

No. 626,208.

Patented May 30, 1899.

F. LUCKE.

SHIFTING DEVICE FOR REVOLVING TOOL HEADS.

(Application filed Feb. 4, 1899.)

(No Model.)

2 Sheets—Sheet 1.

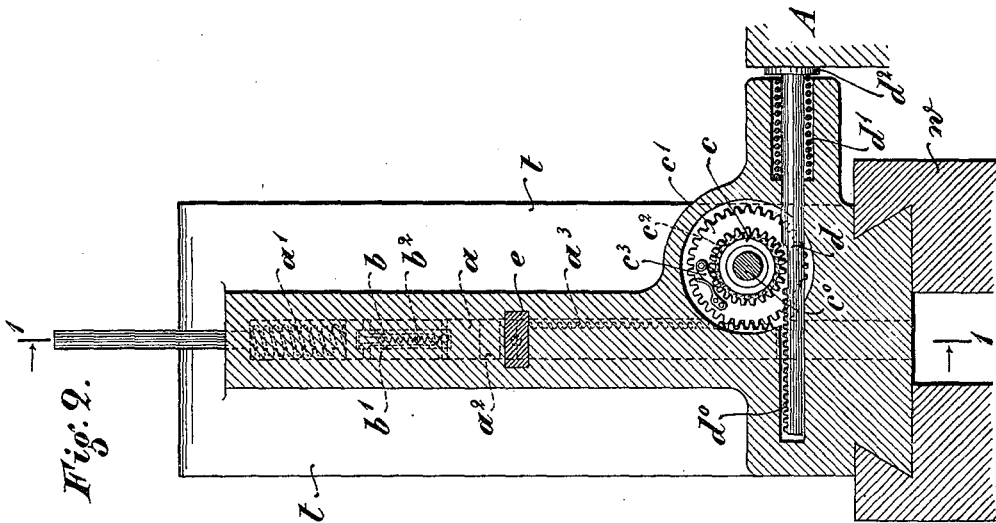


Fig. 2.

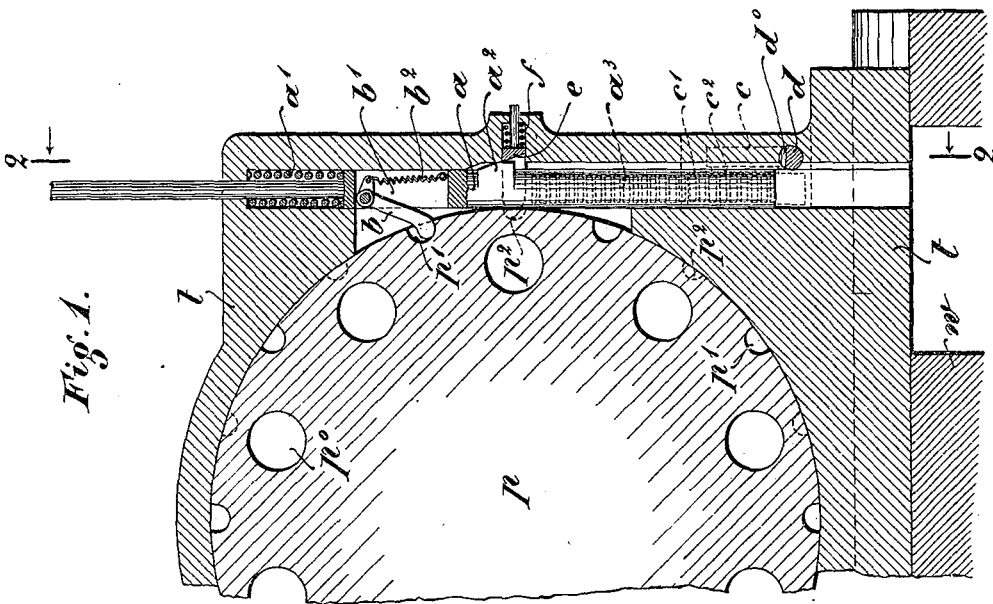


Fig. 1.

Witnesses

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UNITED STATES PATENT OFFICE.

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SHIFTING DEVICE FOR REVOLVING TOOL-HEADS.

SPECIFICATION forming part of Letters Patent No. 626,208, dated May 30, 1899.

Application filed February 4, 1899. Serial No. 704,476. (No model.)

To all whom it may concern:

Be it known that I, FRITZ LUCKE, a subject of the King of Prussia, German Emperor, residing at Moabit, Berlin, in the Kingdom of Prussia, German Empire, have invented a new and useful Shifting Device for Revolving Tool-Heads, of which the following is a specification.

This invention relates to revolving tool-heads, which, unlike the so-called "monitor-turrets," rotate about a horizontal axis situated in the sliding direction of the longitudinal slide.

