No. 687,887. Patented Dec. 3, 1901.

W. T. S. JOHNSON.

BACKING-OFF ATTACHMENT FOR ENGINE LATHES.

(Application filed Aug. 2, 1901.)

(No Model.) 3 Sheets—Sheet 1.

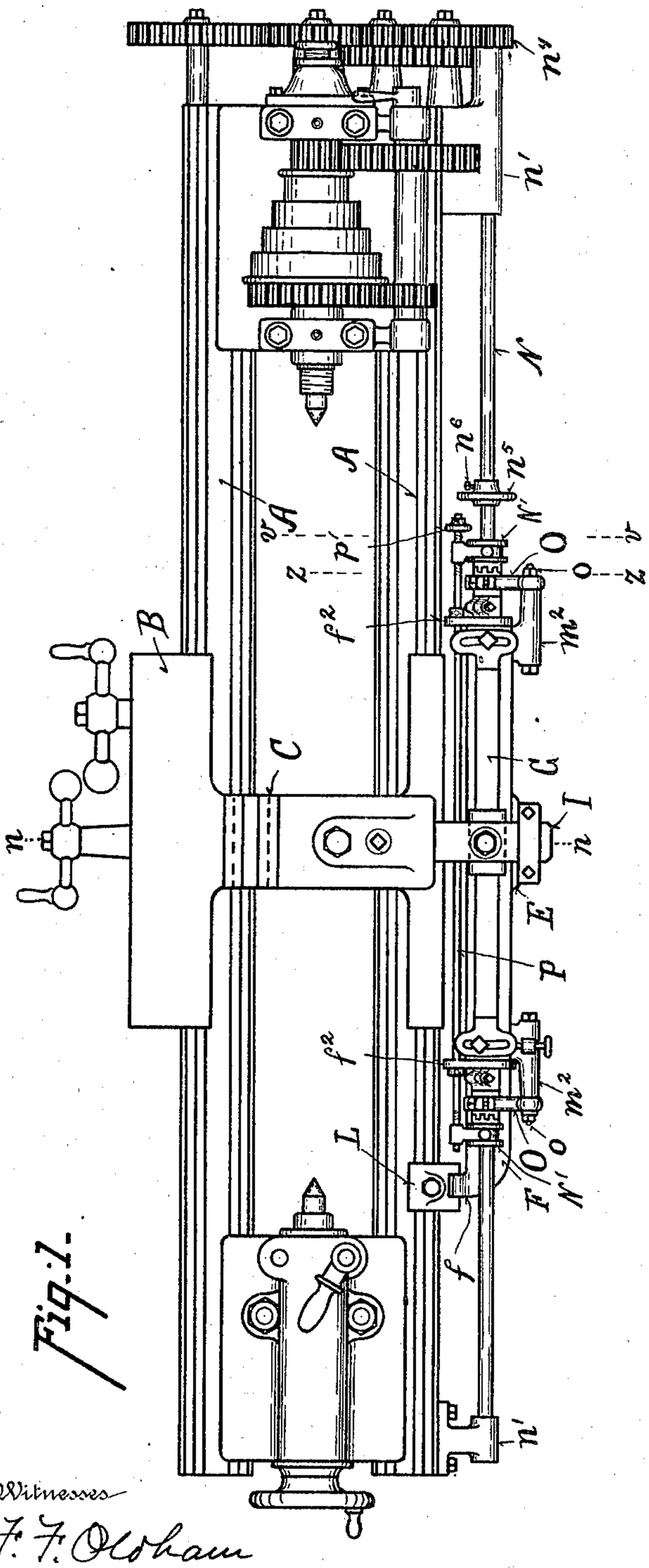

Fig. 1.

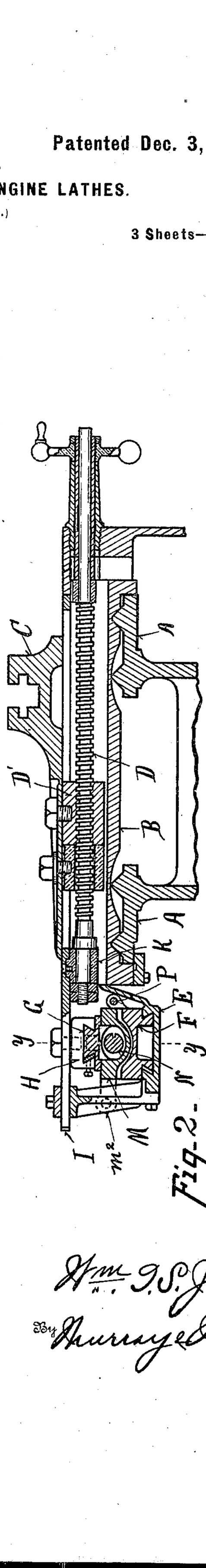

Fig. 2.

