(No Model.) 4 Sheets—Sheet 1.

F. ASHTON.

APPARATUS FOR GRINDING PARALLEL SPINDLES, RODS, OR SHAFTS.

No. 562,268. Patented June 16, 1896.

FIG. 1.

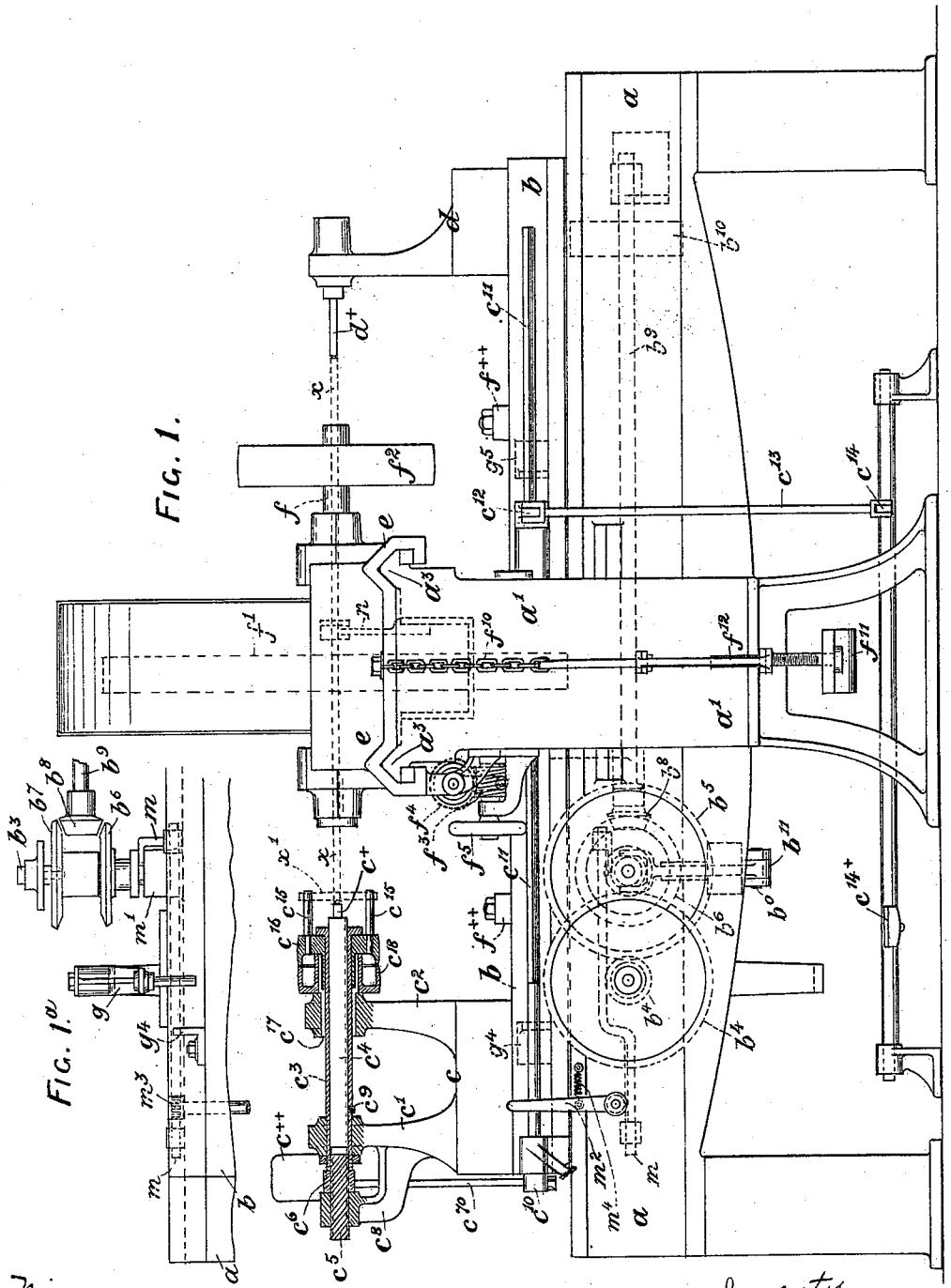

FIG. 1a.

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FIG. 2a.

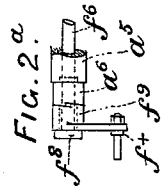

FIG. 2.

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FIG. 4.