It consists in an automatic device for instantaneously shifting the revolving head when by the backward movement of the longitudinal slide the tool has been fully withdrawn from out of the work-piece. The shifting movement is effected by a spring, the tension of which is produced by the longitudinal slide coöperating during its backward stroke with a fixed stop.

Figure 1 is a cross-section on line 1 1 of Fig. 2 and shows the invention in its preferred form. Fig. 2 is a longitudinal section on line 2 2 of Fig. 1. Fig. 3 is a longitudinal section of a modified form of the invention. Fig. 4 is the same longitudinal section as Fig. 3, but shows the parts of the shifting device at another position.

In the device shown in Figs. 1 and 2 the revolving head p is rotatably supported within the standard-like cross-slide t , carried by the longitudinal slide w of the lathe, and is adjustable as to its position relatively to this longitudinal slide by means not shown. A sliding bar a , vertically guided in the cross-slide t and held under downward pressure by the coiled spring a' , carries in a longitudinal slot b' a shifting-pawl b . A spring b^2 presses the pawl against the circumference of the revolving head p , thereby causing the said pawl to engage with recesses p' , provided on the said circumference at angular distances from each other equal to those of the holes p^0 , which receive the tools. A similar series of recesses p^2 , arranged in pairs on the cylindrical surface of the revolving head, is adapted to engage with a bifurcated locking-bolt e , embracing the bar a and acting under the pres-

sure of a coiled spring f . A sloping projection a^2 of the bar a is adapted to engage with a correspondingly-sloping surface at the bifurcating point of the locking-bolt. The lower part of the sliding bar a is on the rear side formed as a rack a^3 . A second sliding bar d is horizontally guided in the cross-slide t , from which it projects in a backward direction. The projecting end carries a collar d^2 , which serves as an abutment for the coiled spring d' and rests in normal position against a stop A , adjustably secured to the bed of the lathe, so as to control the backward stroke of the slide w . The upper part of the inner end of the sliding bar d is provided with rack-teeth d^0 . To connect the sliding bars a and d , a pinion c , adapted to engage with the rack d^0 , is fixed to the horizontal cross-shaft c^0 and rigidly connected with a ratchet-wheel c^2 , while another pinion c' , loosely mounted on the shaft c^0 and gearing with the rack a^3 , carries a pivoted and spring-pressed pawl c^3 , engaging with the ratchet-wheel c^2 .

The operation of the described device is as follows: When a tool has finished its work and the longitudinal slide w begins its backward movement, so as to withdraw the tool from out of the rotating work-piece, the sliding bar d , the collar d^2 of which rests against the fixed stop A , begins to move inwardly, compressing the spring d' and turning, by means of rack d^0 , the pinion c in the sense of the clock-hand. Ratchet-wheel c^2 and pawl c^3 cause the pinion c' to take part in this rotation, and thereby to lift the sliding bar a . During the upward stroke of this bar the spring a' is compressed and the pawl b after being released from the recess p' , with which it was up to that moment engaged, slides on the cylindrical surface of the revolving head. When the sliding bar a approaches the position shown, its projection a^2 releases the locking-bolt e from the respective pair of recesses p^2 , so that the revolving head p is free to be shifted and the pawl b free to engage another recess p' . After these movements the last tooth of the rack d^0 has ceased to mesh with the pinion c , as represented in Fig. 2, whereby the spring a' is enabled to thrust down the sliding bar a , causing the pinions c' and c to

rotate backward. By this rapid downward stroke of the bar a the pawl b is enabled to shift the revolving head p through an angle corresponding to the distance of two consecutive holes p^0 , whereupon the locking-bolt e engages the next pair of recesses p^2 , and the revolving head locked in this way stops, by means of the pawl b , the downward movement of the sliding bar a and the backward rotation of both pinions. When, as here described, the revolving head has accomplished the shifting movement and the following tool is thereby brought into working position, the longitudinal slide w will be caused to advance, so as to continue the work. On the slide w moving away from the stop A the spring d' holds the collar d^2 of the bar d against this stop, so that the sliding bar d is pushed out from the cross-slide t and its rack d^0 reengages with the pinion c and rotates it in backward direction—that is to say, contrary to the clock-hand movement. During this rotation the ratchet-wheel c^2 slides under the pawl c^3 , the pinion c being prevented from rotating with the pinion c by the sliding bar a resting on the locked revolving head p .

