No. 877,403. PATENTED JAN. 21, 1908.

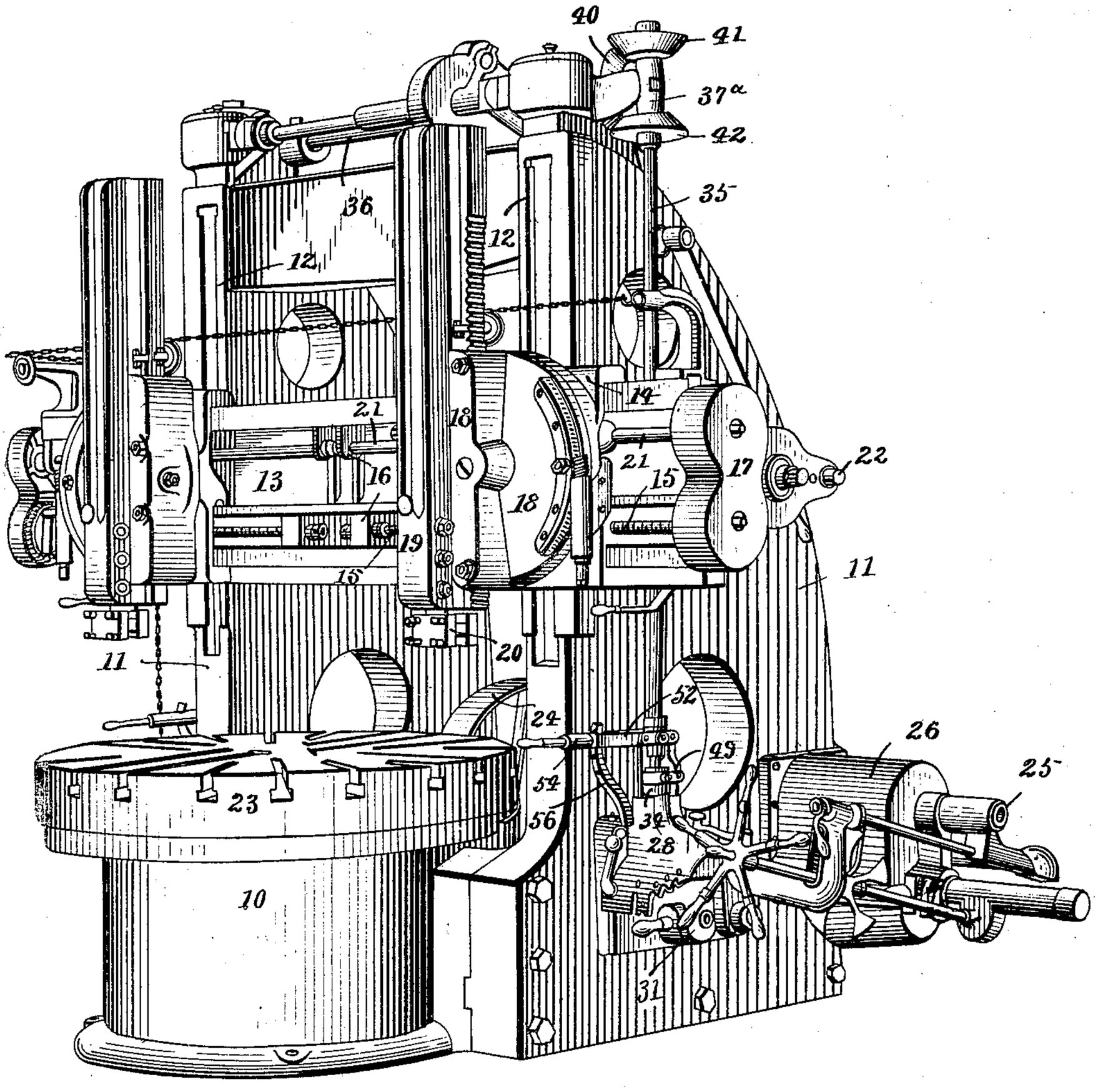
E. P. BULLARD & E. HENRIKSON.

