(No Model.) 3 Sheets—Sheet 1

J. C. & E. J. BULLOCK.

BORING MACHINE.

No. 573,857. Patented Dec. 29, 1896.

FIG. 1.

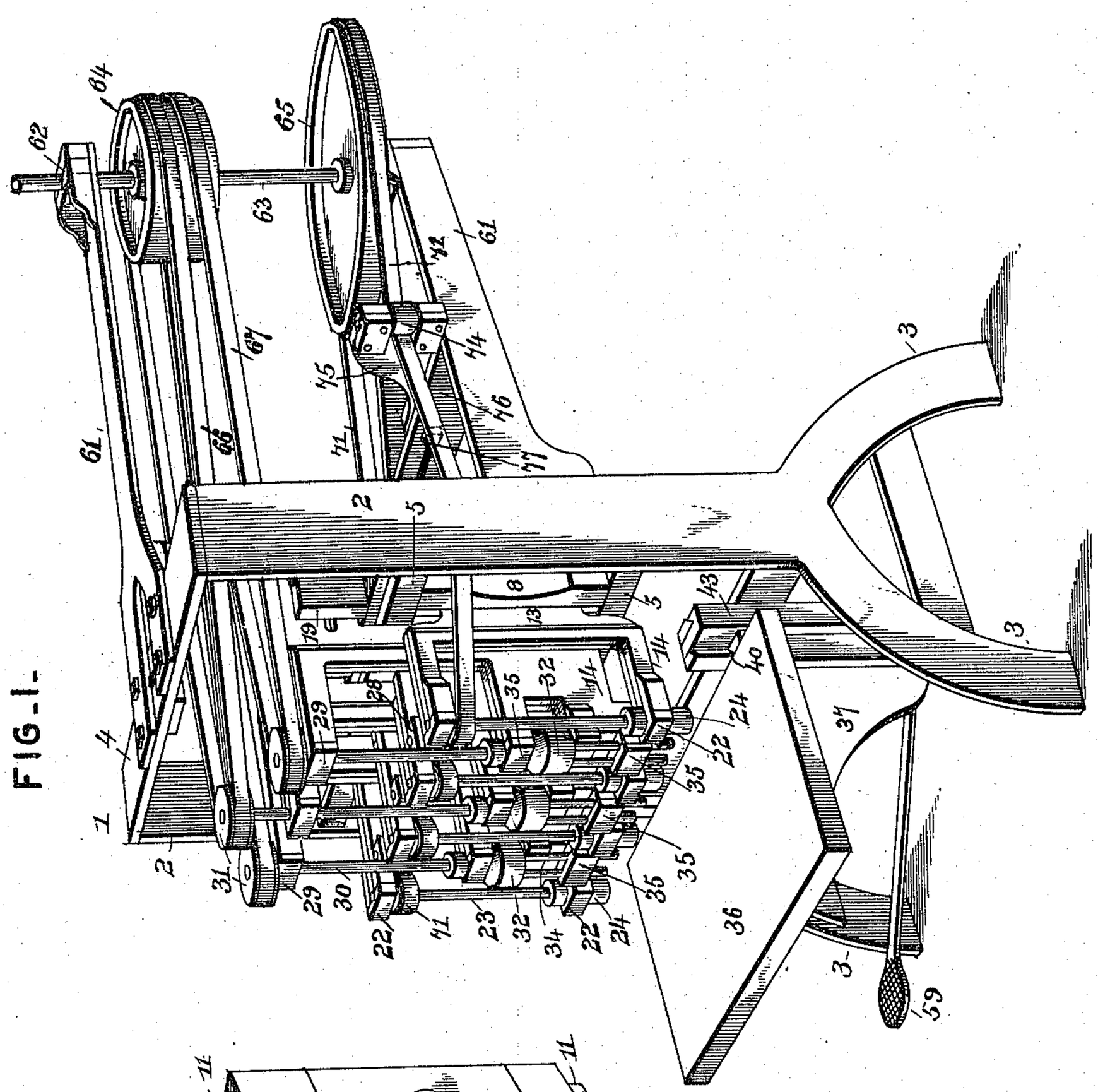
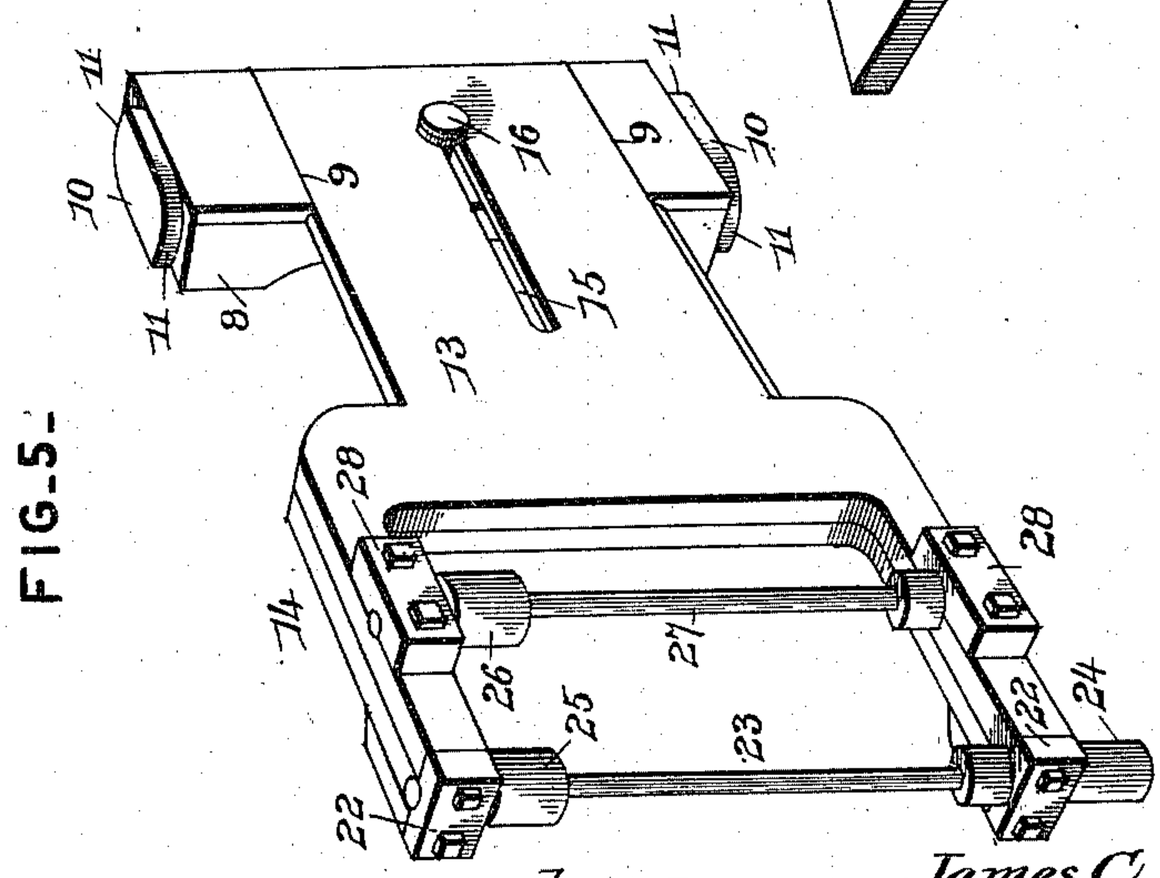