Witnesses—
F. F. Oldham
Emma Lyford

Inventor
Wm. T. S. Johnson
By Murray & Murray
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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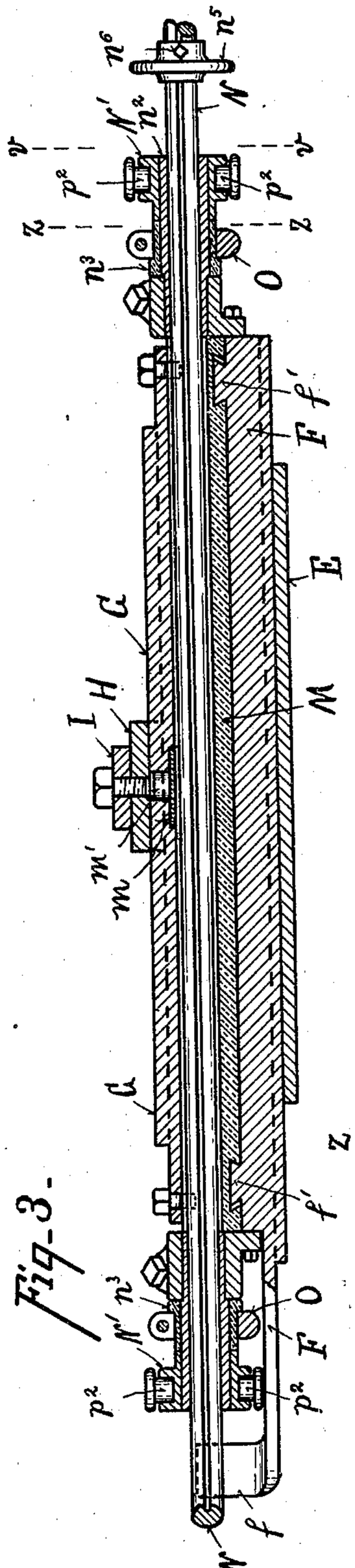

Fig. 3.

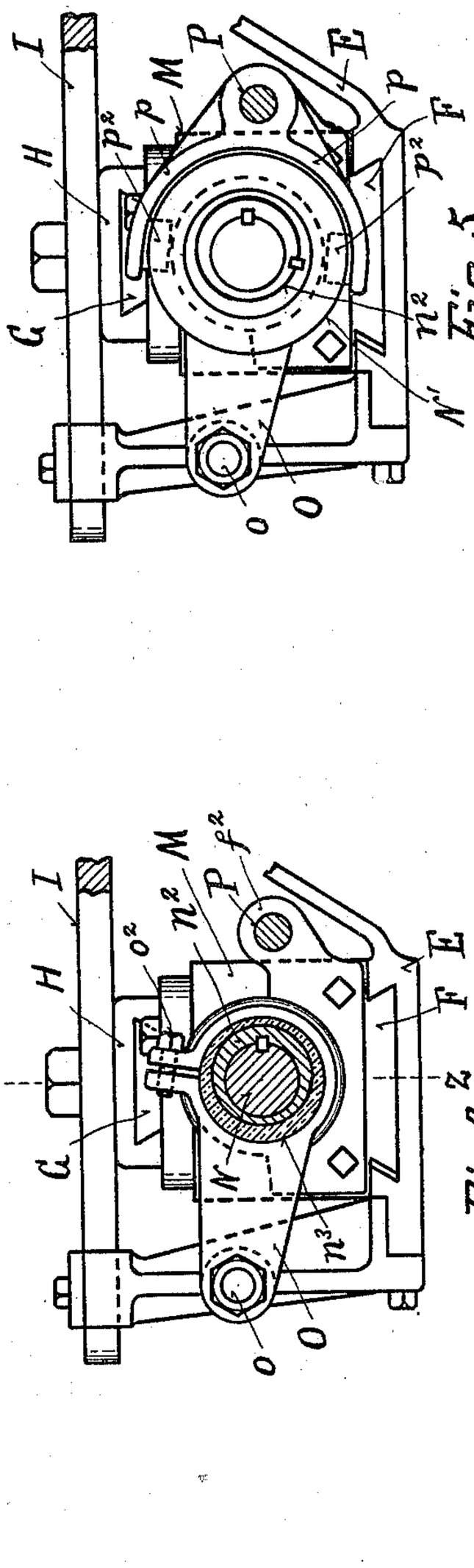

Fig. 5.