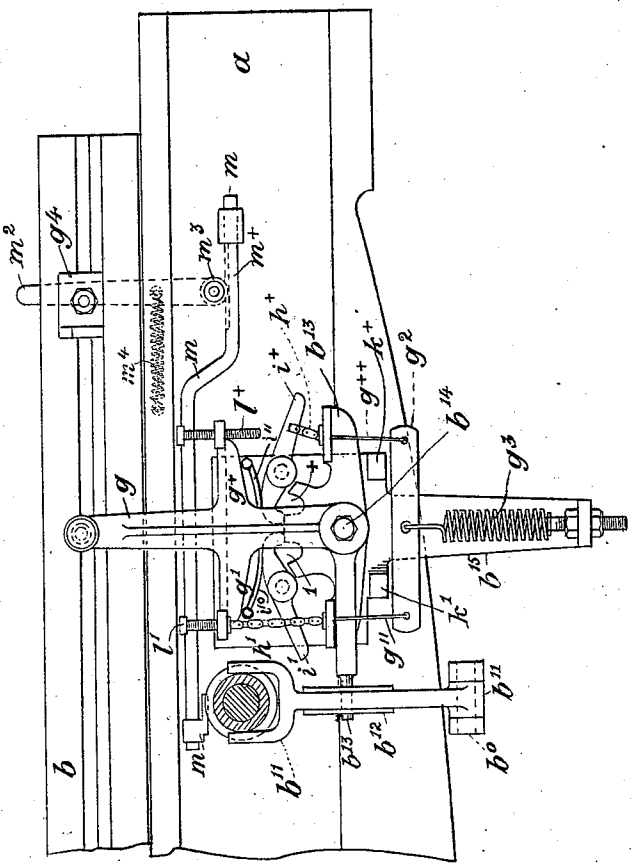
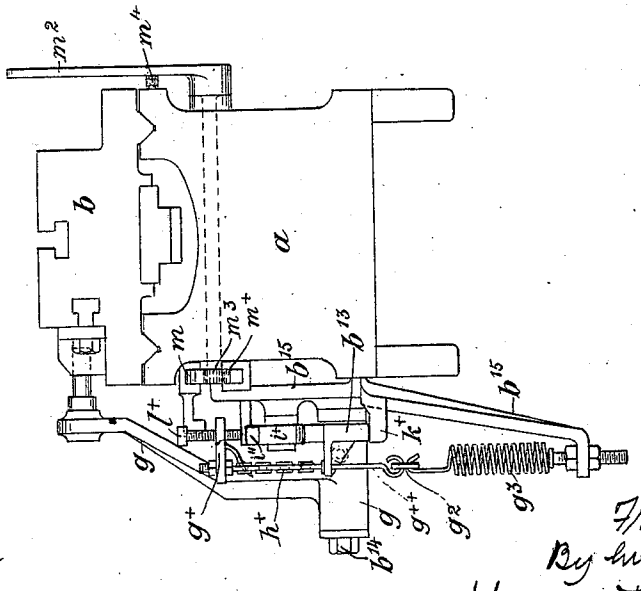


FIG. 3.



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(No Model.) 4 Sheets—Sheet 4.

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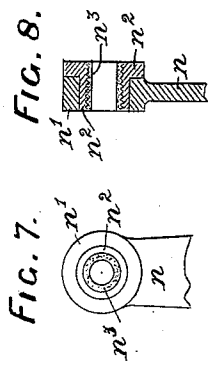

