, A CORPORATION OF DELAWARE.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 766,978, dated August 9, 1904.

Application filed December 7, 1903. Serial No. 184,114. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HARRISON SYMINGTON, a citizen of the United States of America, and a resident of Baltimore city, Maryland, (my post-office address being Calvert Building, Baltimore city, Maryland,) have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

My invention relates to a machine for grinding the teeth of an inserted tooth-cutter while they are all held in place in the cutter and giving to each tooth the same length, face, and shape, so that they will all act alike when presented to the work.

In my grinding-machine the head carrying all of its inserted teeth is mounted upon a spindle fixed at a suitable angle to give the tooth a desired bevel on its cutting-face.

Means are provided for causing the head to approach the grinding wheel or cone and present a single tooth thereto, and means are also provided for moving the single tooth thus presented back and forth past the grinding-cone to grind it.

Means are also provided for centering the carriage which carries the cutter-head upon a fixed center, so that the center of the radius of the outer corner of each inserted tooth will in turn be directly over the revolving center of the main carriage. The cutter-head may then be revolved upon its axis and another cutter brought into position to be ground. Means are provided to limit the rotation of the head, so as to bring the next tooth into exact position for grinding.

For the purpose of setting the grinder means are provided, first, for setting the angle of the spindle of the cutter-head to determine the bevel of the face; second, for approaching and withdrawing the cutter to and from the grinding-wheel; third, for moving the cutter back and forth past the grinder; fourth, for limiting the motion of the cutter-head in its rotation to bring another cutter into position to be ground; fifth, for moving the cutter-head back and forth in the direction of its axis; sixth, for alining the teeth of the cutter to grind the outer corner; seventh, for revolving

the carriage which carries the cutter-head on a fixed center, so as to grind the outer corner of the cutter, so that the center of the radius of the outer corner of each inserted tooth will in turn be directly over the revolving center of the main carriage.

In the drawings the structure is fully illustrated.

Figure 1 is a side elevation partly in section. Fig. 2 is a plan. Fig. 3 is an end view. Fig. 4 is a side elevation of the removable gage by which the head carrying the cutters may be set for grinding.

Referring to the drawings, 1 is a base supporting a bearing 2 for a shaft 3, on one end of which is a pulley 4 and on the other end of which is a cup-shaped grinder, made of any suitable material 5.

6 is a stationary housing surrounding the grinder, secured to the top of which is a water-nozzle 7, which projects beyond the housing and delivers a stream of water upon the grinding-surface of the grinder.

Referring to Figs. 1 and 3, 8 is a bracket secured to the base 1 and projecting horizontally therefrom. 9 is a dovetail way integral with the bracket 8. 10 is a lug depending from the lower side of the bracket, in which is secured a nut 11. 12 is a carriage mounted on the way 9, on the upper side of which is a way 13, located at right angles to the way 9, and on the lower side of which is a depending lug 14, through which there is a central bore parallel to the way 9. Within the lug 14 is journaled the elongated hub 15^a of a gear 15. The hub projects beyond the lug, and to the projecting end is secured a handle 16 by means of a screw-clamp. The hub 15^a has a central axial bore, in which is located a spindle 17, on which the hub freely turns. The spindle is held within the hub by a collar 18 on the spindle, which bears against one end of the hub, and by the hand-wheel 20, secured to one of the extremities of the spindle and which bears upon the other end of the hub. The end of the spindle which projects beyond the gear 15 is screw-threaded and enters and meshes with the nut 10. The carriage 12 and all of its superimposed structure are moved