FIG. 5.



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(No Model.) 3 Sheets—Sheet 2.

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BORING MACHINE.

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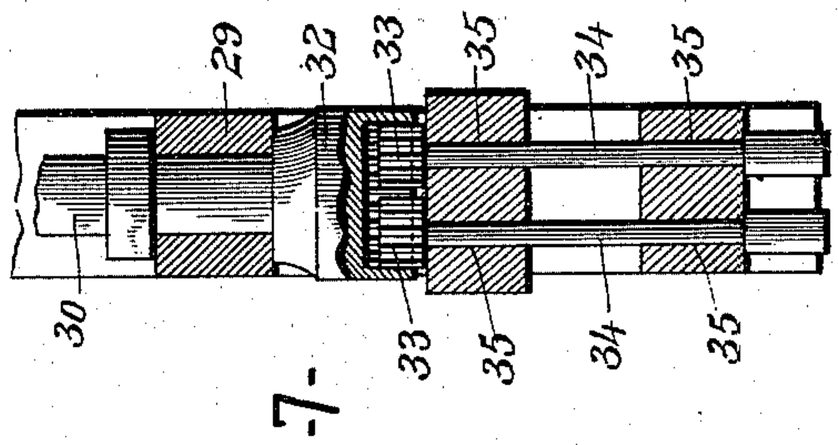