RAPID TRAVERSE DEVICE FOR BORING MILLS.

APPLICATION FILED MAR. 16, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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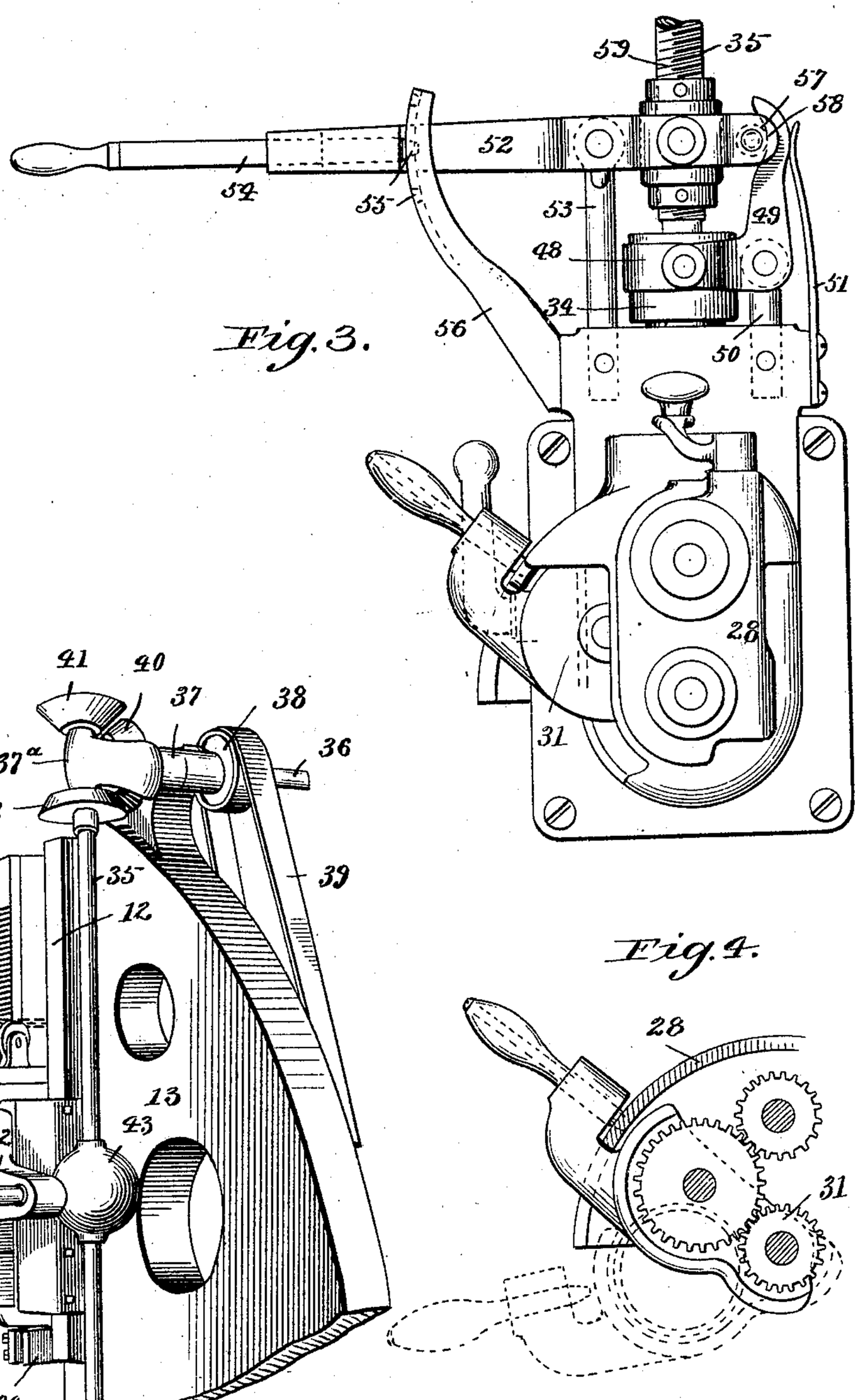

Fig. 3.

Fig. 2.

Fig. 4.