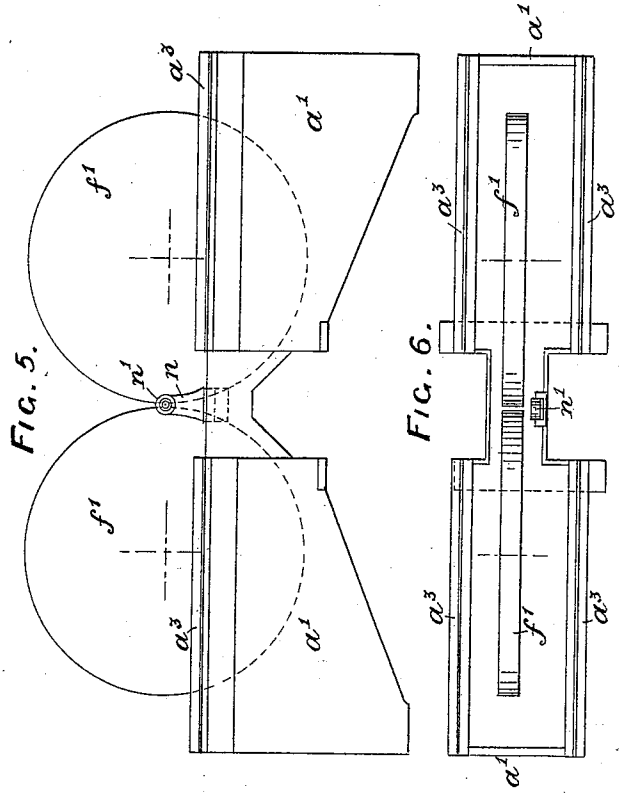

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UNITED STATES PATENT OFFICE.

FRANK ASHTON, OF OLDHAM, ENGLAND, ASSIGNOR OF ONE-HALF TO WILLIAM BODDEN, OF SAME PLACE.

APPARATUS FOR GRINDING PARALLEL SPINDLES, RODS, OR SHAFTS.

SPECIFICATION forming part of Letters Patent No. 562,268, dated June 16, 1896.

Application filed March 2, 1896. Serial No. 581,544. (No model.)

To all whom it may concern:

Be it known that I, FRANK ASHTON, a subject of the Queen of Great Britain, residing at Hargreaves Spindle Works, Oldham, in the county of Lancaster, England, have invented new and useful Improvements in Apparatus for Grinding Parallel Spindles, Rods, or Shafts, of which the following is a specification.

This invention relates to machinery for grinding parallel spindles as used in cotton spinning and preparing machinery, and more especially in slubbing intermediate and roving frames. It is, however, also applicable to machines for grinding any cylindrical metal rods or shafts.

The invention will be readily understood from the following description on reference to the accompanying drawings, of which—

Figure 1 is a side elevation, partly in section, of a machine for grinding parallel spindles, rods, or shafts constructed according to my invention. Fig. 1^a is a plan view of part of Fig. 1, showing the mechanism for reversing the sliding table. Fig. 2 is an end elevation seen from the left hand of Fig. 1. Fig. 2^a shows a detached view of part of the mechanism for increasing the grinding action. Figs. 3 and 4 are enlarged detached views of the mechanism for reversing the sliding table *b*, hereinafter more particularly referred to. Figs. 5 and 6 show the stands or dust-boxes detached and drawn to a smaller scale. Figs. 7 and 8 show the upper ends of the antivibration-bracket *n*, hereinafter referred to.

Upon a suitable bed *a* I mount a table *b*, capable of sliding thereon. This table *b* carries a head-stock *c* and foot-stock *d*, in which are mounted the centers c^+ d^+, between which the spindle to be operated upon is to be inserted.

At or near the center of the length of the bed *a* a pair of stands *a'* *a'*, acting also as dust-boxes, are mounted, one on each side of the bed *a* and connected to a fan by suitable pipes (not shown on the drawings) leading from the dust-outlets a^2 (shown dotted on Fig. 2) in the said dust-boxes *a'*. On the top of these stands *a'* are formed slides a^3 to carry sliding carriages *e*, on which are mounted the shafts *f* of the grinding-wheels *f'*, which may be made of stone, emery, or other suitable grinding or glazing material or composition. These grinding-wheels *f'* are or may be driven by pulleys f^2 and straps or belts (not shown) from a shaft overhead, and each wheel *f'* is fed up to its work by means of a worm f^3 and wheel f^4, the former, f^3, operated by a suitable hand-wheel f^5 and the latter, f^4, actuating an adjusting-screw f^6, which turns in a threaded bush f^7, fixed to or formed with the sliding carriage *e*, supporting the grinding-wheel *f'*. The ends of this screw f^6 are not threaded, but they are free to slide in and are supported by brackets a^4 a^5, cast or fixed to the stand *a'*. The inner end of the screw f^6, however, passes through its bracket a^5 for a suitable distance and is provided with a head f^8, against which rests a bush f^9, capable of turning loosely thereon (see also detached view, Fig. 2^a) and having an incline or helix at its inner edge or face, which is held against a corresponding incline or helical face on a bush a^6, attached to or formed with the supporting-bracket a^5, by means of a weighted chain f^{10} or its equivalent, attached to the outer end of the sliding carriage upon which the grinding-wheel is mounted.

