(No Model.) 2 Sheets—Sheet 1.

Z. B. COES.

TAPER TURNING TOOL FOR LATHES.

No. 532,766. Patented Jan. 22, 1895.

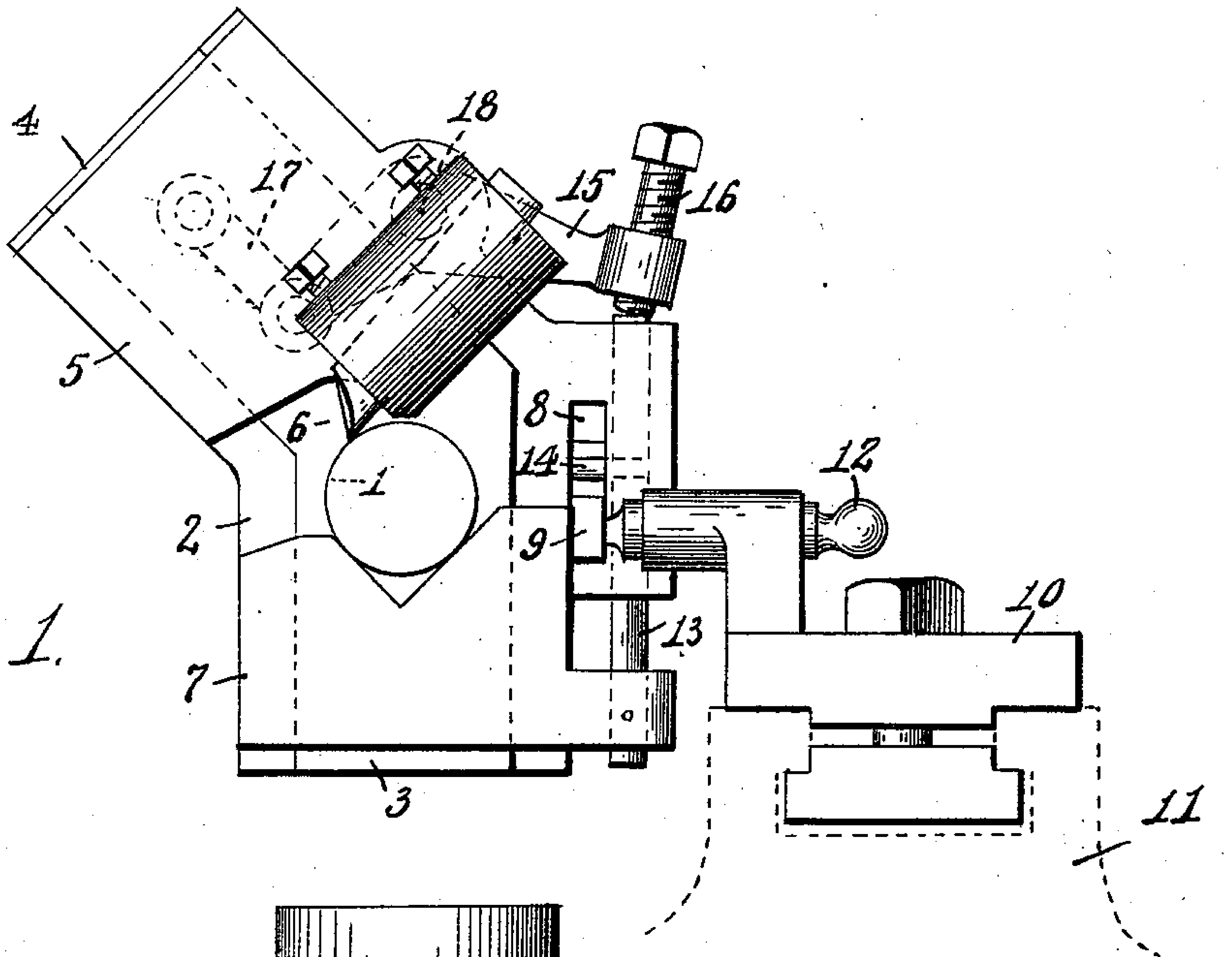

Fig. 1.