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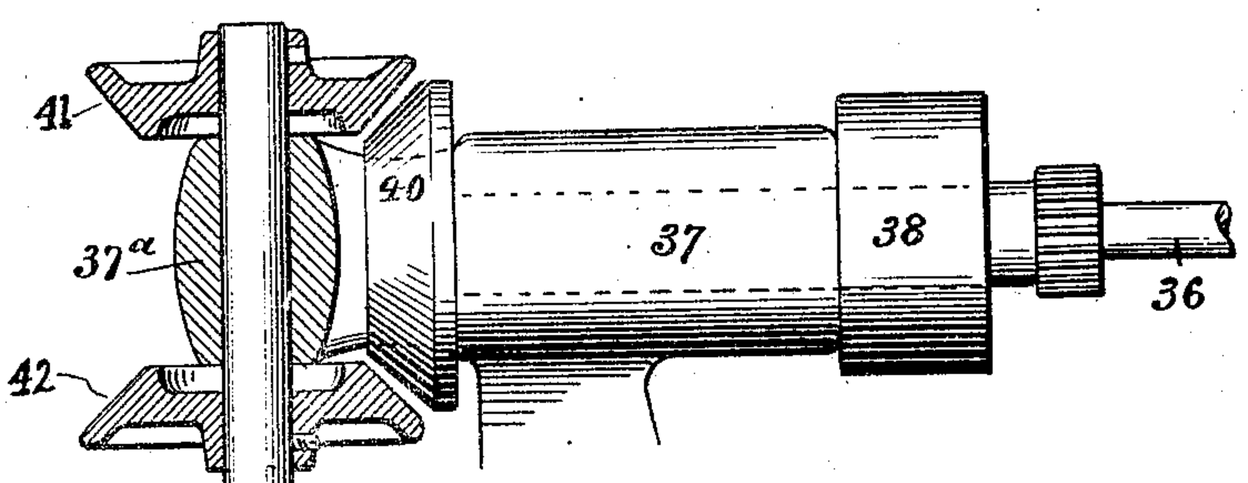


Fig. 5.

