

No. 750,528.

PATENTED JAN. 26, 1904.

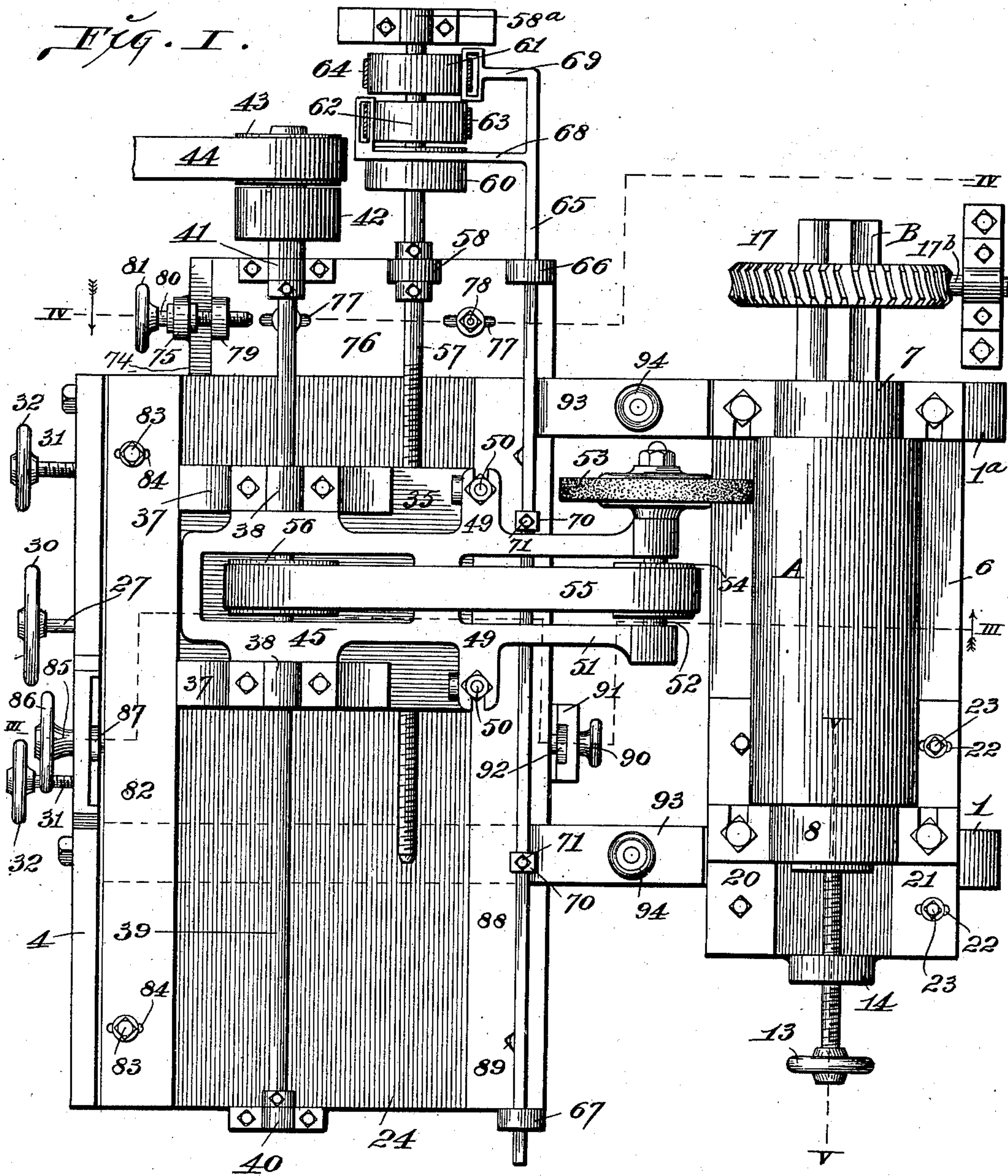
G. R. FORD & B. F. ALLEN.
ROLL GRINDING APPARATUS.

NO MODEL.

APPLICATION FILED MAR. 12, 1903.

3 SHEETS—SHEET 1.

Fig. I.



attest:—

M. Smith,
R. J. Knight

Inventors,
Geo. R. Ford, and
B. F. Allen.

By *Wright, Ford*
attys.

No. 750,528.