FIG-7-

FIG.2-

FIG-6-

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(No Model.) 3 Sheets—Sheet 3.

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BORING MACHINE.

No. 573,857. Patented Dec. 29, 1896.

FIG. 3.

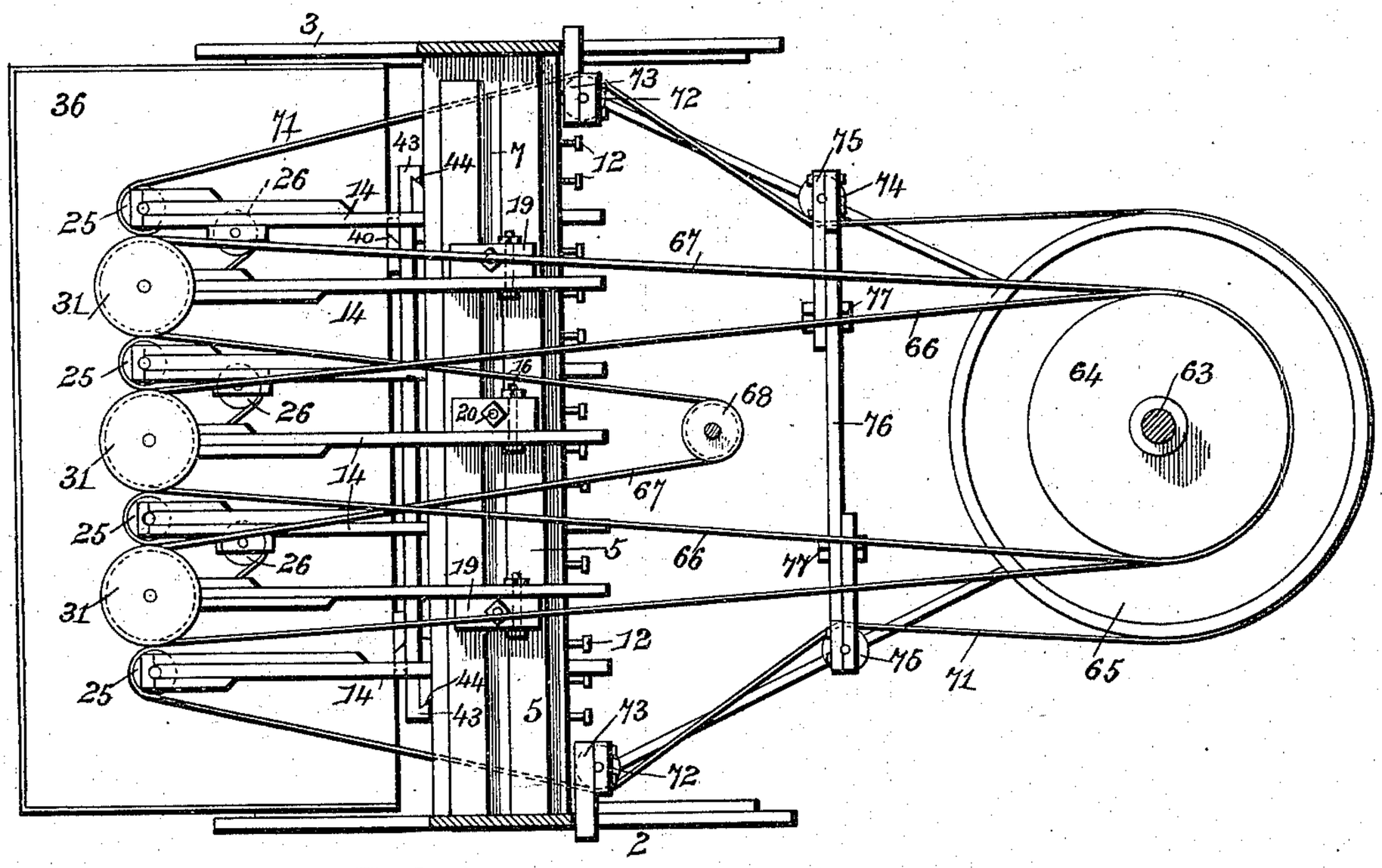
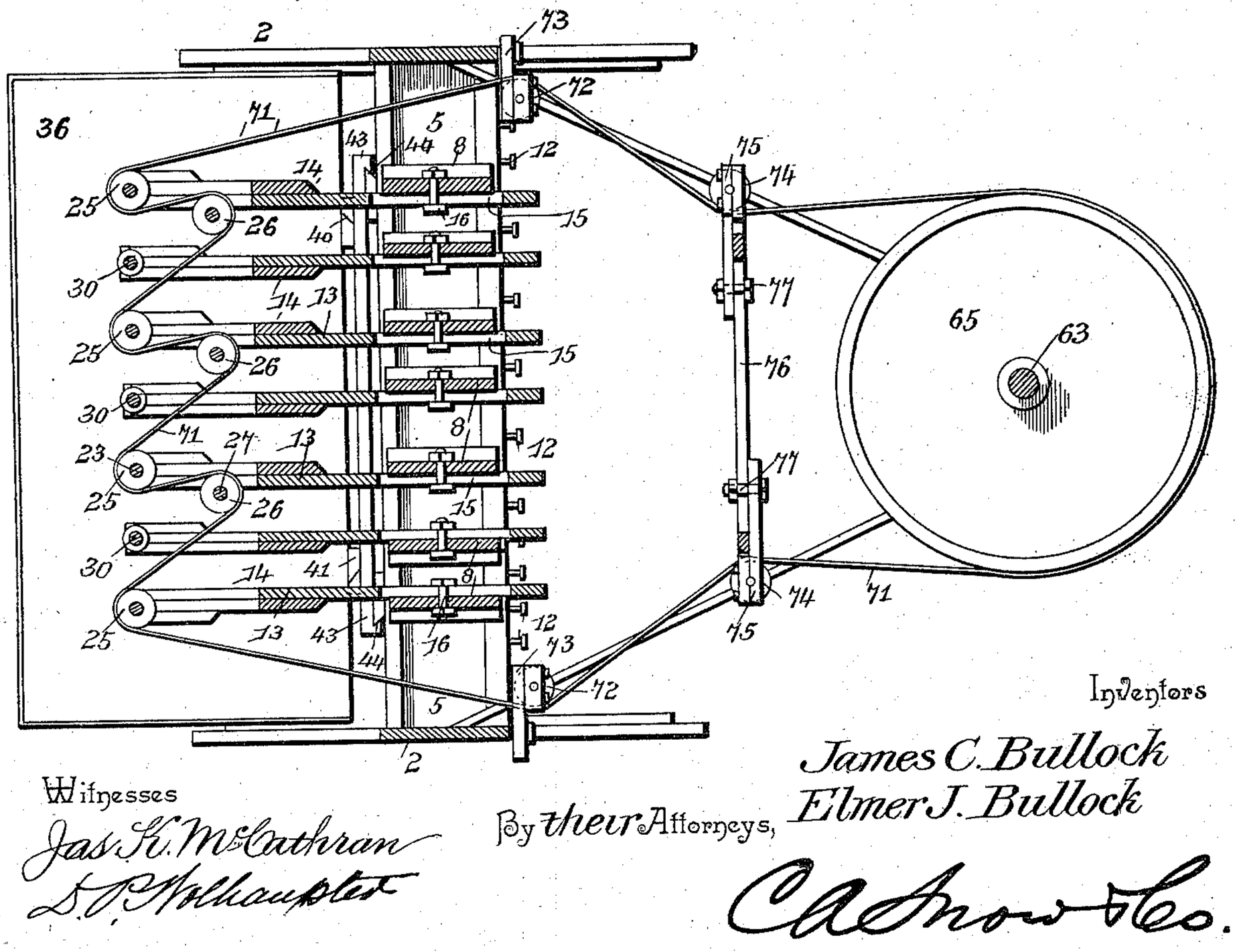


FIG. 4.