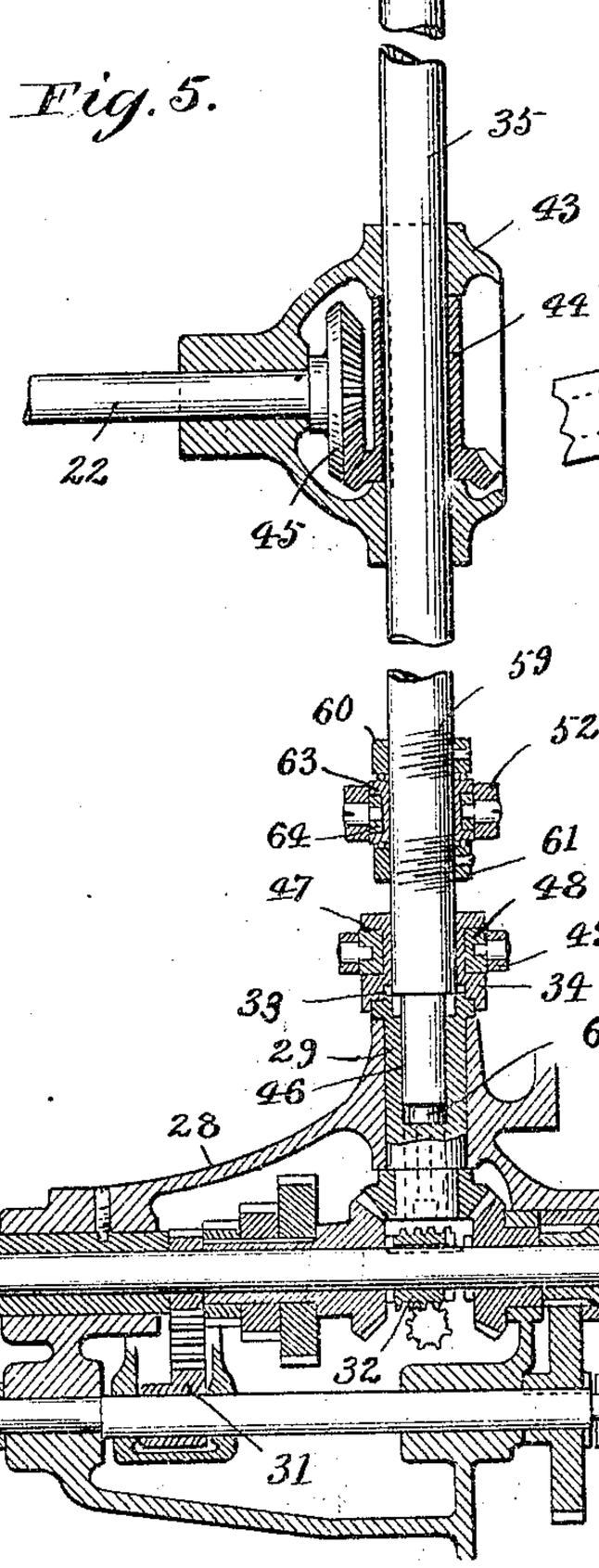
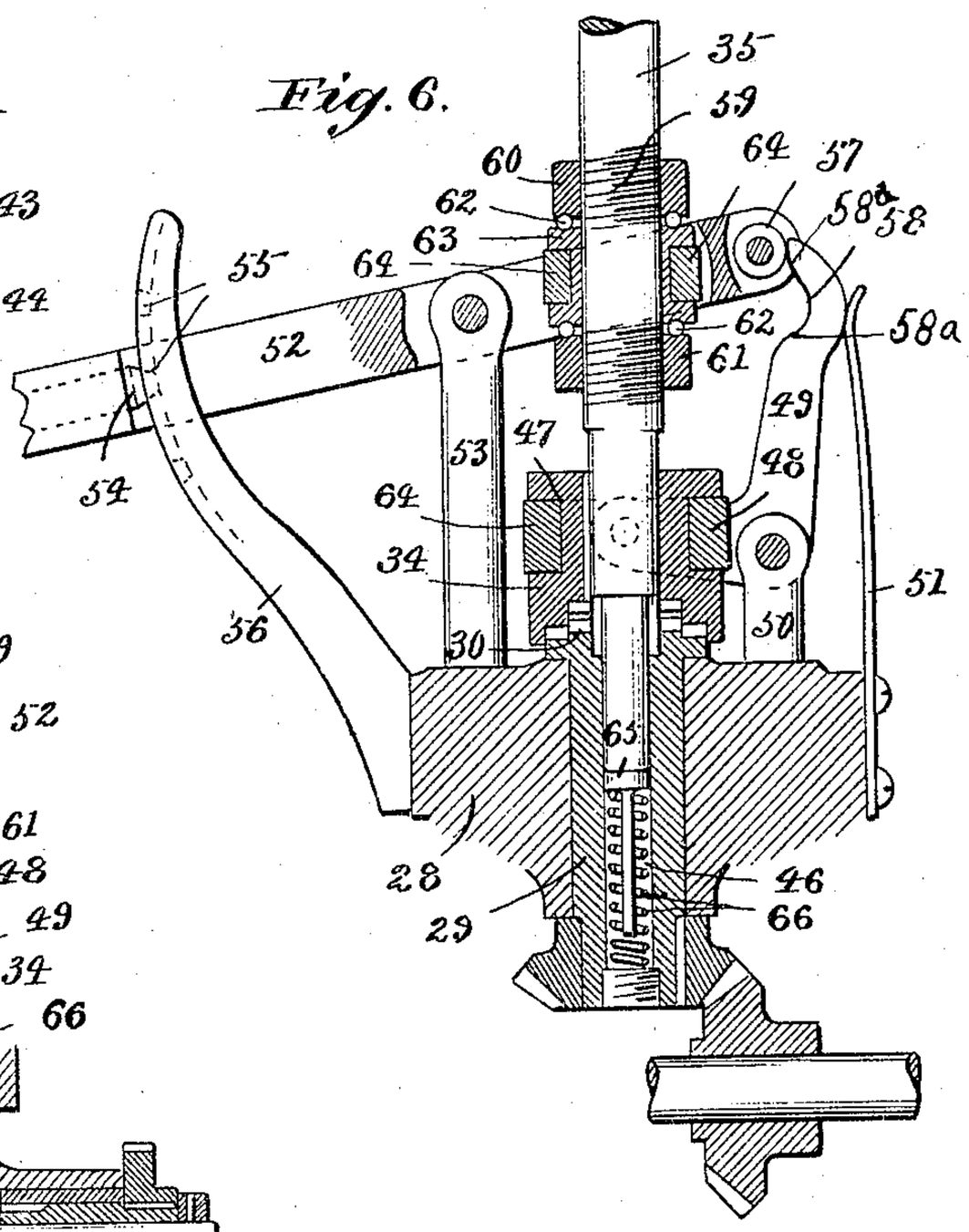