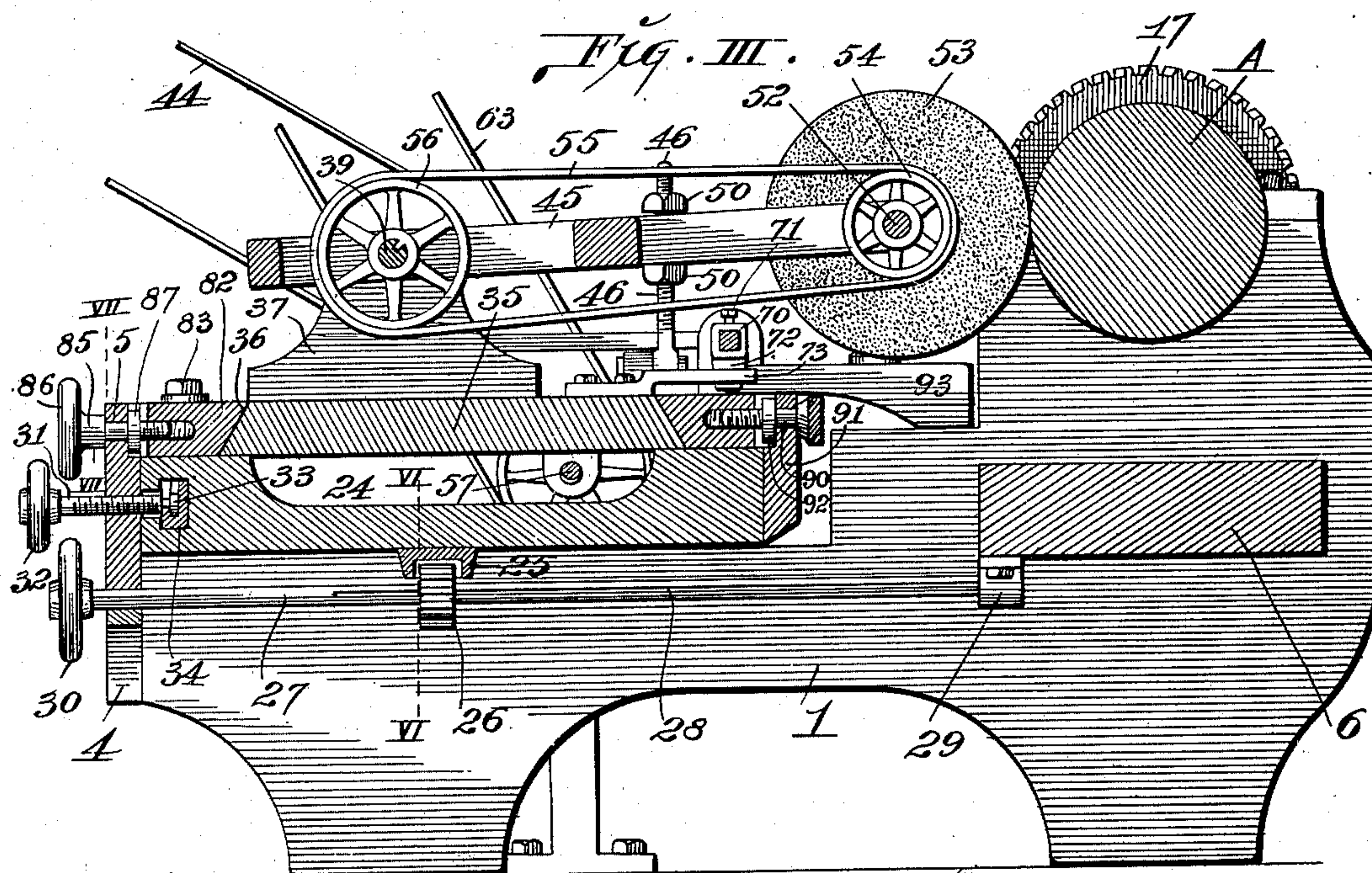
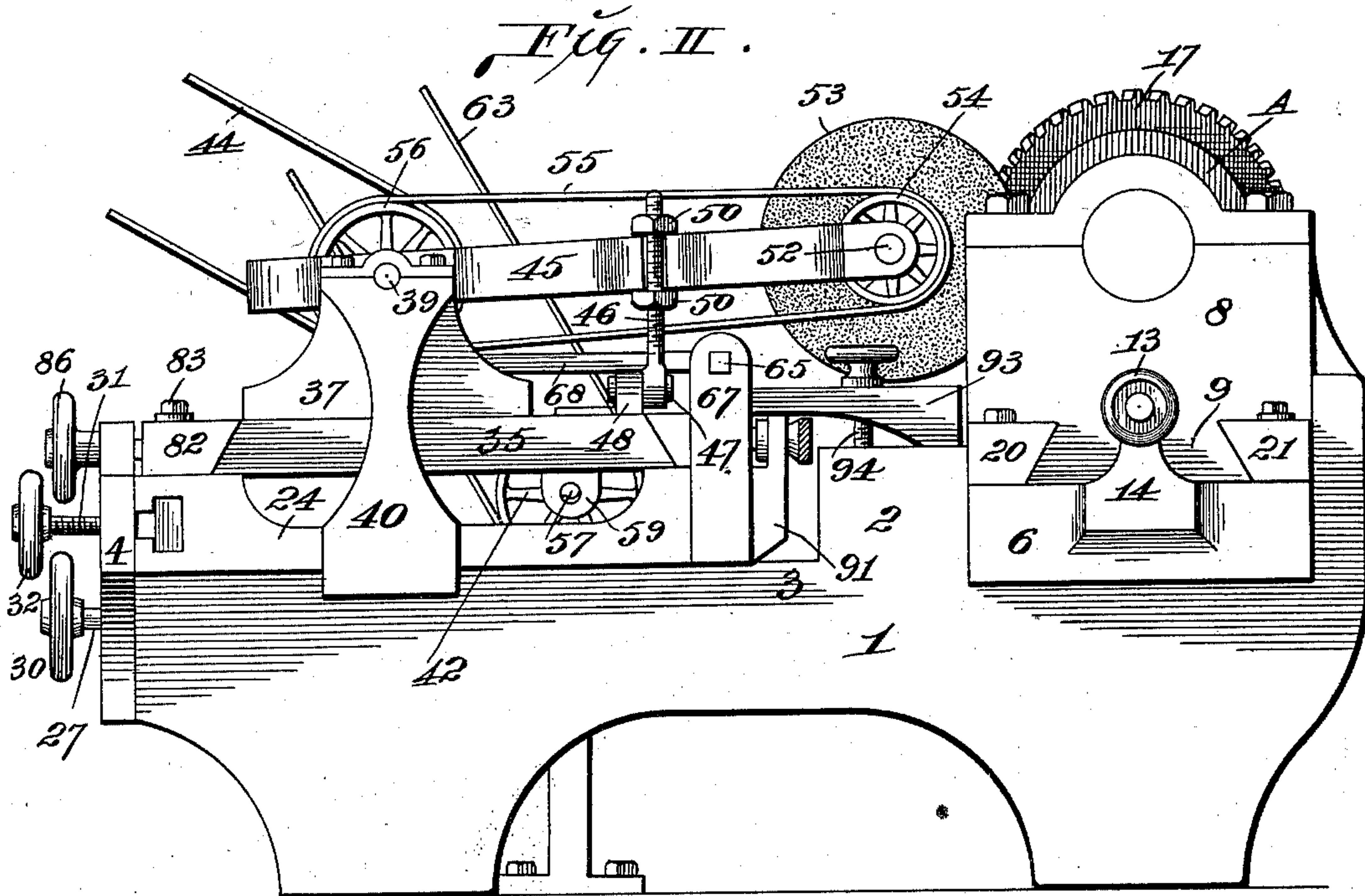
PATENTED JAN. 26, 1904.