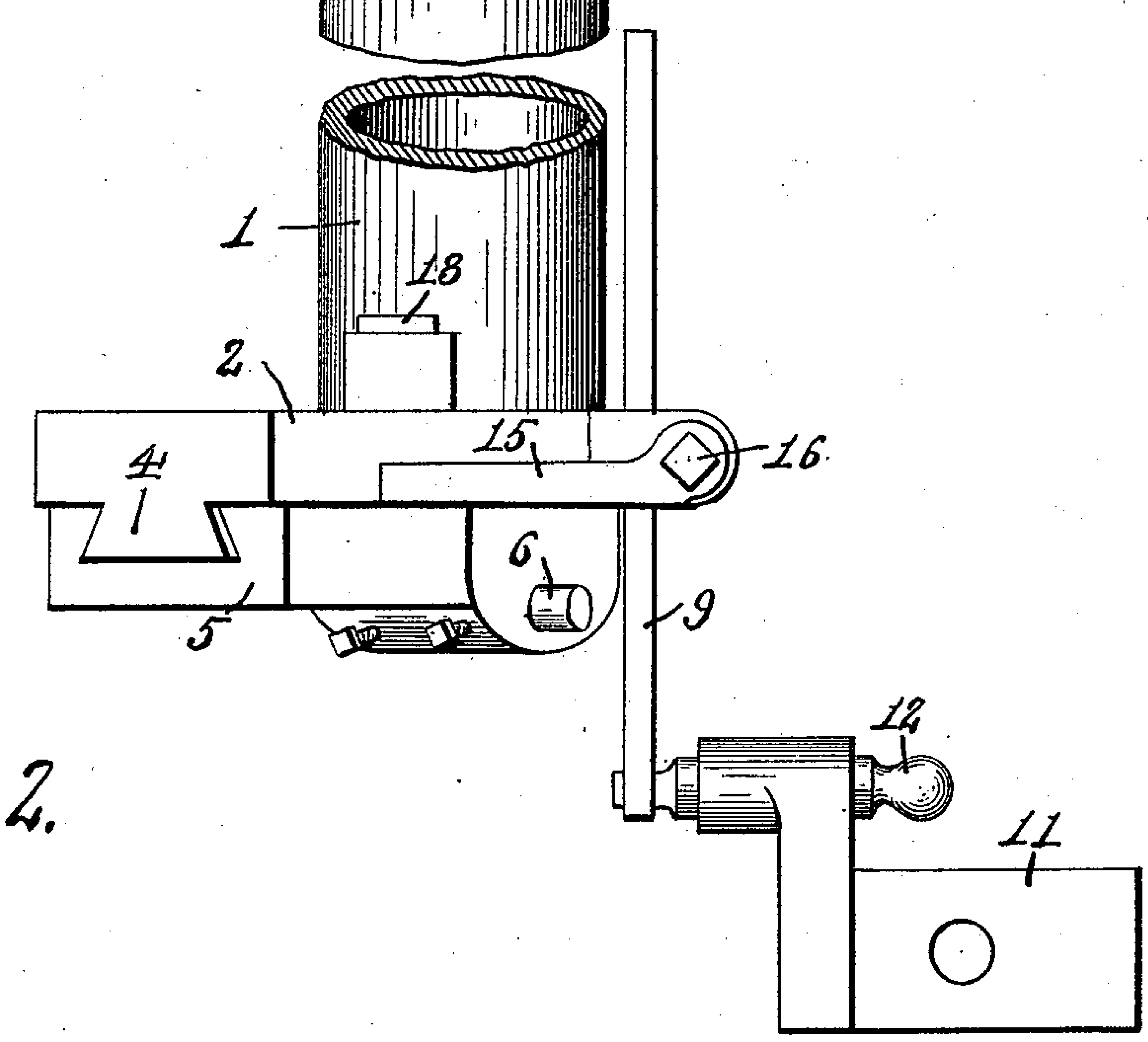

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