Fig. 6.



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UNITED STATES PATENT OFFICE.

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RAPID-TRAVERSE DEVICE FOR BORING-MILLS.

No. 877,403. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed March 16, 1906. Serial No. 306,404.

To all whom it may concern:

Be it known that we, EDWARD P. BULLARD and EMANUEL HENRIKSON, citizens of the United States, and residents of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Rapid-Traverse Devices for Boring-Mills, of which the following is a specification.

This invention relates to new and useful improvements in boring mills and similar machine tools and particularly to mechanism for quickly shifting and setting the heads and tools of such machines.

Heretofore boring mills of this class have been connected to operatively feed the tool forward slowly, both crosswise and vertically in operating upon a piece of work, and could be run back by reversing the same mechanism, which however being operated at a very slow speed was objectionable. These feeds have also been operated in some instances by hand power which owing to the labor involved in setting the head, and likewise on account of the slowness with which it was accomplished was likewise unpopular.

It is therefore the purpose of this invention to provide operative connections with the feed shafts, of the heads, and tool slides, whereby the said parts may be driven by power in either direction, and especially to provide in addition thereto, mechanism for driving said parts by power rapidly, thus enabling the operator to quickly set or reset the tool in adjusting for new work, or the resetting of the tool for new cuts, as the case may require. Further to design said mechanism, in a simple and durable manner and capable of being manipulated conveniently.

Machine tools of the above class are commonly made in single and double head machines and our improved rapid traverse device is equally applicable to either a single or a double head machine as will be apparent from the following detailed description.

Referring to the accompanying three sheets of drawings forming a part of this specification, similar characters of reference will be found denote like or corresponding parts throughout the several figures and of which,

Figure 1, shows a front perspective view of an improved type of double head boring mill containing our novel quick traverse mechanism. Fig. 2, shows a rear perspective view of a part of the machine shown in Fig. 1, illustrating more particularly the operative connections for the cross rail and head. Fig. 3, shows on an enlarged scale a front elevation of the lever connections for operating our quick power traverse mechanism. Fig. 4, is a detail vertical sectional view of the sliding gear speed changing device shown in Figs. 1, 2 and 5. Fig. 5, is a detached and broken vertical sectional view on a smaller scale, of the intermediate driving shaft and operative connection therewith. Fig. 6, is a central vertical sectional view of the mechanism shown in Fig. 3 and taken at a right angle to the section line of Fig. 5.

In Fig. 1 of the drawings, we have shown a double headed boring mill including duplicate saddles, swivel plates, tool slides etc., one of such heads being located to either side of the machine, and each operated independently of the other as is usually the case in this class of machines. This construction enables the user to operate both or but one head at a time, as may be best suited to the particular piece of work being operated upon. In a double headed machine of this sort, our mechanism is likewise made in duplicate, each set being located on the respective sides of the machine to which the heads are attached and with which the said mechanisms are connected. Owing to the particular style of view, however, of the drawing shown in Fig. 1, the duplicate rapid traverse mechanism on the far side of the machine does not appear, this however, is immaterial as the invention is complete on each side and may be used in duplicate or not according to its application to different styles of machines.