Fig. 4.

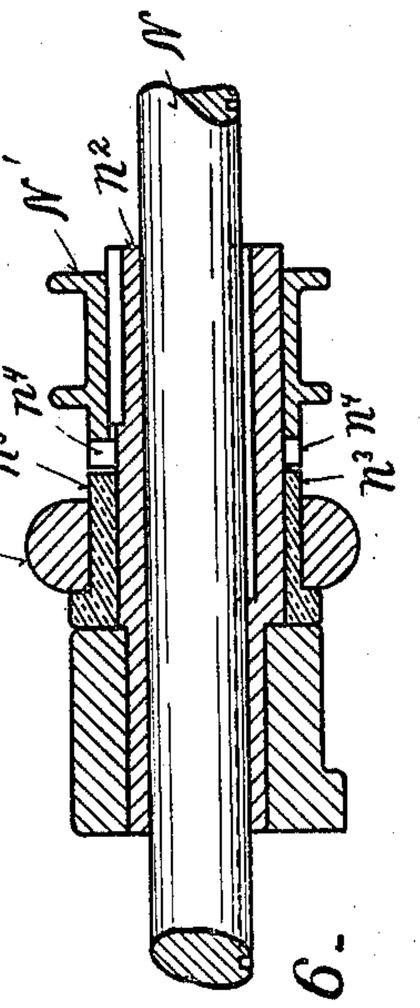

Fig. 6.

Witnesses:
F. F. Oldham
Emma Lyford

Inventor
Wm. T. S. Johnson
By Murray & Murray
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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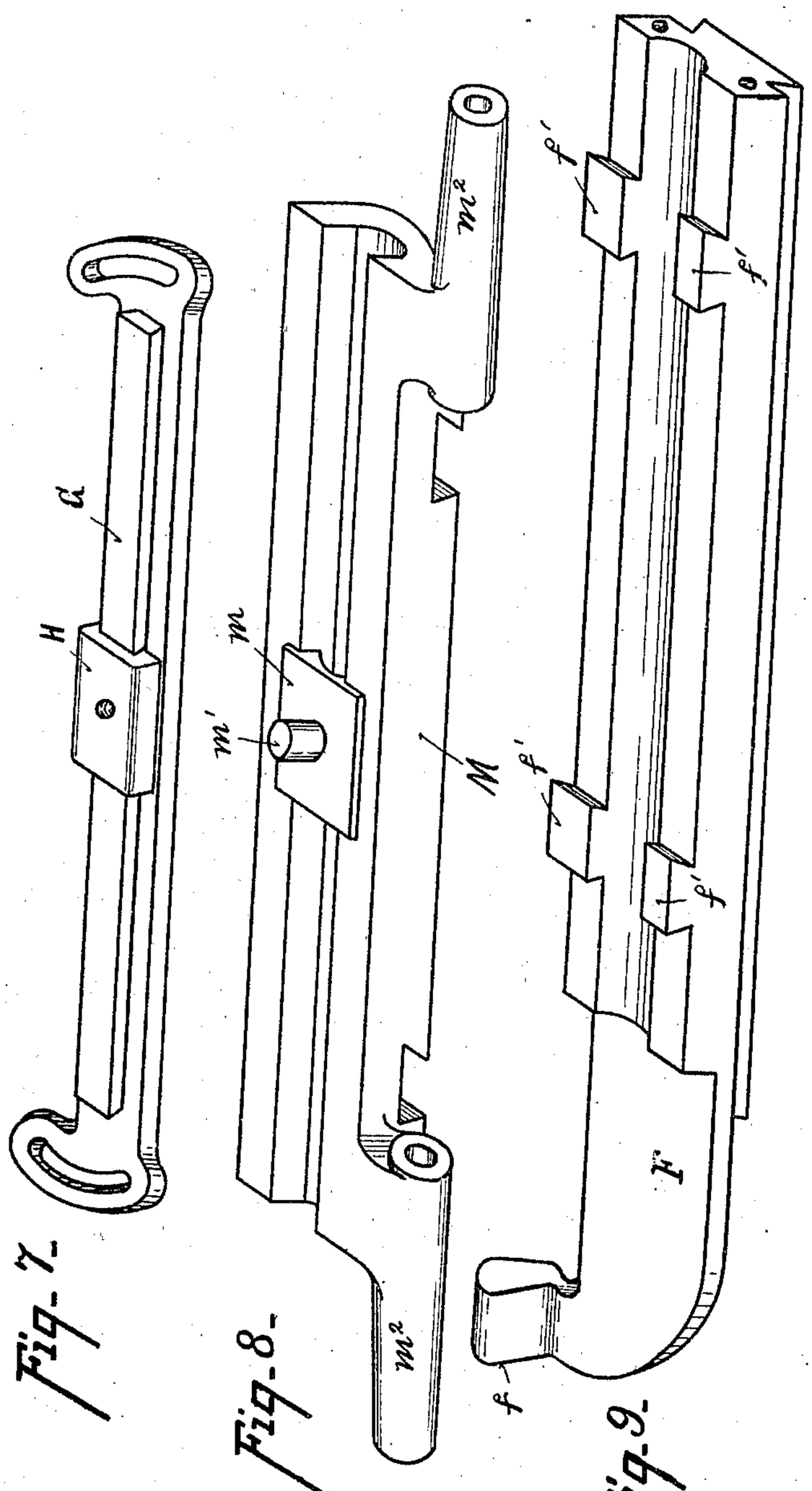