G. R. FORD & B. F. ALLEN.
ROLL GRINDING APPARATUS.

APPLICATION FILED MAR. 12, 1903.

NO MODEL.

3 SHEETS—SHEET 2.



attest:—
W. Smith
V. J. Knight

Inventors—
Geo. R. Ford and B. F. Allen.
By *Thos. H. Pratt* atty's.

No. 750,528.

PATENTED JAN. 26, 1904.

G. R. FORD & B. F. ALLEN.
ROLL GRINDING APPARATUS.

APPLICATION FILED MAR. 12, 1903.

NO MODEL.

3 SHEETS—SHEET 3.

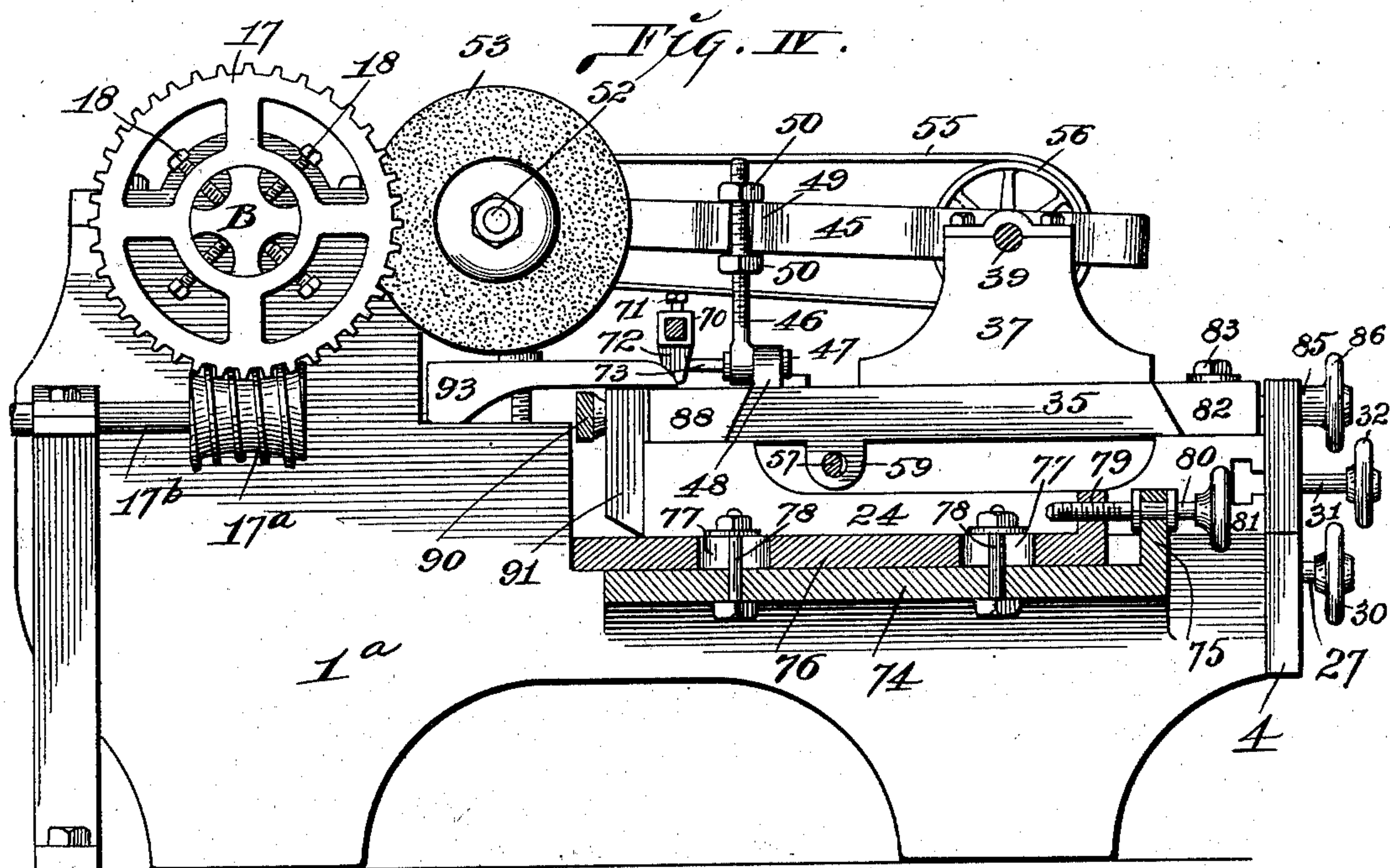


Fig. V.