I prefer to weight the chain f^{10}, attached to the two sliding grinding-wheel carriages *e*, by a single bar f^{11}, passing beneath the stands *a'* and the bed *a* of the table *b*, which carries the spindle, and to connect the bar f^{11} to the chains f^{10} by suitable screwed shackles f^{12}, (or otherwise,) so that its position can be adjusted as the grinding-wheels *f'* become worn down.

The bush f^9 on the above-named adjusting-screw f^6 is provided with a finger or arm f^+, and thus by turning the bush f^9 slightly in one direction the screw f^6 will be moved by the inclined loose bush f^9 very slightly endwise, carrying the sliding carriage *e* and grinding-wheel *f'* with it, and by returning the said bush f^9 to its former position the weighted chain f^{10} will bring back the screw f^6 and the carriage *e* and grinding-wheel *f'*. The object of this very slight endwise motion of the grinding-wheels *f'* is to apply a supplementary feed to the said wheels when the whole

length of the spindle has passed between them and to cause the said spindle to be further ground by the wheels as it is carried back again to its first position.

Stops f^{++} upon the sliding table b above named act against the arms or fingers f^{+} upon the loose helical-faced bush f^{9}, so as to alter the position of the grinding-wheels f' at the end of the traverse of the said table b either forward or backward.

The head-stock c (see Fig. 1) is made with two brackets or bearings c' c^{2}, carrying a long fixed boss or sleeve c^{3}, through which is passed a short shaft or spindle c^{4}, which carries the center c^{+} for the spindle to be ground at one end, and at the other end is formed a multiple threaded screw c^{5}, on which is fitted a nut c^{6}, provided or made with a weighted arm or lever c^{7}.

The nut c^{6} is kept from moving endwise by a suitable bracket c^{8}, and the short shaft or spindle c^{4} is formed with a long groove or slot in which is engaged the end of a set-screw c^{9}, fixed in the bush or sleeve c^{3}; and thus if the weighted arm or lever c^{7} is raised the short shaft on the spindle c^{4} is drawn back and withdraws the center c^{+}, so that the end of the spindle to be ground (shown dotted at x, Fig. 1) can be inserted between it and the center d^{+}, carried by the foot-stock d. As soon as the arm or lever c^{7} is released the weight c^{++} pulls it down and forces the head-stock center c^{+} forward to grip the end of the spindle x, the said weight c^{++} thus holding the latter in place between the two centers c^{+} d^{+} and at the same time allowing for expansion and contraction of the spindle x under operation.

The weighted arm or lever c^{7} is to be operated by a lever connected by a link c^{70} to a lever c^{10}, mounted upon a squared shaft c^{11}, the squared part of which slides (as the head-stock moves) through a lever c^{12}, connected by a link c^{15} to a lever c^{14}, actuated by a treadle c^{14+}, by which the weighted arm or lever c^{7} can be raised to insert or release the spindle x for or after grinding the same. To the end of the latter is attached an ordinary lathe-carrier x', (see Fig. 1), actuated by studs c^{15} on a driving-pulley c^{16}, mounted upon the fixed bush or sleeve c^{3} of the head-stock c, and formed with a long boss passing into one end of a fixed bush c^{17}, forced into the inner bracket or bearing c^{2} of the head-stock c, the same fixed bush c^{17} serving to carry a loose pulley c^{18}, mounted by the side of the driving-pulley c^{16}, but by the above construction revolving entirely independently thereof. By this means also I obtain an increased length of bearing for both pulleys c^{16} and c^{18}.