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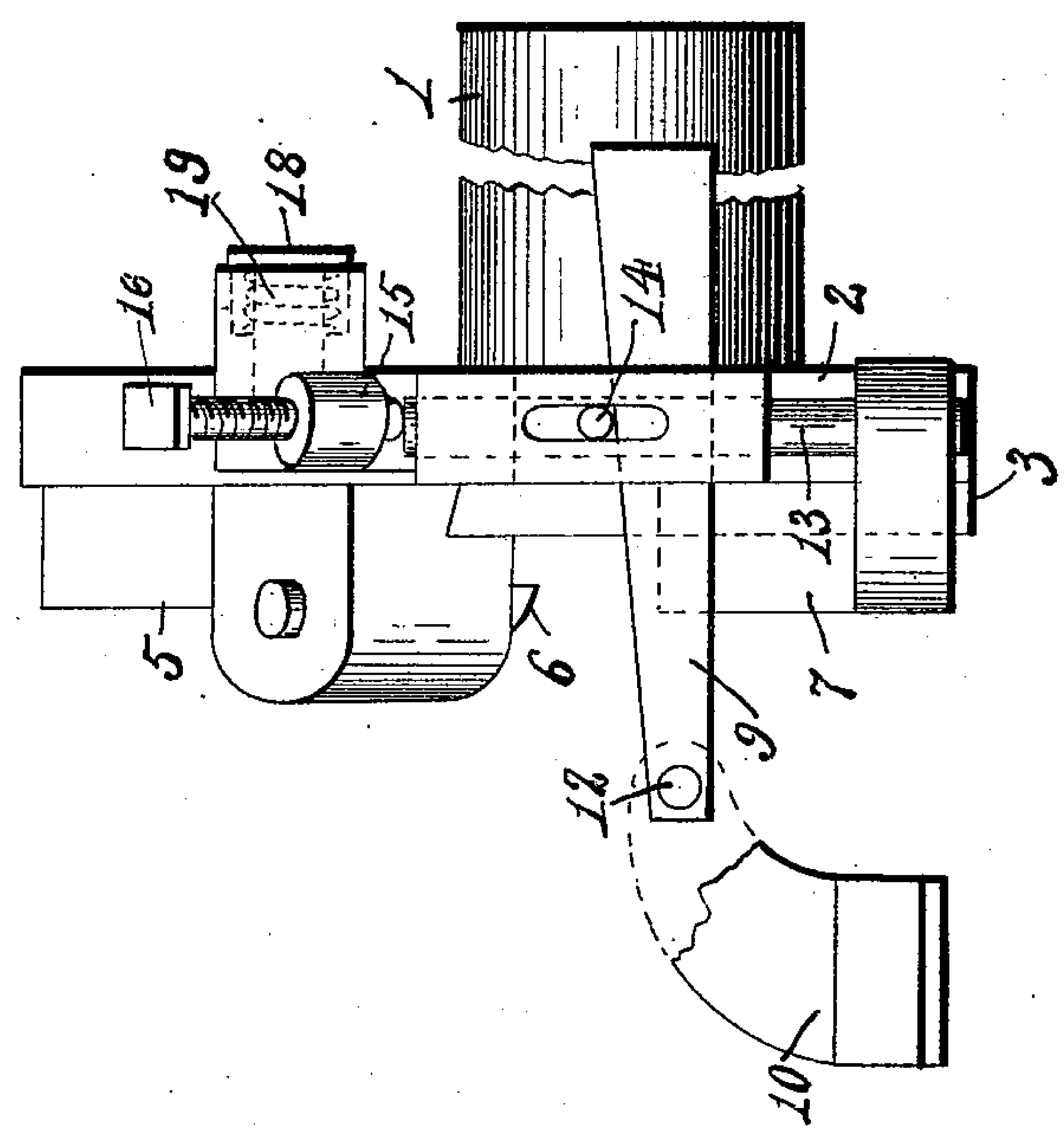

Fig. 4.