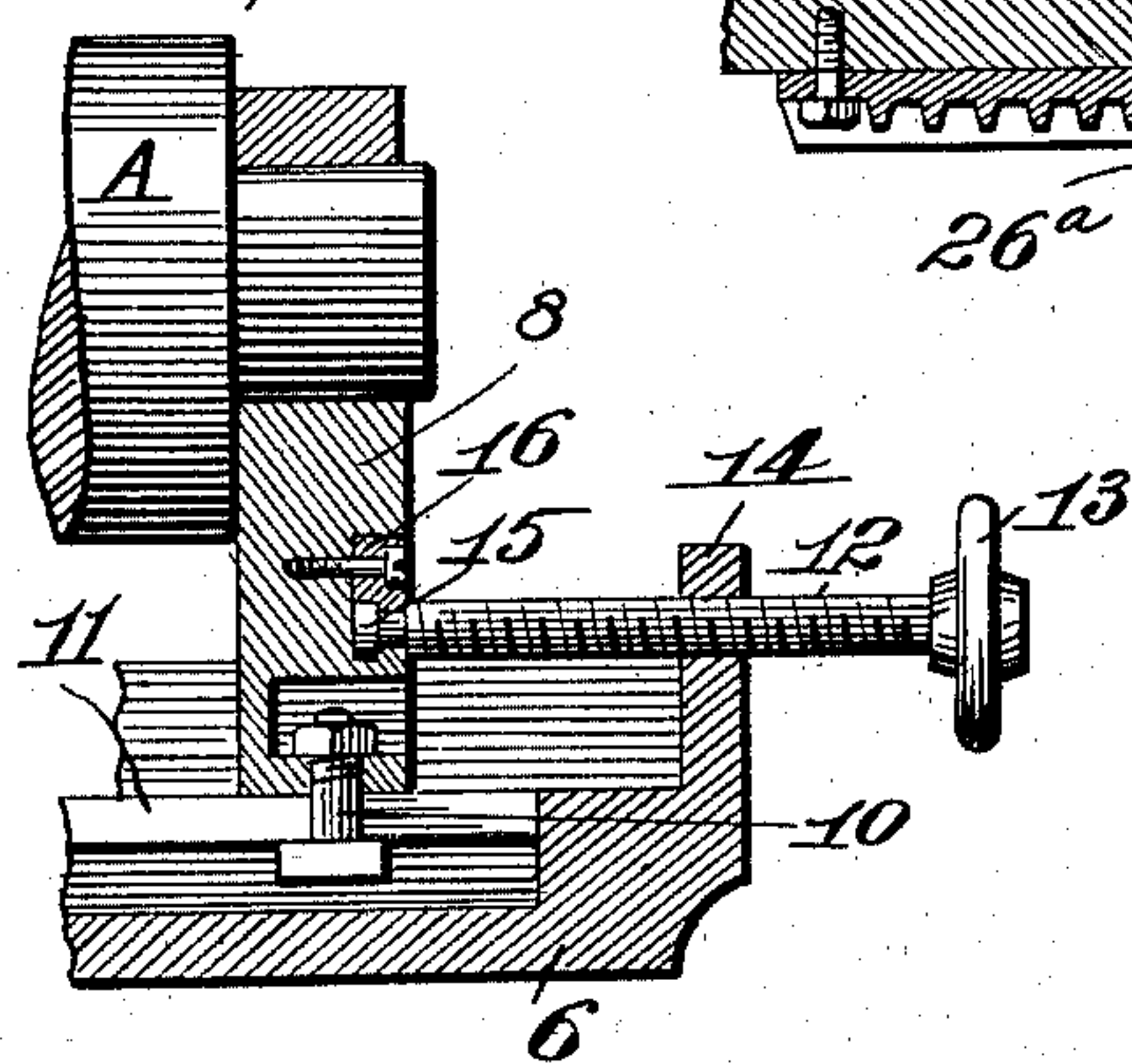


Fig. VI. 24

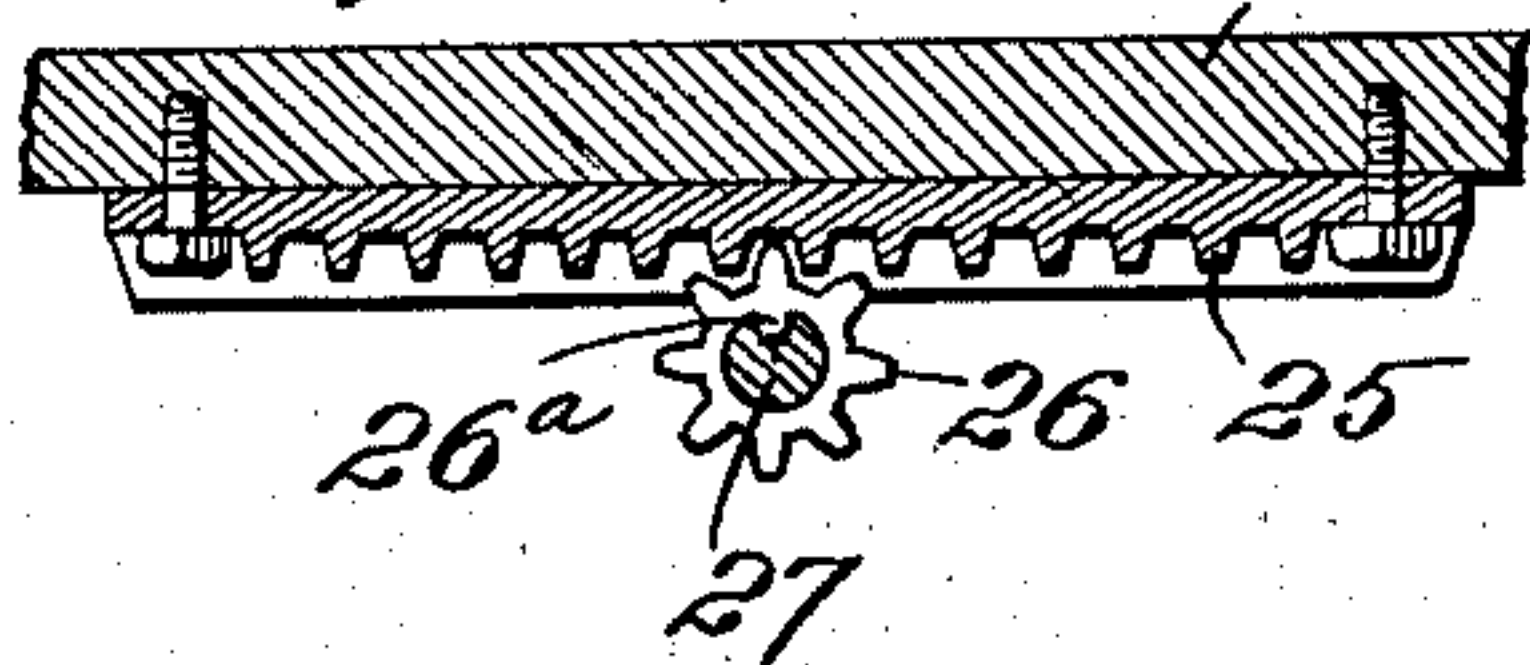


Fig. VII.