Referring in detail to the characters of reference marked upon the drawings and especially Figs. 1 and 2, 10 indicates the base of a boring mill and 11 side uprights of the frame, having vertical ways 12 to receive the cross rail 13 slidably connected and adapted to be raised and lowered thereon as in the usual or any preferred manner. The two sets of tool carrying mechanisms are mounted upon this rail, but as our invention may relate to but one set only and for convenience of description we will refer to the near set shown in Fig. 1, of the drawing, and in which 14 indicates a saddle slidably mounted upon the rail 13, and connected to be moved

in either direction thereon, by the threaded feed shaft 15 shown journaled in the brackets 16 and 17 of the rail. Upon the saddle is a swiveled guide plate 18 which slidably supports the tool slide 19 carrying the tool holders 20 in which cutting tools of various styles and sizes may be secured. The slide 19 may be connected in any preferred manner to be raised and lowered through the medium of a feed shaft 21 journaled in the brackets 16 and 17 of the rail. Both of the shafts 15 and 21 are connected by special gear and clutch mechanism not shown but forming subject matter of a companion application with the short shaft 22 on the back of the end of the rail. This short shaft may drive the shafts 15 and 21 either separately or together and in either a forward or backward direction according to the direction of rotation of said short shaft.

23 represents the work table which is operatively connected to rotate in the usual way in the performance of the several operations.

Power is applied to the machine through pulley 24 (see Fig. 1) mounted upon a driving shaft 25, the end of which also appears in Fig. 1. From this shaft power is communicated through a special changeable speed mechanism inclosed within the speed box 26 and connections not shown, with an inclosed cross shaft 27 shown in Fig. 5. This changeable speed mechanism as well as the operative connections form the subject matter of a separate application and we will consequently omit a detail description of the same here.

The foregoing mechanisms together with many of the other details shown and not described are immaterial features of our present invention, and are only shown to properly illustrate the application of our device to a machine of this kind, and we will purposely omit a further detailed description of the same for the sake of clearness and expediency.

The cross shaft 27 is journaled in a casing 28 secured to the side of the upright and is connected to drive the vertical sleeve 29 also journaled in a bearing of said casing, in either a forward or backward direction, and at several different speeds. The changes of speeds are effected through the operation of the clutch 30 and the slide gear 31 while the reverse drives are effected by the operation of the clutch 32. The upper end of the sleeve 29 contains a clutch face 33 to be engaged by a corresponding clutch faced movable sleeve 34 splined to a feed rod 35, the lower end of which rod is journaled in said sleeve. This feed rod is adapted to be operated in any one of the three positions that it occupies and may readily be adjusted from one position to another as occasion may require. The feeds of the tools for the several cutting operations performed by the machine are effected through the operation of the feed rod 35 while in its intermediate position (see Figs. 3 and 5) and by reason of the changeable gear connections contained within the casing 28, said feed rod may be driven at a number of different speeds, all of which however are comparatively slow, as would be necessary for feeding the tool. This feed rod is also provided with a rapid driving connection whereby the tool may be quickly run up and down or in and out, as the occasion may require, when setting the tool as in starting to work, which connections are as follows: A high speed shaft 36 is journaled in brackets 37 on the top of the sides 11 of the frame and carries a belt pulley 38 directly connected with the main driving shaft 25, by a belt 39 as shown. A friction gear 40 mounted upon this high speed shaft is normally disengaged as shown in the several figures of the drawings but is adapted to be engaged by either the upper friction gear 41 or the lower friction gear 42 secured to the upper end of the feed rod 35 journaled in the extension 37[a] of the bracket 37. The feed rod is also journaled in an intermediate bracket 43 which also forms a casing for a sleeved bevel gear 44 slidably splined to the rod in a way to be driven thereby, and operate a second bevel gear 45 secured to the inner end of the short shaft 22 before mentioned. It will thus be seen that the feed rod is free to be moved longitudinally through the sleeved bevel gear, yet is connected to rotate the same therewith, in either direction and likewise operate the connecting bevel gear, short shaft etc.