Fig. 7.

Fig. 8.

Fig. 9.

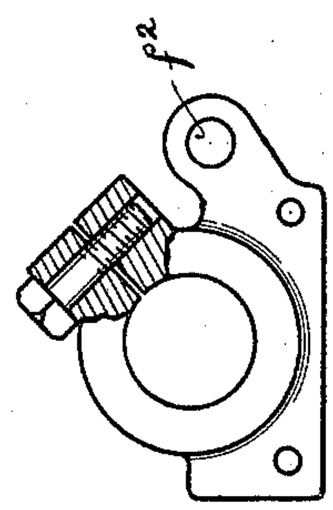

Fig. 10.

Witnesses
F. F. Oldham
Emma Lyford

Inventor
Wm. T. S. Johnson
By Murray & Murray
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM T. S. JOHNSON, OF CINCINNATI, OHIO.

BACKING-OFF ATTACHMENT FOR ENGINE-LATHES.

SPECIFICATION forming part of Letters Patent No. 687,887, dated December 3, 1901.

Application filed August 2, 1901. Serial No. 70,569. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. S. JOHNSON, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Backing-Off Attachments for Engine-Lathes, of which the following is a specification.

My invention relates to a backing-off attachment for engine-lathes. "Backing-off" is understood in the class of machines to which my invention relates to mean some provision by which a tap or milling-tool has its perimeter back of its cutting edge or edges inclined toward the axis of rotation, thus leaving a clearance back of the cutting edge, so as to prevent "burning" or unnecessary friction, as would occur if the whole perimeter were formed concentric to the axis of revolution.

My invention is especially designed for backing-off taps whether cylindrical or tapered, and while it may be applied to any well-known engine-lathe it is believed it would be better understood if illustrated and described as applied to the well-known Johnson taper lathe, which is shown and described in Letters Patent No. 503,088, dated August 8, 1893.

Referring to the drawings, in which like parts are indicated by similar reference-letters wherever they occur throughout the various views, Figure 1 is a plan view of so much of a taper lathe with my improvements attached as is necessary to illustrate my invention. Fig. 2 is a vertical transverse sectional view of the same, taken through line *n n* of Fig. 1. Fig. 3 is a longitudinal sectional view on line *y y*, Fig. 2, and line *z z*, Fig. 4. Fig. 4 is a transverse sectional view, on a large scale, through line *z z*, Figs. 1 and 3. Fig. 5 is a similar view to Fig. 4 upon the same scale, but taken through line *v v*, Figs. 1 and 3. Fig. 6 is a detail view, in longitudinal section through line *z z*, of the attachment on the same scale as Figs. 4 and 5. Figs. 7, 8, and 9 are detached detail views in perspective of the parts of the Johnson taper lathe modified to adapt it to the use for backing-off taps or similar tools used by machine-tool makers, Fig. 7 being a view of the guide-bar, Fig. 8 an intermediate attachment between it and the restraining-bar for a taper attachment for engine-lathes, and Fig. 9 the restraining-bar modified to adapt it to backing-off taps and similar tools, whether tapered, cylindrical, or other desired shape. Fig. 10 is a view, partly in end elevation and partly in section, of one of the bearings which are secured to the opposite ends of the restraining-bar, Fig. 9. These views, Figs. 7 to 10, inclusive, are to a still larger scale than the preceding views.