back and forth on the way 9 by the hand-wheel 20. By this means the end of the cutter is approached to and withdrawn from the grinder, the adjustment being fine. 21 is a carriage mounted and sliding upon the way 13. On its under side it is provided with a rack 22, which depends through a longitudinal slot in the way 13 and meshes with the gear 15. By this means the carriage 21 and all the parts carried by it are caused to move back and forth across the machine in front of the grinder, and the cutter being ground after having been set up to the grinder is moved back and forth past the grinder to grind the end of the cutter. This action is accomplished by the motion of the handle 16 and is rapid and reciprocal. The carriage 21 has on the side next the base a lug 23, which has a vertical hole, and on which is pivoted the super-structure carrying the cutter-head. On the opposite side is a lug 24, also perforated and used to lock the cutter-head carrier in the position in which the face of the cutter is ground. 25 is a plate having a dovetail way 25^a transverse of its upper surface and parallel to the way 13. On each side it is provided with perforated lugs 26, registering with 23, and 27, registering with 24. Through the lugs 23 and 26 is passed a bolt permanently secured therein, and through the lugs 24 and 27 is passed a removable pin. 28 is a carriage mounted upon the ways 25^a and moved thereon by the screw 29. Upon the carriage 28 are two trunnion-supports 30 30 and the water-trough 31. 32 is a sleeve by which the cutter-head is carried. It is provided upon two opposite sides with trunnions 33 33, and centrally located between the trunnions is a depending arm 34. The sleeve is split at the rear and there provided with a locking-bolt 35, controlled by a nut and handle 36. On the rear end of the sleeve is a cap 37, in the center of which there is a hole threaded on its interior. 38 is a spindle located within the sleeve 32 and capable of being clamped therein by the bolt and nut 35 36. The rear end of the spindle passes through the hole in the center of the cap 37 and is threaded therein. On its rear extremity the spindle is provided with a lever 38^a for turning. On the opposite end of the spindle is a boss 39, threaded on its exterior to receive the cutter 40. On the top of the sleeve is a pivoted arm 41, carrying on its extremity an adjustable spring-gage 42, which is designed to stand in the path of the butt-end of the inserted cutters on the back of the cutter-head and limit the motion of the head when turned to bring a tooth into position to be ground. 43 is a set-screw threaded into a lug projecting from the side of the carriage 28.

Referring to Fig. 4, in which is shown a gage by which the teeth of the cutter may be set approximately before grinding and when ground their accuracy may be tested,

the gage consists of a bracket 44, having projecting from its under side a central pin 45 and an eccentric-pin 46. On its upper end is a vertically-adjustable arm 47, in the end of which is a laterally-adjustable screw 48, with means for tightening the thread upon the screw. In the center of the pivot-bolt which passes through the lugs 23 26 is a hole suitable to receive the pin 45, and beside this hole and in the head of the pivot-bolt is another hole suitable to receive the pin 46, the second hole being so located as to present the face of the gage-screw 48 to the face of the teeth of the cutter when they are moved up to it. The face of the gage-screw 48 is set such a distance back of the axis of rotation of the carriage 28 as to provide the desired radius for the rounded corner of the cutter-tooth.

For the purpose of setting the cutters and the cutter-head the hand-wheel 20 is turned so as to move the carriages 12, 21, and 28, carrying the cutter-head away from the grinder. The screw 43 is then turned, if need be, to give the cutter-head and its spindle a desired inclination, so as to produce the desired bevel of the face of the cutter in one direction.

The lugs 24 and 27, by which the carriage 30 is located in relation to the grinder, are so situated that when the pin is in the apertures in those lugs locking the carriage in position, the tooth will be inclined to the axis of the grinder in two directions—that is to say, it will have a suitable bevel, and it will also have a back-rake, which will give the grinding-face of the tooth a desired clearance. The bracket 44 is then located upon the center of the axis of the lugs 23 and 26, the screw 48 having been previously adjusted to occupy a desired position in the rear of the axial line. The pin 45 enters the central hole in the bolt, and the pin 46 enters the eccentric hole in the head of the bolt. The nut 35 having been loosened, the lever 38^a is then turned, and the spindle 38 is screwed into the cap 37, forcing the cutter-holder forward until the face of the cutter makes contact with the gage-screw 48. The clamp 35 36 is then screwed home, and the cutter locked in that position. If the corner of the cutter-face does not occupy exactly the proper position with relation to the gage-screw 48, it may be adjusted laterally by the adjusting-screw 29. The cutter-head may now be turned upon the spindle 38 without altering its adjustment and the face of each cutter brought opposite to the gage-screw 48, each tooth slipping past the spring 42 as the head turns and the end of the spring 42 registering a uniform position for all teeth as they come opposite to the gage. If this registry indicates that the ends of the teeth are out of line, they may be driven back into position as near as may be, forcing them into or out of the holder. When

they stand in approximately the same plane in contact with the gage-screw 48, they will then occupy a position where the axis of rotation of the carriage passing through the center of the pivot will pass through a point within the corner of the cutter which will be equally distant from the face and the side, and which distance will be the desired radius of the curve of the corner of the cutter. The gage may now be removed and the hand-wheel 20 turned and the superimposed structures, including the holders and cutters, approached to the grinder until they make contact with it. Then by moving the handle 16 the individual cutter in contact with the grinder may be moved back and forth past the face of the grinder until suitably ground. The next cutter may then be turned into position without altering the adjustment, and each successive cutter may be ground upon its face until they are all ground to a uniform face-surface.