The modification shown in Figs. 3 and 4 relates only to the means for connecting the two sliding bars a and d . The teeth of the pinion c are supposed to be broad enough to engage with the rack a^3 as well as with the rack d^0 ; but it will be understood that there may also be two pinions and of different size keyed to the shaft c^0 , one pinion engaging with the rack a^3 and the other with the rack d^0 . Both racks are continuously in engagement with the pinion c , the rack d^0 being not in this case integral with the sliding bar d , as in the former construction, but forming a sleeve loosely fitted on this bar. A piston g is guided in the central part of the sliding bar d and adapted to be pressed against the abutment g^0 by the coiled spring g' . A recess g^2 in the piston and a perforation d^4 in the wall of the hollow bar d are adapted each to receive one-half of a ball k . At the rear end of the rack d^0 an inclined surface d^7 is provided for, a similar inclined surface g^3 forming the rear side of the recess g^2 . For preventing the piston g from rotating within the hollow bar d and the latter within the sleeve d^0 the piston g enters with a stud g^0 into a groove d^3 of the bar d , and the bar d enters with a stud d^5 into a groove d^6 of the sleeve d^0 . The operation of this modified device is as follows: At the beginning of the backward stroke of slide w the parts occupy the positions shown in Fig. 3. The piston g compresses the spring g' , while the cross-slide t compresses the spring d' and causes the pinion c to roll on the rack d^0 , this rack being prevented by the ball k from moving backward together with the cross-slide t . As the pinion c rotates in the direction of the clock-hand the bar a is lifted by so much as is necessary for preparing its shifting movement. As soon as the recess g^2 reaches the perfora-

tion d^4 the sleeve d^0 , acting under the pressure of the spring a' by means of its inclined surface d^7 , pushes the ball k inward, so that it is located partly in the perforation d^4 and partly in the recess g^2 . At this moment the parts of the mechanism are occupying the positions shown in Fig. 4, the rack or sleeve d^0 is free to move backward, and the spring a' is enabled to effect the downward or shifting movement of the bar a . During the now following forward movement of the longitudinal slide w the rack d^0 moves, together with the cross-slide t , while the bar d is retained by the spring d' against the stop A and the ball k retains the piston g against the pressure of the spring g' , so that the abutment g^0 is moved away from this piston. When the inclined surface d^7 of the rack d^0 has advanced beyond the ball k , the spring g' is enabled to push the ball outward by means of the inclined surface g^3 of the recess g^2 and then to advance the piston g against the abutment g^0 . The forward movement of the longitudinal slide w is now finished, all parts having retaken the positions shown in Fig. 3.

What I claim as my invention is—

1. The combination with a tool-head carried by the longitudinal lathe-slide and adapted to revolve about a horizontal axis situated in the sliding direction of the said slide, of a rearward stop fixed to the bed of the said slide, a horizontal sliding bar carried by the slide, a spring for holding the rearward end of this sliding bar against the said stop, a spring-pressed vertical sliding bar carried by the slide, a pawl-and-ratchet arrangement connecting the vertical sliding bar with the revolving head, a spring-pressed locking-bolt adapted to engage with recesses in the tool-head, means for effecting an upward movement of the vertical sliding bar by the rearward movement of the longitudinal slide by aid of the horizontal sliding bar, means for automatically interrupting the connection between both sliding bars, and means for automatically disengaging the said locking-bolt both near the end of the said rearward movement, essentially as and for the purpose set forth.

2. The combination with a revolving tool-head mounted on a longitudinal lathe-slide in a plane which is vertical and transversal to the sliding direction of the said slide, of a stop on the bed of the lathe rearward of the slide, a vertical and a horizontal spring-pressed sliding bar both mounted on the slide, the rearward end of the horizontal bar abutting against the stop, a pawl-and-ratchet arrangement connecting the vertical bar and the tool-head, an automatic locking device for the tool-head, two spur-wheels adapted to independently rotate about the same axis, one engaging with a rack formed on the vertical bar and the other with a rack on the horizontal bar, a pawl-and-ratchet device connecting both spur-wheels, means for disconnecting a spur-wheel and its rack and for releasing the

tool-head from its locking device near the end of the rearward movement of the longitudinal slide, essentially as shown and described.

3. The combination with a revolving tool-head mounted on a longitudinal lathe-slide in a vertical and transversal plane, of a stop fixed to the bed of the lathe rearward of the said slide, a vertical and a horizontal spring-pressed sliding bar, the rearward end of the horizontal bar abutting against the stop, a pawl-and-ratchet arrangement connecting the tool-head with the downwardly-moving vertical bar, and automatic locking device for the tool-head, two spur-wheels adapted to independently rotate about the same axis, one engaging with a rack formed on the vertical bar and the other with a rack on the horizontal

bar, the latter rack being so limited that it ceases to mesh with its spur-wheel, when the longitudinal slide approaches the end of its backward stroke, a pawl-and-ratchet device connecting both spur-wheels and means for releasing the tool-head from its locking device when the longitudinal slide approaches the end of its backward stroke, essentially as shown and described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRITZ LUCKE.

Witnesses:

HENRY HASPER,
CHAS. H. DAY.