Referring to the parts, A represents the lathe-bed, and B the carriage mounted to slide thereon between the customary head and tail stocks.

C is the tool block or holder, mounted to slide on the carriage across the lathe. The tool block or holder is coupled to the cross-feed screw D by a nut D'. The screw D is plain or unthreaded at its forward end and is splined in its front bearing, so that if it slides with the tool-block when said block is controlled by the taper attachment which is supported by bracket E, which bracket is secured to the rear edge or may be made integral with the carriage, the tool-block is under control of the cross-feed screw at all times to adjust the cutting-tool with relation to the axis of the lathe-spindles or the work acted upon. The bracket E has a longitudinal way to guide the restraining-bar F of the taper attachment upon which the angular adjustable guide-bar G is pivoted. There is fitted to slide on the rib of the guide-bar the slipper H, which is coupled to the tool-holder C, which carries the stud K, in which the rear end of the cross-feed screw is journaled between collars which prevent endwise movement of the screw independent of the bar I. The restraining-bar F has its end turned at *f* to enter a notch in the bed-clamps L, by which the bar F and taper attachment are locked to or released from the lathe-bed for the purpose of turning tapers when the clamp is locked and cylindrical work when the clamp is unlocked.

The parts above referred to are well known and need not therefore be more specifically described excepting only the modification of the bracket E and restraining-bar F, which adapts the taper lathe to be changed to back-off taps or similar tools when desired without removing any of the parts or interfering in

any way with the functions of the Johnson taper lathe when the backing-off attachment is disconnected. These changes will now be described in connection with my backing-off attachment.

It is well understood and is apparent from the foregoing description that the guide-bar G is pivoted and angularly adjustable upon the restraining-bar F, that they move together when the clamp L is released, and rest together when the clamp L is fixed to the lathe-bed. This relation of the guide-bar G and restraining-bar F is followed in my backing-off attachment; but the frame or support for the backing-off attachment M (see Fig. 8, Sheet 3) is interposed between the guide-bar G and restraining-bar F, and this interposition requires some modification of the bracket E and bars F and G. In order to get my backing-off attachment in my taper lathe in as compact a form as possible without interfering with its other functions, I conceived the following changes to be essential, made those changes, put them into practical use, and found they attained the results I contemplated when I first conceived the invention:

In order to obtain the space between the bars G and F for the interposition between them of the support for the backing-off attachment, the bottom or base of the foundation-plate of the bracket E is dropped somewhat lower than in my former patent and the guideway formed in the foundation to receive the rib on the under side of the bar F, the parts being merely a reversal of those shown in my former patent. The bar F being correspondingly dropped, the inturned end f of the bar is elevated to engage the notch in the clamp L. The bar F being separated from the guide-bar G by the interposition of the support M of the backing-off attachment required further changes in both bars F and G, so that they would retain fixed relation to each other after the guide-bar G was given its proper angular adjustment. These changes consist in providing the upper face of the bar F with dovetail blocks f' to engage dovetail ways in the under side of the support M. Upon the top of the support M is fixed the foundation-plate m, which has an upwardly-projecting pivot-pin m' to enter a hole in the under side of the guide-bar G, thus practically pivotally connecting the guide-bar G and restraining-bar F to act as in all modern taper lathes. The restraining-bar F, guide-bar G, and intermediate support M are cored out, as shown in the drawings, to reduce the weight of the castings without weakening them for effective work and also to provide ways for the passage of the shaft for operating the backing-off attachment.