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UNITED STATES PATENT OFFICE.

JAMES CLARENCE BULLOCK AND ELMER JAMES BULLOCK, OF REEDSBOROUGH, VERMONT.

BORING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,857, dated December 29, 1896.

Application filed January 31, 1896. Serial No. 577,587. (No model.)

To all whom it may concern

Be it known that we, JAMES CLARENCE BULLOCK and ELMER JAMES BULLOCK, citizens of the United States, residing at Reedsborough, in the county of Bennington and State of Vermont, have invented a new and useful Boring-Machine, of which the following is a specification.

This invention relates to boring-machines; and it has for its object to provide a machine of this character capable of boring a number of holes simultaneously in wood or other material in a straight line or on any curve at equal or variable distances apart.

To this end the main and primary object of the present invention is to construct a boring-machine with a gang of bit-operating spindles having a great variety and range of adjustment in order to provide means for boring holes at any point in a piece of work within the range of the table of the machine.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a perspective view of a boring-machine constructed in accordance with this invention. Fig. 2 is a central vertical sectional view thereof. Fig. 3 is a horizontal sectional view on the line 3 3 of Fig. 2. Fig. 4 is a similar view on the line 4 4 of Fig. 2. Fig. 5 is a detail in perspective of one of the adjustable spindle-carrying brackets and its attachments. Fig. 6 is a horizontal sectional view on the line 6 6 of Fig. 2. Fig. 7 is a detail sectional view on the line 7 7 of Fig. 2.

Referring to the accompanying drawings, the numeral 1 designates a machine frame or stand essentially comprising the opposite side standards or uprights 2, having the supporting-legs 3 at their lower ends and the horizontal top cross-bar 4, connecting the upper ends of the said opposite side standards or uprights 2. At an intermediate point between the upper and lower ends of the side standards or uprights of the machine frame or stand is arranged a pair of horizontal spaced cross-beams 5. The horizontal spaced cross-beams 5 are suitably connected at their ends to the side standards or uprights 2 and are provided in their opposing sides with the wide longitudinal slide-grooves 6, which extend from end to end of the cross-beams, and the upper of said cross-beams 5 is additionally provided at the upper side thereof with a narrow longitudinal T-groove 7, extending from end to end of said upper cross-beam, for a purpose to be hereinafter more particularly specified.

A series of oscillatory supporting-posts 8 are arranged between the upper and lower cross-beams 5 and are disposed in an upright position so as to extend across the space between the two cross-beams. Each of said oscillatory supporting-posts 8 is slidably fitted between the two cross-beams 5, and is provided at one side with a wide dovetailed groove or way 9 and at its upper and lower ends with the slide-blocks 10, which slide-blocks 10 register loosely in the grooves 6 of the beams 5 and are provided with rounded ends 11, which roll against the opposite inner sides of the grooves 6 in order to allow the slide-blocks 10 to also act as pivots for the supporting-posts 8, so that the same may be oscillated on their axes, while at the same time adjusted laterally toward opposite sides of the machine frame or stand. In conjunction with the upper and lower slide-blocks 10 of the several supporting-posts 8 are employed upper and lower series of set-screws 12, respectively mounted in the rear sides of the upper and lower cross-beams. The set-screws mounted in the rear sides of the upper and lower cross-beams are arranged closely together, and the inner ends thereof are designed to work into the grooves 6 at one side thereof, so as to impinge against one end of the slide-blocks 10 and thereby provide means for binding said slide-blocks in the grooves 6 and holding the supporting-posts 8 fixed at any angle or laterally-adjusted position, as will be readily understood.