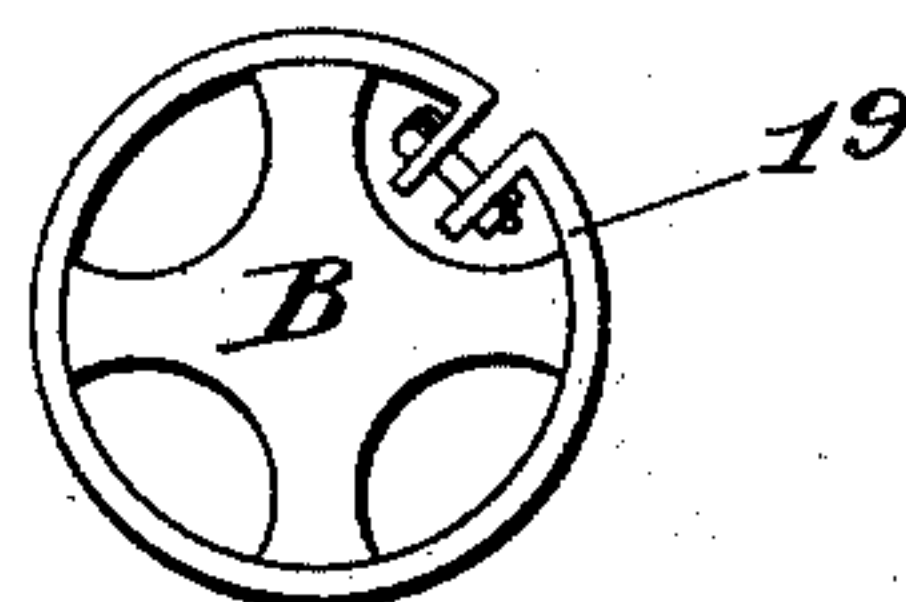
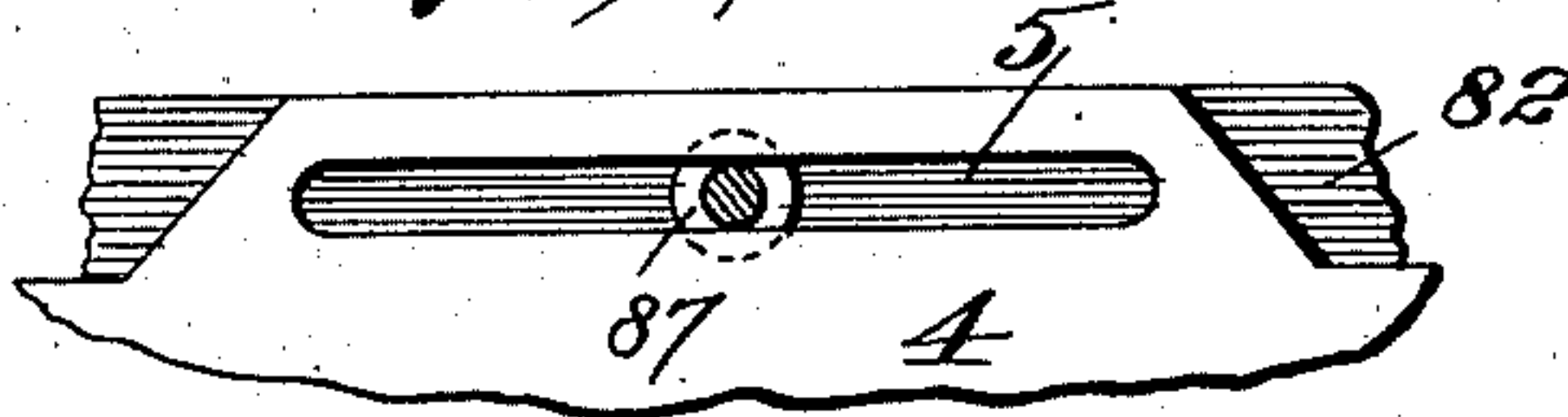


Fig. VIII.



attest:—
W. Smith
W. J. Knight

Inventors—
Geo. R. Ford and B. F. Allen.
By Wright, 13rd
attys.

UNITED STATES PATENT OFFICE.

GEORGE R. FORD AND BENJAMIN F. ALLEN, OF ST. LOUIS, MISSOURI;
SAID ALLEN ASSIGNOR TO SAID FORD.

ROLL-GRINDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 750,528, dated January 26, 1904.

Application filed March 12, 1903. Serial No. 147,441. (No model.)

To all whom it may concern:

Be it known that we, GEORGE R. FORD and BENJAMIN F. ALLEN, citizens of the United States, residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Roll-Grinding Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to an apparatus for use in turning or dressing mill-rolls, the object of the invention being to furnish a construction whereby the rolls may be rapidly and efficiently turned and dressed either with a straight, convex, or concave surface.

The invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a top or plan view of our apparatus. Fig. II is an end elevation of the apparatus. Fig. III is a vertical cross-section taken on the irregular line III III, Fig. I. Fig. IV is an elevation of the apparatus at the opposite end from that shown in Fig. II, parts being shown in vertical cross-section taken on line IV IV, Fig. I. Fig. V is a vertical longitudinal section taken on line V V, Fig. I. Fig. VI is a vertical longitudinal section taken on line VI VI, Fig. III. Fig. VII is an elevation of the front frame-plate of the apparatus with one of the adjustment-screws passing through said plate, shown in section taken on line VII VII, Fig. III. Fig. VIII is a view of the adjustable bushing used in connection with the roll-driving journal.