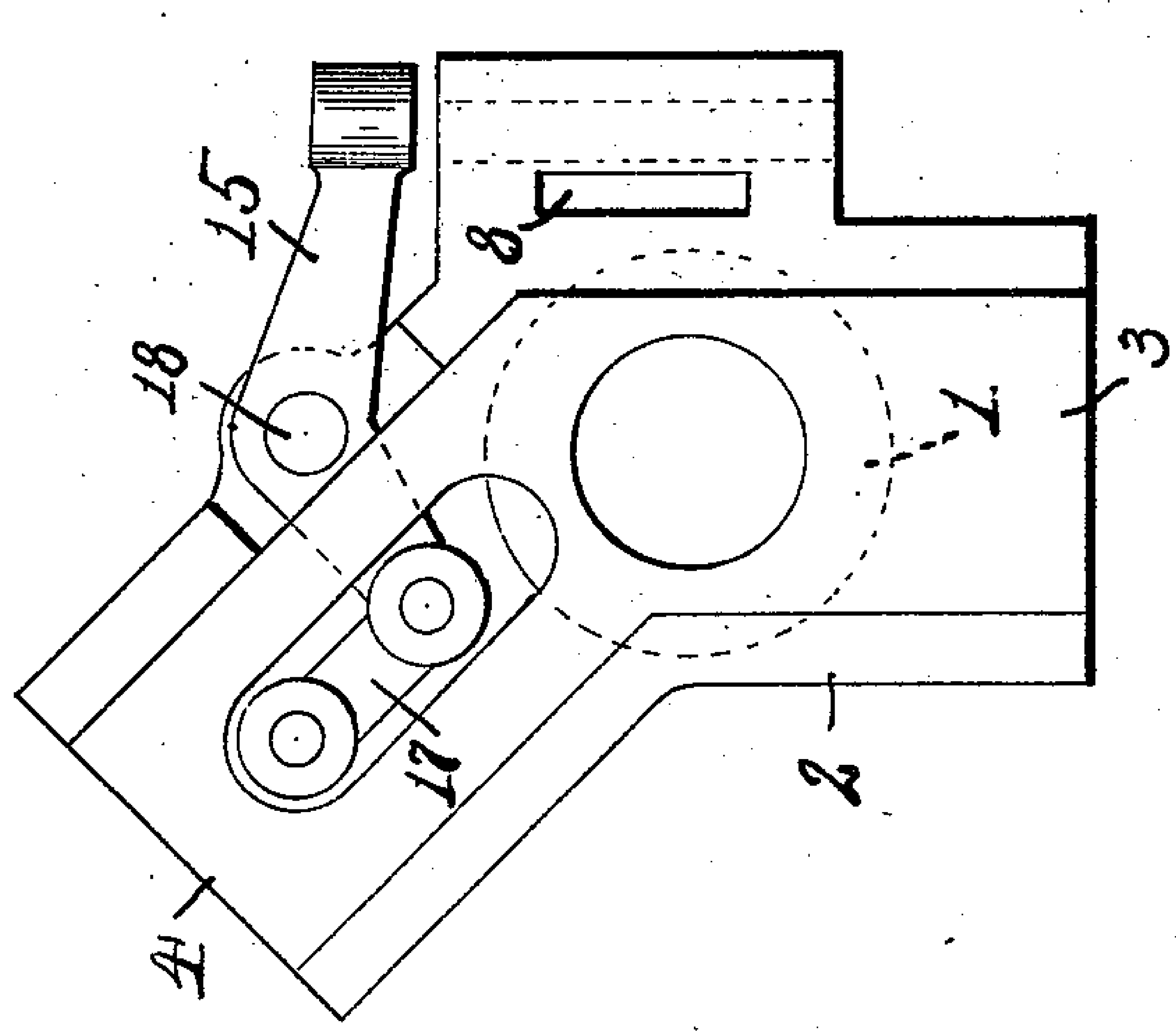

Fig. 3.

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UNITED STATES PATENT OFFICE.

ZORESTER B. COES, OF HAMILTON, OHIO, ASSIGNOR TO THE NILES TOOL WORKS COMPANY, OF SAME PLACE.

TAPER-TURNING TOOL FOR LATHES.

SPECIFICATION forming part of Letters Patent No. 532,766, dated January 22, 1895.

Application filed May 7, 1894. Serial No. 510,303. (No model.)