The wide dovetailed grooves or ways 9 at one side of the supporting-post 8 are adapted to slidably receive the dovetailed slide-arms 13 of the bifurcated spindle-brackets 14, carried at the outer ends of said arms, and the said slide-arms 13 are provided therein with longitudinally-disposed slots 15, which re-

ceive the clamping-bolts 16, also passed through the supporting-posts 8 and providing means for tightly clamping the arms 13 to the posts 8 to hold the spindle-brackets 14 fixed in any projected position, as will be readily understood. Certain of said spindle-brackets, which are illustrated as being every alternate bracket, are of a greater height than the other spindle-brackets and are provided at their upper ends, in a plane above the upper cross-beam 5, with the upper supplemental rearwardly-projected slide-arms 17, provided with longitudinally-disposed slots 18, and adjustably secured at one side of the supporting-blocks 19, loosely arranged on top of the upper cross-beam 5, and movably secured in position by the vertical bolts 20, the heads of which bolts are disposed below the lower ends of the blocks 19 and pivotally and slidably engaged in the T-groove 7 at the top of the said upper cross-beam. Clamping-bolts 21 are passed transversely through the blocks 19 and engage in slots 18 of the slide-arms 17 to provide for tightly clamping said slide-arms to the blocks 19 when the higher spindle-frames have been adjusted to the desired working position.

The alternating spindle-brackets 14, which are supported solely by the adjustable supporting-posts 8, are provided at their outer ends with the upper and lower vertically-alined bearing-boxes 22, in which are journaled the upper and lower ends of the bit-spindles 23, carrying at their lower ends below the brackets suitable bit-attaching sockets 24, with which may be suitably connected the desired tool or bit intended for boring a hole in the work or material supported in position below the bits in a manner to be described. The said bit-carrying spindles, mounted in an upright position in the alternating spindle-brackets referred to, are provided near their upper ends with the vertically-disposed belt-pulleys 25, in rear and at one side of which are mounted similarly-disposed idler-pulleys 26, which pulleys are arranged near the upper ends of vertically-disposed idle-shafts 27, mounted in suitable bearings 28 in rear and at one side of the bearings 22 previously referred to, and the function of the said idler-pulleys 26, in connection with the belt-pulleys 25, will be described in connection with the mechanism for imparting motion to the bit-spindles.

The higher spindle-brackets 14, alternating with those brackets carrying the bit-spindles 23 and idler-shafts 27, are also provided at their outer ends with upper and lower vertically-alined bearing-boxes 29, in which are journaled the upper and lower ends of the bit-spindles 30, which spindles carry at their upper ends above the brackets the horizontal belt-pulleys 31, and at their lower ends directly below the lower of said bearing-boxes 29 the said bit-spindles 30 carry hollow internally-toothed gears 32, within each of which hollow gears 32 is arranged a pair of pinions 33, meshing with the interior teeth of the hollow gear and mounted on the upper extremities of the short rotating bit-stocks 34, mounted side by side in suitable bearings 35, arranged on the aforesaid spindle-brackets below the hollow gears 32. This construction provides means for imparting motion to a pair of rotating bit-stocks on each of the higher spindle-brackets, and said bit-stocks are designed to have connected with their lower ends in any suitable manner any suitable bits or tools for boring the work.

Arranged below the entire gang of spindle-brackets 14 is a flat horizontal vertically-adjustable and vertically-movable table 36 for the work to be bored. The table 36 is mounted on a pair of offstanding table-supporting brackets 37, projected from one side of a vertically-adjustable bracket-frame 38, provided at its opposite side edges with chamfered flanges 39, slidably engaging the outer chamfered edges 40 of the guide-strips 41, secured in a vertical position on the outer side of the vertically-movable table-carrying frame 42. The vertically-movable table-carrying frame 42 is provided at its opposite side edges with the chamfered slide-strips 43, slidably engaging the outer chamfered edges 44 of the upright guide-posts 44ª, secured to the machine frame or stand below the lower cross-beam 5.