To impart a reciprocating movement to the support M, and through it to the tool-block while the carriage is traveling on its ways on the lathe-bed, I have provided a shaft N, which is journaled in bearings n' n', secured to the rear of the lathe-bed at each end, which shaft passes freely through the taper attachment below the guide-bar G and through the cored-out portion of the support M, restraining-bar F, and the semicircular part of the interposed member M. The shaft N, opposite each end of the arms m^2 of the member M, is provided with eccentrics n^2, which are secured to the shaft by splines, which permit their movement longitudinally on the shaft and compel their rotation with it. Upon the eccentrics n^2 are fitted similar eccentrics n^3, which have projecting from their opposite faces clutch members to engage similar clutch members n^4, which project from sliding collars N', which collars are splined upon the eccentrics n^2. The purpose of this arrangement is to adjust the outer eccentrics with relation to each other when the clutches are disconnected to limit the movement in either direction of the support M of the backing-off attachment when the clutches are thrown into engagement. Thus when the highest points of the inner eccentrics are opposite the lowest points of the outer eccentrics the perimeters of the outer eccentrics are concentric to the axis of the shaft N and no movement in a transverse direction is imparted to the member M. When, however, the highest points of both sets of eccentrics coincide, the extreme limit is attained. By adjusting the eccentrics between these limits the backing-off attachment may be set to any angle of adjustment to form taps of any size or kind desired.

The backing-off attachment is connected to the eccentrics n^3 by arms O, which are journaled at their outer ends on stud-shafts o, secured in the arms m^2 of the support M. The inner ends of these arms are formed in eccentric-straps to fit the eccentrics n^3. These straps have outwardly-projecting flanges to receive tightening-bolts o^2 for tightening the straps on the eccentrics to compensate for wear.

The clutches have grooved hubs to receive yokes p, which are actuated by a shaft P, which shaft is journaled in bearings f^2, secured at each end of the member F, the shaft being prevented from moving longitudinally by collars on the shaft in the usual manner. The inner ends of the yoke-arms are tapped, the one with a right and the other with a left hand thread to engage right and left hand threads on the shaft P. Thus when the shaft is turned in one direction by the hand-wheel p' the clutches are simultaneously disengaged from the eccentrics n^3, and a reverse movement of the hand-wheel after the angle of the eccentrics is adjusted throws the clutches into engagement. The yoke-arms which enter the grooves in the clutch-hubs are armed with friction-rollers p^2.

The shaft N is driven by pinion n^4, which meshes with one of the pinions of the driving mechanism at the head-stock of the lathe. The speed of the shaft may be varied in the

usual manner relative to the speed of the live-spindle or lead-screw. The shaft N has secured upon it between its bearing f^3 in the plate F′ and the head-stock a hand-wheel n^5. This hand-wheel has an extended hub fitted with a set-screw n^6, which makes the hand-wheel also a shaft-coupling. The separated part of shaft N enters this hub and is coupled to or disengaged from the hand-wheel by tightening or loosening the screw n^6. The purpose of this arrangement is twofold: First, when the clutches are disconnected the set-screw is loosened. Then the hand-wheel is used to adjust both sets of outer eccentrics upon the inner eccentrics to fix the throw of the backing-off-attachment support M. When the eccentrics are given the proper angular adjustment, the set-screw nut n^6 is tightened on the shaft N within the hub. Second, when it is desired to wholly disconnect the backing-off attachment the set-screw n^6 is simply loosened, thus allowing the end of shaft N to revolve freely within the hub of coupling and hand-wheel n^5, the part of the shaft carrying the eccentrics remaining idle, as they would if the pinion n^4 were removed from the end of shaft N.

Assuming that the blank for a taper tap is to be formed and backed off preparatory to having the radial grooves milled in it to present cutting edges, which may be sharpened by grinding the radial faces of the cutting edges, the operation may be briefly described as follows: Disconnect the shaft N by loosening screw n^6, then adjust the guide-bar G to the desired angle, and tighten the bed-clamp L to the bed of the lathe. When the lathe is started, the desired taper is turned, precisely as described in my former patent. Then by means of the hand-wheel p' separate the clutch members N′, and by means of hand-wheel n^5 adjust the eccentrics to give proper throw to the backing-off attachment M. When properly adjusted, turn the hand-wheel p' in the reverse direction, coupling the clutch members, tighten the set-screw n^6, and the blank for the tap (the proper tool of course being fixed in the tool-block) will then cut the threads and back them off at the same time. Of course if the clamp L is released the blank will be first turned to a cylindrical form if the set-screw n^6 is loosened, and when the set-screw is tightened up to put the backing-off attachment in operation the threads will be cut on the cylindrical form and properly backed off, the same as before described for the taper form.