To all whom it may concern:

Be it known that I, ZORESTER B. COES, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Taper-Turning Tools for Lathes, of which the following is a specification.

This invention pertains to that class of taper turning tools designed to be carried by the sliding tail-stock of a lathe, or by the turret of a turret-lathe, and to be fed forward to operate upon work revolved by the lathe-spindle.

My improvements will be readily understood from the following description taken in connection with the accompanying drawings, in which—

Figure 1, is an end view of a taper turning tool exemplifying my present invention, the apparatus being viewed toward the end which presents toward the head of the lathe; Fig. 2, a plan of the same, the lower end of this view being the end which appears in Fig. 1; Fig. 3, an end view, similar to Fig. 1, but with many of the parts removed; and Fig. 4, a front view of the apparatus, and the front corresponding with the right hand of the other two views.

In the drawings:—1, indicates a shank adapted to be held in one of the holes in a lathe-turret as is usual with turret-tools, the axis of the shank coinciding with the axis of the work to be turned, and the shank being bored so that the work may pass into or through it; 2, a plate rigidly supported on the front end of this shank; 3, a slide-way formed on this plate with its path-line radial to the axis of the shank; 4, a second similar slide-way on the plate; 5, a tool-block fitted to slide on slide-way 4; 6, a cutting-tool carried thereby; 7, a back-rest block fitted to slide on slide-way 3 and having a notch adapted to engage the work being turned; 8, a mortise through plate 2; 9, a wedge engaging this mortise, the taper of this wedge corresponding with the desired taper to be produced upon the work in hand; 10, a bracket designed to support the wedge against endwise motion, and illustrated as a plate adapted to be bolted to the usual tool-post block of the lathe carriage, it being understood that when this apparatus is in use the lathe-carriage will remain stationary; 11, the usual tool-post block of the lathe-carriage; 12, a pin supported in the bracket 10 and engaging a hole in one end of the wedge, this pin being capable of endwise motion to permit of the wedge being readily disconnected from the bracket; 13, a rod fast in back-rest block 7 and parallel with the path of movement of the block upon its slide-way; 14, a pin projecting from the rod 13 and engaging over the wedge 9, this pin being virtually a rigid part of block 7; 15, a lever pivoted to plate 2; 16, an adjusting screw in one end of this lever bearing against the end of rod 13 and tending to push block 7 downwardly as far as the engagement of pin 14 with the wedge will permit; 17, a link connecting the other end of the lever with tool-block 5; 18, a central pivot of the lever, and 19 a spring connected with this pivot and tending to rock the lever in such direction as to force tool-block 5 outwardly and force the back-rest block 7 downwardly.

The wedge is supported against endwise motion and as the parts carried by the shank traverse the wedge, moving toward the wide end of the wedge, pin 14 will be forced upward, thus lifting the rod 13 and rocking the lever 15 and pulling tool-block 5 and the tool inwardly thus reducing the diameter produced upon the work by the cutting-tool. At the same time rod 13 lifts the back-rest block 7 and maintains contact of the notch-walls in the block with the work, thus furnishing a back-rest for the work as the diameter changes. One wall of the notch in the back-rest block 7 is tangent to the circle and diametrically opposite the point of the cutting-tool, while the other wall of the block is at ninety degrees to the first wall and, consequently, at right angles to the tangent of cutting strain. The work is thus properly supported in the two directions of strain.

By withdrawing pin 12 the wedge becomes disconnected from its fixed support and may be readily withdrawn. Different wedges will be employed in correspondence with desired different tapers to be produced.

The walls of the notch do not move to and from the axis of the work at the same rate as the block which carries those walls, the proportion of movement being as the side of a square is to the diagonal of a square. Therefore to produce a given change in radial distance from the axis of the work to the walls of the notch the block which carries those walls must be changed in position a greater distance, the advance of notch-walls to the advance of block being as one is to one and forty-one one-hundredths. The cutting-tool is to be moved in direct relation to the approach or recession of the notch-walls to and from the axis of the work and it follows that tool-block 5 and back-rest block 7 must have movements in the proportion of one to one and forty-one one-hundredths. The arms of lever 15 are made in the above proportion and it follows that the point of the tool and the walls of the notch will have the same movements of approach and recession to and from the axis of the work. In case the walls of the notch should be at other angles than ninety degrees as shown then the arms of lever 15 will require a correspondingly different proportion. Set screw 16 may be employed in adjusting the point of the tool to and from the axis of the work to secure the desired diameter of work. The wedge draws the tool and back-rest block inwardly and spring 19 urges the parts outwardly and takes up lost motion.