The extreme height to which the work-table 36 may be adjusted is regulated by means of an adjusting-screw 46, having separate right and left threaded portions 47 and 48 and provided at a point intermediate of its ends with a hand-wheel 49 for manipulating the screw. The upper threaded end of the said adjusting-screw engages in a screw-box 50, fitted to the bracket-frame 38 at its upper side, and the lower threaded portion of said screw engages in a similar screw-box 51, fitted to the table-carrying frame 42 at the lower side thereof. The said table-carrying frame has suitably attached to the rear side thereof a pair of spaced vertically-disposed rack-bars 52, with the teeth of which mesh the toothed segments 53, carried by a pivotally-supported forked adjusting-lever 54. The straight arm of the forked adjusting-lever 54 is provided at one side of its pivotal support 55 with a series of perforations 56, providing an adjustable connection for the upper end of the link 57, the lower end of which link is adapted to engage either of a pair of perforations 58, formed in the treadle-lever 59, the front end of which is normally in an elevated position beneath the table 36, and the rear end of which is pivotally connected to the fixed point of attachment 60, arranged on the floor or base supporting the machine. By depressing the treadle-lever 59 it will be obvious that the table 36 can be readily raised and lowered to carry the work to and away from the boring bits or tools, while by adjusting the screw 46 the height or elevation of the table 36 may be accurately adjusted according to the thickness of the work to be bored or the depth of

the holes to be bored therein, as will be readily understood by those skilled in the art, it being noted that the treadle mechanism simply provides means for the raising and lowering of the table.

A pair of parallel offstanding bearing-arms 61 are suitably connected at their inner ends with the machine frame or stand 1, and projecting rearwardly therefrom are provided at their outer ends with the vertically-alined bearing-boxes 62, in which boxes are journaled an upright drive-shaft 63, to which motion is communicated in any suitable manner, and between the bearing-arms 61 the drive-shaft 63 has mounted thereon the upper and lower spaced belt-pulleys 64 and 65, respectively, the upper belt-pulley 64 being wider than the lower pulley 65, and accommodating thereon a pair of drive-belts 66 and 67, respectively. The drive-belt 66 passes from its connection with the belt-pulley 64 to the belt-pulley 31 at the upper extremity of the bit-spindle 30, carried by the central one of the high spindle-brackets 14, and motion is communicated to the bit-spindles carried by the remaining similar brackets through the medium of the drive-belt 67. The drive-belt 67 passes around the pulley 64 and also around the belt-pulleys 31 at each side of the centrally-located pulley 31, it being noted at this point that the said centrally-located pulley 31 is in a higher plane than the other of said pulleys 31. At a point between and in rear of the pulleys 31, around which the belt 67 passes, is arranged a take-up pulley 68, mounted at the rear end of a longitudinally-slotted supporting-arm 69, adjustably clamped to the top cross-bar 4 by means of the clamping-bolt 70, passed through said cross-bar and the slot in the arm 69. By adjusting the arm 69 the belt 67 may be always maintained at the proper tension irrespective of the adjustment of the spindle-frames in connection with which the said belt operates.

Motion is communicated to the several bit-spindles carrying the belt-pulleys 25 through the medium of the lower drive-belt 71, which passes around the lower belt-pulley 65. The opposite portions of the lower belt 71 are held to pass through the machine frame or stand at opposite sides thereof by means of oppositely-located idler-pulleys 72, mounted in the bifurcated bearing-blocks 73, secured to the frame 1 at opposite sides thereof, and intermediate of the idler-pulleys 72 and the lower belt-pulley 65 are arranged the oppositely-located take-up pulleys 74, mounted in bifurcated laterally-adjustable bearing-arms 75, which are arranged for adjustment at one side of the longitudinally-slotted supporting-bar 76, fitted in the lower of the offstanding bearing-arms 61. Bolts 77 pass through the bearing-arms 75 and engage in the slot of the supporting-bar 76, to provide for holding the take-up pulleys 74 in any laterally-adjusted position against opposite portions of the belt 71, to maintain such belt always at a proper tension to provide for rotating the entire series of bit-spindles 23. In order to communicate motion to the bit-spindles 23, the belt 71 is passed around the belt-pulley 25 of each bit-spindle 23 and from thence around the directly-adjacent idler-pulley 26, from which idler-pulley the belt passes to the belt-pulley 25, carried by a succeeding one of the frames 14, as clearly illustrated in Fig. 4 of the drawings. By this arrangement of the belt 71, in connection with the take-up pulleys 74, the spindle-brackets 14, carrying the bit-spindles 23, may be adjusted to any desired position without affecting the operativeness of the drive connections.