The arrangement for traversing the sliding table b is as follows: The said table b is provided beneath with a long rack b', gearing with a toothed wheel b^{2} upon a bush revolving upon a transverse reversing-shaft b^{3}, and actuated through suitable reducing-gearing b^{4} by a toothed wheel b^{5} on one end of the said shaft b^{3}, which is caused to revolve in one direction or the other alternately by the following reversing-gear: On the other end of the traverse-reversing shaft b^{3} are two bevel-wheels b^{6} b^{7}, arranged face to face with a space between and so mounted as to slide together on the shaft b^{3} in order that either one or other of the bevel-wheels b^{6} or b^{7} can be put in gear with a driving-pinion b^{8} on a shaft b^{9}, actuated by a pulley b^{10} and strap (not shown) from an overhead shaft. The boss of the inner wheel b^{6} is grooved and into the groove takes the forked end of a lever b^{11}. This forked lever b^{11}, which moves one or other of the bevel-wheels b^{6} or b^{7} to reverse the motion of the sliding table b, is mounted on a fixed pivot b^{0} at its lower end and is provided with an inclined groove b^{12}, in which works one end of a reversing-bracket b^{13}, (see also detached views, Figs. 3 and 4,) which is raised to move the outer bevel-wheel b^{7} into gear with the driving-pinion b^{8} and depressed to move the inner bevel-wheel b^{7} into gear with the same. This reversing-bracket b^{13} rocks on a pin b^{14}, fixed or formed on a suitable bracket b^{15}, attached to the bed a of the machine, and on the same pin b^{14} is a vertical reversing-lever g, provided on either side with an arm g' g^{+}, extending over the bracket b^{13}, and beneath the latter extends a cross-bar g^{2}, each end of which is connected by a link g'' g^{++}, passing through one side of the bracket and connected to a chain h' h^{+}, attached to one of the arms g' g^{+} on the reversing-lever g, the center of the cross-bar g^{2} being held or pulled vertically downward by a spring g^{3}. Upon the aforesaid fixed bracket b^{15}, on either side of the reversing-lever g and above the reversing-bracket b^{13}, is a small catch or detent i' i^{+}, pivoted at about its center and acted upon by springs i^{10} i^{11}. One of these spring catches or detents i' or i^{+} takes into a notch 1 or 1^{+} in the upper part of the reversing-bracket b^{13} when the corresponding side of the same is raised and thus locks the bracket b^{13} in this position, thereby holding the end which works in the groove b^{12} in the forked lever b^{11} above described in the raised or depressed position and keeping one or other of the bevel-wheels b^{6} or b^{7} in gear with the pinion b^{8} above named. The rocking motion of the reversing-bracket b^{13} is limited by two fixed stops k' k^{+} beneath the same.

If the reversing-lever g is pushed over to the right, then an adjustable screw l^{+} on its right-hand arm g^{+} will descend and release the spring catch or detent i^{+} from the right-hand side of the reversing-bracket b^{13}, which is pulled over by the action of the cross-bar g^{2}, the right-hand chain h^{+} being slackened and the left-hand chain h' tightened, and the central spring g^{3} pulling vertically downward the left-hand end of the reversing-bracket b^{13}, which moves in the slotted forked lever b^{11}, is thus raised until the lower end of the said bracket is stopped by the fixed stop k^{+} beneath it, (above referred to,) and the bracket

b^{13} is locked in this raised position by the spring catch or detent i' engaging in the notch 1 at the left-hand side of the reversing-bracket b^{13}.

When the reversing-lever g is reversed, that is, pushed over to the right, then the position of the reversing-bracket b^{13} is reversed, and consequently the traverse of the sliding table b is also reversed. This reversal of the lever g is effected by two adjustable reversing-stops g^4 g^5, fixed upon the sliding table b. As, however, it is necessary that the said table b should remain stationary for the insertion and removal of the work, a sliding bolt m is provided for insertion between the end of the grooved boss of the wheel b^6 and the boss m' (see Fig. 1ª) on the frame a, through which the reversing-shaft passes, so that both of the bevel-wheels b^6 b^7 above described can be held out of gear with the pinion b^8. This sliding bolt m is withdrawn by the hand-lever m^2 and pinion m^3, gearing with a rack of teeth at m^+ on the said bolt m, in order to start the forward traverse motion of the sliding table b, and the said bolt m is returned into position by a spring m^4 as soon as the traverse is reversed, in order to stop the complete reversal of the traverse by the reversing of the stop g^5 on the table b, and the consequent recommencement of the traverse of the table b, until the ground spindle has been removed and another spindle to be ground mounted in its place between the centers c^+ d^+.

In order to reduce the vibration of the spindle or article under operation, which would take place during the grinding thereof, a bracket n is fixed to the stands as near to the grinding-wheels f' as possible, and at the back side thereof are detached views, Figs. 5 and 6, and at the top of the bracket is a boss n', (shown enlarged at Figs. 7 and 8,) through which the spindle or other article passes. This boss is bored out to receive a bush n^2, which is formed with a screw-thread or otherwise, so as to retain a lining n^3, of leather or other suitable flexible material, which just allows the spindle or other article to be ground to pass through and thus prevent vibration thereof during the grinding process, especially when the centers c^+ d^+ are about equidistant from the grinding-wheels f'.