As before stated the normal or intermediate position of the feed rod shown in Figs. 3 and 5, is that which connects with the changeable speed driving mechanism within the casing 28 and is thereby adapted to feed the tool during its operations. This feed rod is slidably journaled in the brackets 37[a] and 43 and in a bore 46 of the sleeve 29 rotatably mounted in the casing 28. The movable sleeve 34 contains an annular recess 47 to receive a loose split ring 48 pivotally connected to the lower arm of a bell crank lever 49 pivoted to a stud 50 secured to the casing 28. This lever is normally held to engage the clutches 33 and 34 by a spring 51 as seen in Fig. 3, but permits of the disengagement of said clutch when the feed rod operating lever 52 is in either of its shifted positions one of which is shown in Fig. 6. This lever 52 is pivoted to a stud 53 secured to the casing 28 and contains a spring actuated pull pin 54 to engage the notches 55 of the rack 56 to hold the lever in either of its adjusted positions. The inner portion of the lever is bifurcated to encircle the feed rod and connections, while the inner end contains a roll 57 to engage the inner edge of the vertically dis-

posed arm of the bell crank lever 52. Said roll normally rests in the pocket 58 of the edge of said arm as seen in Fig. 3, but is adapted to ride out on either side shoulder 58[a] thereby forcing the vertical arm of the lever out and lifting the inner arm which in turn raises the clutch sleeve 34 from engagement with the clutch 33 of the sleeve 29. It will thus be seen that either an upward or downward movement of the lever 52 will disconnect the feed rod from the sleeve 29 of the feed mechanism and put said rod into engagement with the high speed shaft 36 to drive said feed rod in either a forward or backward direction according to whether said rod is raised or lowered.

The feed rod is threaded as at 59 to receive upper and lower collars 60 and 61 each of which is provided with annular side grooves to form bearings for balls 62. A lever sleeve 63 is supported intermediate of the aforesaid collars and is also provided with annular grooves to correspond with those of the collars and to accommodate the balls therefor. The sleeve 63 is further provided with a peripheral groove to receive a split collar 64 bearing trunnions 67 pivotally connecting it with the opposite sides of the lever 52. This forms a light running bearing intermediate the lever and shaft to operatively support the latter, and readily permits of this feed rod being raised or lowered to engage either the feed mechanism or the gears 41 or 42 one of which pulleys obviously operates said rod in one direction in one instance, and in the other direction in the other instance.

Within the bore of the sleeve 29 we provide a cushion to be engaged by and support the reduced end 35[a] of the feed rod 35, which cushion comprises a piston 65 normally held distended by a spring 66 beneath it and within said bore in a way to also serve as a counter-balance for the weight of the feed rod and its attached mechanism.

Reviewing the operation of our device in connection with a machine of the class described, after the work has been secured to the rotary table 23. The tool would be quickly brought into position by adjusting the saddle sidewise and the tool slide 19 vertically, said adjustments being accomplished through the feed rod when operated from the friction gears of the high speed shaft 36. Said speed shaft being adapted to drive the feed rod and tool in either a forward or back direction according to whether the upper or lower friction is in engagement. When the tool is set to the proper position to begin work the operating lever 52 is brought back to its intermediate normal position as shown in Fig. 1, engages the sleeve of the rod with the sleeve 29 of the feed driving mechanism, and whereby the tool is fed forward in either a vertical or horizontal direction simultaneously with the rotary movement of the table.

Having thus described our invention what we claim and desire to secure by Letters Patent is:—

1. A rapid power traverse for boring mill tools, comprising driving mechanism, a movable feed rod operatively related to said driving mechanism, a tool bar having operative connections with the feed rod, an independent high speed shaft, gears connecting the latter and the feed rod for engaging the feed rod with the high speed shaft at predetermined points in the range of movement of the feed rod, mechanism for engaging the feed rod with the driving mechanism when the feed rod is in a position intermediate of its range of movement, and for disengaging the driving mechanism when the rod is engaged with the high speed shaft, and means for operating the feed rod to render operative the connections between the same and the high speed shaft when the rod is shifted from said intermediate position.