1 and 1^a designate the side frames of our apparatus, which are formed with steps 2 and 3 and are united at their forward ends by a front plate 4, containing a slot 5, to which more particular reference will hereinafter be made.

6 designates a table that connects the rear ends of the side frames 1 and 1^a and which preferably projects at one end beyond the side frame at that end, as seen in Fig. I.

7 is a bearing-box surmounting the rear end of the side frame 1^a and adapted to receive the driving-journal B of a roll A to be op-

erated upon in the apparatus. The driving-spindle B of the roll to be operated upon receives a worm-wheel 17, which is held to said spindle by set-screws 18, inserted through the worm-wheel and engaging the spindle, as seen in Fig. IV. The diameters of the driving-spindles of rolls vary to a considerable degree, and to provide for the application of a single worm-wheel to driving-journals of smaller diameters than the diameter of the interior of the hub of the worm-wheel we utilize an adjustable ring-bushing 19, (shown in Fig. VIII,) which may be adjusted to any desired size to fit the roll-journal and to receive the worm-gear. The worm-wheel 17 is driven by the worm 17^a, that is carried by a shaft 17^b, suitably driven.

8 is an adjustable tail-stock, in which the second journal of the roll A is mounted for rotatable support. This tail-stock is formed with a dovetail tenon 9, that rests upon the table 6, and it is held after being set in desired position by an anchor-bolt 10, (see Fig. V,) which passes through a longitudinal slot 11 in the table 6, the length of which corresponds to the length of adjustment that it may be desired to provide for said tail-stock.

12 is a screw-threaded adjustment-rod having a handle 13 and passing through a threaded aperture in a post 14 at the end of the table 6, at which the tail-stock is located. The inner end of the adjustment screw-rod 12 is provided with a grooved head 15, that is rotatably seated in the tail-stock and held therein by a block 16. By adjustably mounting the tail-stock 8 and furnishing means for its adjustment longitudinally of the table 6 we provide for the support of rolls of varying lengths, inasmuch as it will be seen that the tail-stock may be easily and readily readjusted and reset to accommodate different lengths of rolls. The tenon 9 of the tail-stock 8 fits between a pair of guides 20 and 21, that have beveled inner faces to receive the bearing of the sides of said tenon, as seen in Fig. II. The guide 21 is adjustably held to the tenon by set-bolts 23, which pass through transverse slots 22 in the guide. By this arrangement the guide may be adjusted to the tenon

as wear occurs, thereby always providing for a close bearing between the tenon and the tail-stock and the guides and obviating play that is liable to occur in long-continued use of the machine, during which the tail-stock is frequently moved to and fro in the insertion and removal of the rolls to be operated upon.

24 designates a bed-plate reciprocally mounted on the steps 3 of the side frame 1 between the front plate 4 and the side-frame steps 2. This bed-plate is reciprocated longitudinally of the apparatus through means of a flanged rack-bar 25, secured to its under side, and a pinion 26, carried by a shaft 27. The shaft 27 is provided with a longitudinal keyway 28, that receives a spline 26^a on the interior of the pinion 26 and by which said pinion is held from rotation on said shaft. The shaft 27 is mounted in the front plate 4, and a box 29, supported by the table 6, is provided at its forward end with a hand-wheel 30, by which the shaft may be rotated to effect longitudinal movement of the bed-plate 24 through the medium of the pinion 26 and rack-bar 25. Sufficient space between the front plate 4 and side-frame steps 2 is provided for transverse adjustment of the bed-plate 24 on the side-frame steps 3 for the purpose hereinafter stated, and to accomplish such adjustment we provide adjustment-screws 31, that pass through screw-threaded apertures in the front plate 4 and are furnished at their outer ends with hand-wheels 32. The inner ends of these adjustment-screws are provided with heads 33, rotatably seated in sockets 34, set into the bed-plate 24, so that upon rotation of said adjustment-screws movement may be imparted to the bed-plate 24 to shift it rearward and forwardly on its supports.

35 designates the base of a grinding-wheel carriage which is mounted on the bed-plate 24 and is provided with forward and rear beveled edges 36. (See Figs. II, III, and IV.) On the carriage-base 35 are uprights 37, provided with bearing-boxes 38.

39 is a drive-shaft journaled in the bearing-boxes 38 and extending longitudinally of the bed-plate 24, being rotatably mounted in fixed journal-boxes 40 and 41, the former of which is supported by said bed-plate, while the latter is mounted on a support to be hereinafter referred to. The shaft 39 is equipped with tight and loose pulleys 42 and 43, that receive a driving-belt 44, which leads from a suitable source of power.

45 designates a swing-frame loosely mounted on the shaft 39 between the journal-boxes 38 and adapted to slide longitudinally of the shaft 39 with the grinding-wheel carriage of the apparatus when said carriage is reciprocated longitudinally of the bed-plate 24 in the manner to be hereinafter stated. The swing-frame 45 is normally held in lowered position by a pair of retaining-bolts 46, the lower ends of which are loosely mounted on pivots 47,

carried by lugs 48, surmounting the carriage-base 35. (See Figs. I, II, III, and IV.) These retaining-bolts engage in forward arms 49, extending laterally from the swing-frame 45, and they are equipped with upper and lower nuts 50, that embrace said forked arms to hold the swing-frame in lowered position. The retaining-bolts are readily disengaged from the swing-frame on the loosening of said nuts, thereby permitting the retaining-bolts to be swung out of engagement with the swing-frame to allow the frame to be swung upwardly, swinging on the shaft 39 as a pivot. At the rear end of the swing-frame 45 is a pair of forked arms 51, in which is journaled a shaft 52, that carries a grinding-wheel 53. Rigidly mounted on the shaft 52 is a driven pulley 54, that receives a belt 55, which passes to said pulley from a drive-pulley 56, fixed to the drive-shaft 39 within the swing-frame 45, and through the medium of which rotation is imparted to the grinding-wheel 53.