It is desirable to give to the cutter some additional clearance upon the heel of the bevel, and for this purpose the screw 43 is given another adjustment, so as to drop the holder a little lower and bring a different vertical plane in contact with the grinder. The hand-wheel 20 is turned until the cutter-tooth occupies a desired position with reference to the grinder, when each of the teeth may be separately ground by successive movements of the handle 16 without disturbing the adjustment of the hand-wheel 20. When all of the teeth have thus been ground on the ends, the pin which passes through the lugs 24 and 27 is removed and the carriage, with all its superimposed structure, turned upon the pivot of the lugs 23 26, which will cause the corner of the tool to be ground in a fixed radius. Thus each tool may be separately ground upon its corner, and all teeth will have the same curve upon the same radius.

The rotation of the carriage upon its pivot is regulated by the handle 49.

In operation each tooth consecutively is ground with a flat face with the desired rake radially and circumferentially. Adjustment is then made to have the center of the corner of the tooth being ground coincident with the axis of the pivot of the holder-carriage, when each tooth in succession has its corner rounded off to the desired radius.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for grinding successively the teeth of an inserted tooth-carrier, the combination of a grinder suitably mounted and revolved, a carriage having two adjustments, one parallel to the axis of the grinder, and one at right angles to the axis of the grinder, an auxiliary carriage mounted upon the first carriage, and pivoted thereto at its side, at a

point approximately below the tooth being ground, a cutter-holder support mounted upon the auxiliary carriage, and provided with a feed to move the holder-support in line at right angles to the axis of the grinder when the axis of the cutter-holder is parallel to the axis of the grinder, a cutter-holder trunnioned to the holder-support, having a seesaw adjustment, and provided with another adjustment in a line parallel to the axis of the holder, a spindle to which is attached the cutter-head, which spindle revolves in the center of the holder.

2. In a machine for grinding successively the teeth of an inserted tooth-carrier, the combination of a grinder suitably mounted and revolved, a carriage having two adjustments, one parallel to the axis of the grinder, and one at right angles to the axis of the grinder, an auxiliary carriage mounted upon the first carriage, and pivoted thereto at its side, at a point approximately below the tooth being ground, a cutter-holder support mounted upon the auxiliary carriage, and provided with a feed to move the holder-support in line at right angles to the axis of the grinder when the axis of the cutter-holder is parallel to the axis of the grinder, a cutter-holder trunnioned to the holder-support, having a seesaw adjustment, and provided with another adjustment on a line parallel to the axis of the holder, a spindle to which is attached the cutter-head, which spindle revolves in the center of the holder, and a stop engaging the teeth of the cutter-head one after the other, as the head is turned to register each tooth with the grinder.

3. In a machine for grinding the teeth of an inserted tooth-cutter, the combination of a grinder suitably mounted and revolved; a carriage mounted in relation to the grinder having the following adjustments: one parallel to the axis of the grinder, and two at right angles to the axis of the grinder, one a rough adjustment and the other a fine adjustment; a cutter-holder mounted upon the carriage in suitable supports, and provided with trunnions by which the axis of the cutter-holder may be caused to assume any desired angle to the axis of the grinder, the holder-support being pivoted upon the carriage so as to swing the axis of the holder around a fixed center to any desired angle in relation to the axis of the grinder; a removable gage adapted to be located upon the axis of rotation of the holder-support to set the holder in proper relation to said axis of rotation.

Signed by me, at Baltimore city, Maryland, this 9th day of November, 1903.

THOMAS HARRISON SYMINGTON.

Witnesses:

T. BAYARD WILLIAMS,
THORVALD A. LEE.