In the operation of the machine the work to be operated on is placed on the table 36 and after the proper adjustment of the table the latter is elevated to carry the work against the boring-bits rotated by the bit-spindles 23 and 30. It will be noted that each spindle-bracket is entirely independent in its adjustment of every other spindle-bracket and may be swung laterally to any desired angle and may be adjusted inward and outward over the work-table in order to position the boring-bit at any particular point, and it will therefore be obvious that by thus independently adjusting the several spindle-brackets the bits may be positioned at any point over the table and thereby provide for boring a number of holes simultaneously at any distance apart in a straight line or on a curve, and it will also be understood that the pair of bit-stocks 34 carried by each of the higher spindle-brackets provides means for boring holes close together, but in performing some particular work only one of the said bit-stocks need be used.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described boring-machine will be readily apparent to those skilled in the art, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a multiple-boring machine, the machine frame or stand having a pair of horizontal spaced cross-beams, a plurality of vertical oscillatory supporting-posts arranged in the space between said cross-beams and having their upper and lower ends loosely and slidably fitted to the said beams, means for securing the loose ends of said posts in any adjusted position, spindle-carrying brackets, each having an adjustable connection with one of the supporting-posts, and a vertically-movable table, substantially as set forth.

2. In a boring-machine, the machine frame or stand, a vertically-movable table, a series of vertical oscillatory slidable supporting-

posts loosely mounted at their upper and lower ends within the machine frame or stand, means for securing the loose ends of said posts in any adjusted position, and spindle-brackets carrying bit-operating spindles and each having a slidable connection with one of said supporting-posts, substantially as set forth.

3. In a boring-machine, the machine frame or stand, a vertically-movable table arranged at one side of the frame or stand, a pair of horizontal spaced cross-beams fitted within the machine frame or stand and provided in their opposing sides with slide-grooves, a series of vertical oscillatory supporting-posts arranged between said cross-beams and provided at one side with grooves or ways and at their upper and lower ends with slide-blocks loosely registering in said slide-grooves and having rounded ends, set-screws mounted in said cross-beams and adapted to impinge against said slide-blocks, and a gang of spindle-brackets carrying vertically-disposed rotary bit-operating spindles, and provided with offstanding slide-arms having a sliding adjustment in the grooves or ways of said supporting-posts; substantially as set forth.

4. In a boring-machine, the machine frame or stand, a vertically-movable work-table supported at one side of the machine frame or stand, a pair of horizontal spaced cross-beams fitted within the machine frame or stand, and the upper of which beams is provided on the upper side thereof with a longitudinal T-groove, a series of oscillatory supporting-posts slidably supported between said cross-beams, a gang of spindle-brackets carrying vertically-disposed rotary bit-operating spindles and provided with offstanding slide-arms having a sliding adjustable connection with said supporting-posts, certain of said spindle-brackets being further provided at their upper ends in a plane above the upper cross-beam with upper supplemental slide-arms, supporting-blocks loosely arranged on top of the upper cross-beams and having vertical bolts, the heads of which engage in said T-grooves, and clamping-bolts passed through said blocks and adjustably engaging said supplemental slide-arms, substantially as set forth.

5. In a boring-machine, the machine frame or stand, a vertically-movable work-table supporting one side of the machine frame or stand, a gang of adjustable spindle-brackets supported above said table, vertically-disposed bit-operating spindles mounted in said brackets and carrying belt-pulleys, certain of said belt-pulleys being disposed in a higher plane than those alternating therewith, a vertical drive-shaft suitably supported at one side of the machine frame or stand and carrying a pair of upper and lower spaced belt-pulleys, a drive-belt passed around said lower belt-pulley and around the bit-spindle pulleys in the lower plane, a pair of drive-belts passed around the upper belt-pulley of the drive-shaft, one of which belts is passed around the central one of the elevated bit-spindle pulleys, and the other of which drive-belts is passed around the elevated bit-spindle pulleys alternating with said central pulley, and a take-up pulley adjustably supported on the machine frame or stand and receiving therearound the drive-belt for the elevated belt-pulleys alternating with said central elevated pulley, substantially as set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

JAMES CLARENCE BULLOCK.
ELMER JAMES BULLOCK.

Witnesses:
W. D. HOWE,
GEO. W. MCKNIGHT.