57 designates a feed-screw journaled in boxes 58 and 58^a and having engagement with the carriage-base 35 through means of a lug 59, containing a screw-threaded aperture through which said feed-screw 57 passes. (See Figs. II, III, and IV.) This feed-screw is designed for service in reciprocating the base 35 of the grinding-wheel carriage longitudinally of the bed-plate 24 to move the grinding-wheel 53 along the surface of the roll being turned, and it is equipped with a pair of tight pulleys 60 and 61 and an intermediate loose pulley 62. The tight pulleys 60 and 61 are adapted to receive, respectively, belts 63 and 64, by which the feed-screw is rotated alternately first in one direction and then in the other direction to reciprocate the grinding-wheel carriage to and fro on the bed-plate 24. The loose pulley 62 is adapted to receive either of the belts 63 or 64 when it is not in service for the rotation of the feed-screw.

65 is a shifter-rod extending longitudinally of the bed-plate 24 and slidably mounted in supporting-lugs 66 and 67. This shifter-rod carries a loop-arm 68, through which the belt 63 passes, and a loop-arm 69, through which the belt 64 passes.

70 represents collars adjustably secured to the shifter-rod 65 by set-screws 71 and provided with fingers 72. These fingers 72 are designed to be engaged by a trip-arm 73, (see Figs. III and IV,) that is carried by the grinding-wheel-carriage base 35, so that at the limit of travel provided for the carriage in either direction said trip-arm will strike the collar-finger toward which it is traveling and reciprocate the shifter-rod 65 in a corresponding direction to cause the belt 63 or 64 to be shifted from the tight pulley 60 or 61, which it operates, onto the loose pulley 62 and move the other belt from said loose pulley onto the tight pulley it is adapted to operate, thereby effecting reverse actuation of the feed-screw

57 to reciprocate the grinding-wheel carriage in a direction the reverse of its previous movement.

74 designates a ledge projecting from the side frame 1 of the end of the apparatus at which the driving mechanism of the apparatus is located. This ledge is provided at its forward edge with a vertical flange 75. As has hereinbefore been stated, the bed-plate 24 is adjustable transversely or forwardly and rearwardly of the apparatus, and inasmuch as the driving mechanism of the apparatus must be supported aside from the bed-plate in a manner to accomplish the adjustment of the bed-plate in the manner mentioned we provide an adjustable support mounted on said ledge, which consists of a movable journal-carrying plate 76. This plate 76 is slidably seated on the ledge 74 and carries the journal-boxes 41 and 58, that receive the drive-shaft 39 and feed-screw 57, and also the guide-lug 66, that receives the shifter-rod 65. The plate 76 is provided with slots 77, that receive set-bolts 78, (see Figs. I and IV,) that pass upwardly through the ledge 74 and said slots. At the forward end of the plate 76 is an upright flange 79.

80 is an adjustment-screw loosely seated in the flange 75 of the ledge 74 and having screw-threaded connection with the flange 79 of the plate 76. When the bed-plate 24 is shifted rearwardly or forwardly through the medium of the adjustment-screws 31 31, the journal-box carrying plate 76 is shifted to a like degree through the medium of the adjustment-screw 80, which is furnished with a hand-wheel 81.

Having set forth the general construction of the apparatus, including the driving mechanism thereof, we will proceed next to describe the means whereby the grinding-wheel carriage is guided in its reciprocation across the apparatus. In this connection it is a particular characteristic of our apparatus that the guiding means between which the roll-grinding-wheel carriage travels is so placed and provided for adjustment with respect to the carriage as to enable the grinding of the roll operated upon either with a straight face or a concave or convex face, according to the desire of the operator. To produce a straight surface upon the roll, the grinding-wheel carriage is reciprocated in a straight line corresponding to the axis of the roll; but in order to produce the result of curving the face of the roll into concave or convex form the grinding-wheel carriage is caused to travel in a curving path longitudinally of the apparatus, so that the grinding-wheel will travel along the face of the roll operated upon in a like curving path to reduce the roll either to a greater degree throughout its central portion than at its ends or to a less degree throughout its central portion than at its ends. 82 is a guide-bar movably seated on the bed-plate 24 in front of the grinding-wheel-carriage

base 35 and having a beveled rear face adapted to bear against the beveled face 36 of said base. This guide-bar is secured to the bed-plate 24 by set-bolts 83, that pass through slots 84 in the guide-bar 82, located near the outer ends of said bar and adapted to hold the bar in contact with the carriage-base 35. The set-bolts 83, passing through the slots in the guide-bar, permit forward and rearward adjustment of said guide-bar to compensate for wear of the contact-surfaces of the carriage base and bar. By locating the set-bolts 83 near the outer ends of the guide-bar 82 the central portion of said bar is free from restraint and is therefore in a condition to be sprung rearwardly by applying pressure thereto for a purpose to be hereinafter set forth. 85 is an adjustment-screw provided with a hand-wheel 86 and passing through the slot 5 in the front plate 4 of the apparatus-frame. The screw 85 bears a rim 87, fixed thereto, that rests against the rear face of the front plate 4, and the screw has threaded engagement with the guide-bar 82, as seen in Fig. III. It will be seen that upon rotation of said screw the central portion of the guide-bar may be sprung rearwardly out of a straight plane, so as to furnish a rearwardly bulging or curving contact-surface against which the carriage-base 35 will travel and follow the curvature produced. 88 is a rear guide-bar mounted on the rear portion of the bed-plate 24 and having a beveled forward face that contacts with the carriage-base 35. This rear guide-bar is secured to the bed-plate by bolts 89, passing therethrough into the bed-plate in positions corresponding to the locations of the set-bolts 89, that hold the forward guide-bar 82. The guide-bar 88 is therefore free of restraint at its central portion the same as the guide-bar 82, and it may be bowed throughout its central portion in a like degree to the bowing of the forward bar. The bowing of the rear guide-bar is accomplished through the medium of an adjustment-screw 90, that passes through an upright 91 at the rear of the bed-plate 24 and has screw-threaded engagement with said rear guide-bar, as seen in Fig. III. 92 is a rim fixed to the adjustment-screw 90 to bear against the forward face of the upright 91. It will be seen from the foregoing that when the forward guide-bar 82 is bowed rearwardly through the medium of its adjustment-screw the rear guide-bar 88 may be bowed similarly by manipulation of the adjustment-screw 90 and that therefore a runway of even contour is furnished for the grinding-wheel-carriage base to travel in in its reciprocation. When the guide-bars have been bowed in the rearward directions, as described, it will be seen that the grinding-wheel carriage will reciprocate across the apparatus from each end of the bed-plate 24 in a gradual curve until the center of the roll being operated upon is reached and will then move in a forward curve to the op-