The method of using the machine is, briefly, as follows: Assuming that the machine has been set and adjusted so as to grind the given article, the center d^+ of the foot-stock d will be in such a position that it projects just through the grinding-wheels f'. The head-stock center c^+ is then withdrawn by the foot-lever c^{14} above described. One end of the article (parallel spindle or shaft) is then placed in the foot-stock center d^+, and the head-stock center c^+ is then allowed to move forward again and secure the other end of the article with its carrier attached to the pulley c^{16}, and studs c^{15} are then set in motion and the attendant moves the reversing-handle g, so as to start the forward traverse of the table b, until the first reversing-stop g^4 moves the said handle g and reverses the traverse, and at the same moment a small amount of supplementary feed of the grinding-wheels f' is put on by the stops f^{++} above described coming in contact with the arms f^+, which move the helically-faced bushes f^9 to move the heads f^8 of the adjusting-screws f^6 of the grinding-wheels f' slightly nearer together. Thus at the return traverse a second quantity is ground off and the diameter of the article under operation is futher reduced. As the table b regains its original position it is brought to a standstill by the sliding bolt m above described, and the supplementary feed is taken off by the stops f^{++} on the table b returning the arms f^+ on the helically-faced bushes f^9 to their former position. The article is then released from its centers c^+ d^+ by the foot-lever (the revolution of its driver c^{15} c^{16} having been stopped) and the said article is removed and another inserted.

Any increase due to wear in the diameter of the grinding-wheels f' is compensated for by the adjusting-screws f^6, above described, by the worms f^3 and hand-wheels f^5.

I claim as my invention—

1. The combination of a sliding table carrying the centers for supporting the parallel rod (such as a roving-spindle) to be ground and means for rotating the said rod, and for reversing the motion of the table, with a pair of adjustable grinding-wheels so set as to grind the said rod simultaneously on both sides and means for imparting an alternate motion slightly inward or outward to the grinding-wheels at the reversal of the motion of the sliding table, substantially as hereinbefore set forth.

2. The combination of a sliding table provided with a foot-stock and center for holding one end of the rod to be ground, and a head-stock carrying an adjustable center for holding the other end of the rod, a quick-threaded screw and a weighted nut to adjust the head-stock center, and a treadle and connections for moving the said weighted nut, with grinding-wheels, means for moving the said table to pass the rod to be ground forward and backward between the grinding-wheels, and means for slightly increasing the grinding action of the wheels at the backward motion of the rod, all substantially as set forth.

3. The combination of a sliding table provided with a foot-stock and center for holding one end of the rod to be ground, and a head-stock carrying an adjustable center for holding the other end of the rod, separate and independent bushes carried by the head-stock concentric with the said adjustable center and pulleys revolving on the said bushes, one of which pulleys drives the rod to be ground, with grinding-wheels, means for moving the said table to pass the rod to be ground forward and backward between the grinding-wheels, and means for slightly increasing the

grinding action of the wheels at the backward motion of the rod, substantially as set forth.

4. The combination of a pair of revolving grinding-wheels, a sliding table carrying a parallel rod to be ground between the said wheels, means for rotating the said rod, and means for slightly increasing the feed of the grinding-wheels during the backward motion of the sliding table, with a shaft for moving the table, bevel-wheels movable on the said shaft and means for moving the bevel-wheels into and out of gear with a driving-pinion, the said means consisting of a forked lever, a reversing-lever acting thereon, and stops on the sliding table to act on the reversing-lever, substantially as set forth.

5. The combination of a pair of grinding-wheels, and a sliding table carrying a parallel rod to be ground forward and backward between the grinding-wheels, with sliding brackets upon which the said grinding-wheels are carried, each of the said brackets being weighted and provided with a nut through which passes a screw for adjusting the said grinding-wheel, the said screw being provided with a head at its inner end, a loose helically-faced boss and a fixed helically-faced bush working against each other, the screw-head bearing against the loose boss, an arm and stops on the sliding table actuating the loose boss for slightly increasing the feed of the said grinding-wheels during the backward motion of the table and taking off such increase of feed for the next forward motion thereof, substantially as hereinbefore described.

6. The combination of a pair of grinding-wheels and a sliding table carrying a parallel rod to be ground forward and backward between the pair of grinding-wheels to which a slight increase of feed is given during the backward motion thereof, a bush lined with suitable material and fixed behind and close to the said grinding-wheels for supporting the central portion of the rod and preventing the vibration thereof during the grinding operation substantially as hereinbefore set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK ASHTON.

Witnesses:

GEORGE DAVIES,

CHARLES A. DAVIES.