2. A rapid power traverse for boring mill tools, comprising driving mechanism, a movable feed rod operatively related to said driving mechanism, a tool bar having operative connections with the feed rod, an independent high speed shaft, gear connections between the latter and the feed rod for engaging the feed rod with the high speed shaft at predetermined points in the range of movement of the feed rod, a clutch intermediate the feed rod and driving mechanism, adapted to be engaged with said driving mechanism when the rod is in such intermediate position, means for moving the clutch and for shifting the feed rod to operatively connect the same or disconnect it from the high speed shaft.

3. A rapid power traverse for boring mill tools, comprising driving mechanism, a movable feed rod operatively related to said driving mechanism, a tool bar having operative connections with the feed rod, an independent high speed shaft, gear connections between the latter and the feed rod for engaging the feed rod with the high speed shaft, a clutch intermediate the driving mechanism and feed rod, a means for shifting and holding the feed rod in engagement with the high speed shaft and also to move the clutch to disengage it from the driving mechanism.

4. A rapid power traverse for boring mill tools, comprising driving mechanism for feeding the tool, a longitudinal movable feed rod connected with said driving mechanism and having friction gears, a tool bar operatively connected with said feed rod, a high speed shaft bearing a friction gear, mechanism upon the feed rod for shifting the same to engage either of its friction gears with that of the high speed shaft to operate the feed rod in either a forward or backward direction, and means for simultaneously disconnecting said rod from the driving mechanism when the

rod is shifted to engage either of said friction gears.

5. In a rapid power traverse device for boring mill heads, the combination with driving mechanism for feeding said head, of an intermediate feed shaft operatively connected to said head, a clutch carried on the shaft for engagement with the driving mechanism, a high speed shaft bearing a friction gear, a friction gear upon the feed shaft above and below the gear of the high speed shaft, a lever connection for raising and lowering the feed rod and its friction gears for engagement with the gear of the high speed shaft, and mechanism connected with said lever for simultaneously disengaging the clutch of the shaft from the driving mechanism, when the lever is operated to engage the friction gears before mentioned.

6. In a rapid traverse device for a boring mill head the combination with driving mechanism, of a feed rod and connections through which the head is operated from said driving mechanism, a clutch sleeve slidably mounted upon the feed rod for engagement with the driving mechanism, a high speed shaft, gear connections on the feed rod for engagement with the high speed shaft by a movement of said rod, a pivotal lever supporting the feed rod and adapted to operate the same longitudinally to engage the high speed shaft, a bell crank lever connected with the clutch sleeve upon the feed shaft to disengage the said clutch sleeve from the driving mechanism by a movement of the pivotal lever before mentioned and simultaneously engage the driving connections with the high speed shaft.

7. In a rapid traverse, of the class described the combination with driving mechanism including a clutch face sleeve, of a longitudinally movable feed rod, a clutch sleeve upon the rod to normally engage with the sleeve of the driving mechanism, a bell crank lever to engage both the lever and the sleeve of the rod, an operating lever engaging the feed rod to move the same longitudinally and to engage said bell crank lever to operate the same by a movement of the lever in either direction, a high speed shaft, and gear connections intermediate said shaft and the feed rod for engaging said high speed shaft when the rod is shifted to either an upper or lower position.

8. In a rapid traverse device, the combination with driving mechanism, of a feed rod operatively connected with the driving mechanism, a high speed shaft, mechanism upon the feed rod for engagement with the high speed shaft by a longitudinal movement of the feed rod, a lever for operating said rod longitudinally, a cushion to counter-balance the weight of the feed rod, and mechanism for rendering inoperative the operative connections intermediate of the feed rod and driving mechanism with the operation of the lever, and simultaneously connecting the said rod with the high speed shaft.

Signed at Braidentown, Manatee county, Florida, this 5″ day of March, 1906.

EDWARD P. BULLARD.

Witnesses as to Bullard:
O. K. REAVES,
JNO. B. SINGELTARY.

Signed at Bridgeport, Fairfield county, Connecticut, this 14 day of March, 1906.

EMANUEL HENRIKSON.

Witnesses as to Henrikson:
G. N. MOREHOUSE,
E. P. BULLARD, Jr.