The exemplification contemplates that the work and the wedge have no endwise motion, the feed being produced by moving the tool endwise along the work and wedge, as by means of the sliding turret or tail-stock of a lathe, but it is obvious that the system would find its equivalent in a non-feeding cutting-tool employed in conjunction with work and a wedge feeding endwise.

Lathesmen are all familiar with the fact that in turning tapers, either by setting the tail-stock over, as in usual lathe construction, or by the use of an adjustable guide to move the tool transversely to the work, as in the case of the well known Slate lathes, a true taper will be produced only in case the point of the tool is set at the level of the lathe centers so that the transverse movement of the tool with reference to the axis of the work will be in a true radial plane. If the tool be set above or below the center, so as to move in other than a true radial plane, the contour of the work will be longitudinally curved. This may be readily illustrated as follows:— Assume a piece of work an inch in diameter, and assume the lathe center or the Slate taper attachment to be so set as to produce a taper of one inch to the foot, the work getting smaller as the tool feeds toward the head-stock. Assume the tool to be set at the exact level of the lathe centers and to start its cut at the one inch diameter of the bar at the tail-stock end. At the end of a foot of feed the bar would be reduced to nothing, to a perfect point, and the taper would be a perfect one of one inch to the foot. Now, assume the operation to be repeated but the point of the tool to be set a quarter of an inch above the lathe center. At the end of the foot of feed the bar is not reduced to zero diameter but to half an inch, the point of the tool then tending to pass a quarter of an inch above the axis of the work and, as it continues its feed, to taper the work in the other direction; and the work produced will not be a true taper but will be a concave curve.

Taper devices have been proposed in which the tool is carried in a pivoted arm so as to swing the point of the tool to and from the axis of the work. A tool thus mounted can obviously not move transversely in a truly radial plane and cannot produce a true taper. In my taper turning device the tool moves in a slide guide in a true radial plane and can produce a true taper. Again, the walls of the back-rest must be true tangents to the work being turned if taper work is to be produced. Any sort of a back-rest notch will work fairly well with cylindrical work, and would also work fairly well with taper work if the back-rest was held to its work by a spring or weight or some equivalent arrangement; but if the movement of the back-rest is to be arbitrarily controlled by a guide then, in order that the walls of the back-rest may maintain proper bearing on the tapered work, the walls must be true tangents, forming a perfect angle, and curved walls become inadmissible.

I claim as my invention—

1. In a taper turning tool, the combination, substantially as set forth, of two right-line guide-ways disposed at right angles to the axis of the work to be turned, a tool-block mounted to slide in one of said right-line guide-ways and carry a tool point in a right line radial to the work to be turned, a back-rest block mounted to slide in the other right-line guide-way and having a rest-notch with two straight walls at equal angles to the path of sliding motion of said rest-block in its right-line guide-way, and a wedge and lever connected with said two blocks to cause them to move in their right-line guide-ways at different rates of motion as the work of taper turning progresses.

2. In a taper-turning tool, the combination, substantially as set forth, of a notched back-rest block mounted to slide in a right line, a tool-block mounted to slide in a right line at a constant angle to the line of motion of said back-rest block, a wedge controlling directly the sliding of one of said blocks, and an unequally armed lever connected with said two blocks whereby the movement of one block imposes a movement upon the second block but at a different rate.

3. In a taper-turning tool, the combination,

substantially as set forth, of two right-line guideways disposed at an angle to each other, a back-rest block sliding in one of said guideways and having a notch with straight walls, a tool-block sliding in the other guideway, a controlling wedge acting directly on one of said blocks and acting with the same controlling surface on one arm of an unequally armed lever, and a connection from the other arm of the lever to the second block.

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