posite end of the roll, thereby causing the grinding-wheel 53 to produce a concave surface upon the face of the roll while it is being turned in its journal-bearings by the means provided for its rotation. In order to produce a convex surface upon the roll being operated upon, it is only requisite to bow the guide-bars 82 and 88 both forwardly at their central portions by manipulating their adjustment-screws 85 and 90, and when this is done the grinding-wheel-carriage base will reciprocate in a gradual-curving-forward direction throughout its travel in front of the central portion of the roll being operated upon, and therefore the roll will be reduced by the grinding-wheel to a greater extent at its ends than at its central portion to form it into convex contour.

In order to prevent vertical movement of the bed-plate 24 and the parts carried thereby during the reciprocation of said bed-plate, we provide keepers 93, that are mounted on the steps 2 of the side frame 1 of the apparatus and project over the rear portion of said bed-plate. These keepers are removably secured to the side frames by retaining-screws 94.

We claim as our invention—

1. In an apparatus of the character described, the combination of a roll-support, a bed-plate movable longitudinally with respect to said roll-support, and a reciprocating grinding-wheel carriage mounted on said bed-plate for movement longitudinally of said roll-support, substantially as set forth.

2. In an apparatus of the character described, the combination of a roll-support, a bed-plate movable transversely with respect to said roll-support, and a reciprocating grinding-wheel carriage mounted on said bed-plate for movement longitudinally of said roll-support, substantially as set forth.

3. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, and means for reciprocating said carriage to and fro on said bed-plate, substantially as set forth.

4. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, a feed-screw having engagement with said carriage, and means whereby said feed-screw is rotated to reciprocate said carriage, substantially as set forth.

5. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, means for reciprocating said carriage, comprising a feed-screw, tight and loose pulleys mounted on said screw, belts traveling on said pulleys, a shifter through which said belts move, and means whereby said shifter is actuated to shift said

belts upon the reciprocation of said grinding-wheel carriage, substantially as set forth.

6. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, means for reciprocating said carriage, comprising a feed-screw, tight and loose pulleys mounted on said screw, belts traveling on said pulleys, a shifter through which said belts move and fingers carried by said shifter, and an arm projecting from said carriage to strike said fingers in the reciprocation of said carriage, substantially as set forth.

7. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, guide-bars on said bed-plate between which the base of said carriage travels, one of said guide-bars being laterally adjustable with respect to the other, substantially as set forth.

8. In an apparatus of the character described, the combination of a roll-support, a bed-plate, a grinding-wheel carriage reciprocally mounted on said bed-plate, a carriage guide-bar fixed to said bed-plate, a second carriage guide-bar adjustably mounted on said bed-plate, and means for holding said last-named guide-bar to the base of said grinding-wheel carriage, substantially as set forth.

9. In an apparatus of the character described, the combination of a roll-support, a reciprocating grinding-wheel carriage, a support for said carriage, and means for moving said carriage in a curving path during its reciprocation, substantially as set forth.

10. In an apparatus of the character described, the combination of a roll-support, a reciprocating grinding-wheel carriage, a support for said carriage, a pair of guide-bars mounted on said carriage-support at opposite sides of the carriage, and means for bowing said guide-bars to vary the path of travel of said carriage, substantially as set forth.

11. In an apparatus of the character described, the combination of a roll-support, a reciprocating grinding-wheel carriage, a support for said carriage, a pair of guide-bars mounted on said carriage-support at opposite sides of the carriage, and held to said support at their ends, and adjustment-screws having engagement with the central portions of said guide-bars for the purpose of bowing said central portions to cause said carriage to reciprocate in a curving path, substantially as set forth.

12. In an apparatus of the character described, the combination in a roll-support of a bearing-box in which one of the journals of the roll to be operated upon is mounted, and an adjustable tail-stock in which the other roll-journal is mounted, substantially as set forth.

13. In an apparatus of the character de-

scribed, the combination of a roll-support, comprising a table, a bearing-box to receive one of the roll-journals, a tail-stock to receive the other roll-journal, and means for shifting
5 said tail-stock, substantially as set forth.

14. In an apparatus of the character described, the combination of a roll-support comprising a slotted table, a bearing-box to receive one of the roll-journals and an adjustable tail-stock mounted on said table to receive the other roll-journal, an anchor-bolt arranged in the slot in said table to secure said tail-stock thereto, and an adjustment-rod for shifting said tail-stock, substantially as set
15 forth.

15. In an apparatus of the character described, the combination of a roll-support, a reciprocating grinding-wheel carriage, a bed-plate movable transversely with respect to said

roll-support and on which said carriage is
20 mounted, mechanism for reciprocating said carriage and operating a grinding-wheel carried thereby, and a journal-carrying plate by which said mechanism is supported, substantially as set forth.
25

16. In an apparatus of the character described, the combination of side frames, a roll-support, a reciprocating grinding-wheel carriage, a bed-plate movably mounted on said frames, and by which said grinding-wheel
30 carriage is supported, and keepers mounted on said side frames and projecting over said bed-plate, substantially as set forth.

GEO. R. FORD.

BENJAMIN F. ALLEN.

In presence of—

E. S. KNIGHT,

M. P. SMITH.