In machines of this kind the live-spindle and the lead-screw are both run at a low speed to attain the best results, and the shaft N should make two, three, or more revolutions to one revolution of the live-spindle, depending upon the number of longitudinal grooves or cutting edges to be formed upon the tap or other cutting-tool; but it is not necessary to give any detail description of this, because every lathe is built with change-gear, and every mechanic skilled in operating a lathe knows how to change the gear to regulate the speed of the live-spindle or of the lead-screw, which reciprocates the carriage upon the ways of the lathe-bed.

I have shown my invention in what I believe to be its simplest and most effective form, but do not desire to limit myself to the specific construction shown, as it is evident that any one skilled in the branch of the art to which this invention relates may by slight modifications and changes adapt it to well-known forms of machines or lathes which are now and have been for a long time in public and common use and described in numerous Letters Patent both before and since the date of the Johnson patent of August 8, 1893.

What I claim is—

1. In an engine-lathe the combination of the carriage, the tool-block fitted to slide thereon and having a bar extending from the rear end of the carriage, a shaft journaled at the rear of the lathe-bed and driven by suitable gearing mounted in the head-stock, eccentrics splined upon said shaft to revolve with it while permitting longitudinal play along said shaft, and suitable connections as shown to couple said eccentrics to the rearwardly-extended bar of the tool-block to impart a reciprocating movement to the tool-block independent of the lead or cross-feed screw, substantially as shown and described.

2. In an engine-lathe the combination of the carriage having a depending bracket at its rear, the tool-holder mounted to slide upon the said carriage and having a rearwardly-extending bar projecting over the depending carriage-bracket, a pivoted guide-bar capable of angular adjustment with relation to the travel of the carriage, a sliding block or shoe to slide upon said guide-bar and connected to the rearwardly-extending bar of the tool-block, a transversely-sliding support upon which the guide-bar is pivotally mounted, a restraining-bar upon which the transverse support is mounted to slide transversely said restraining-bar being fitted to slide longitudinally in the bracket connected to the carriage and having an upturned end to enter a notch in the bed-clamp, the notched bed-clamp capable of being clamped to or released from the lathe-bed, the shaft journaled at the rear of the lathe-bed at each end and connected to suitable gearing mounted in the head-stock, the eccentrics splined upon said shaft, and eccentric-straps and arms connecting the eccentrics with the transversely-sliding support for the purpose of imparting a limited reciprocating movement to the tool-block independent of the lead or cross-feed screw, substantially as shown and described.

3. In combination with a taper lathe of the character described the lathe-bed, the carriage, the tool-holder mounted to slide thereon and having a bar connected to it extending over the rear end of the carriage, the bracket depending from the carriage and having a bar fitted to slide longitudinally in said bracket,

said bar having an upturned end to engage a bed-clamp, the bed-clamp notched to receive the upturned end of the said sliding bar and having a clamping-screw to clamp it to or release it from the bed, an intermediate sliding member fitted to travel longitudinally with said bar but capable of being reciprocated upon said bar, a block mounted on said reciprocating member and having an upwardly-projecting pivot, the guide-bar angularly adjustable on said pivot, the shoe fitted to slide upon said guide-bar and pivotally connected to the rearwardly-extending bar of the tool-holder, a shaft journaled in bearings at the rear of the lathe and having eccentrics splined upon it, eccentric-straps and arms connecting said eccentrics to the intermediate sliding member whereby the tool-block is given a reciprocating movement independent of the movement imparted to it by the guide-bar with its connections, substantially as and for the purpose set forth.

4. In a taper lathe of the character described the carriage, the bracket depending from the rear edge thereof and having in its base a guideway for the restraining-bar, the restraining-bar fitted to slide in said way having an upturned end to engage a notch in the bed-clamp and transverse dovetailed blocks to furnish guides for the reciprocating support for the backing-off attachment, the backing-off attachment having dovetailed ways on its under side to fit said blocks, a support on its upper side having a pivot-pin to enter a hole in the guide-bar, longitudinally-extended perforated arms to receive stud-shafts upon which the arms by which the backing-off support is actuated are journaled, the notched bed-clamp to receive the upturned end of the restraining-bar to lock it to or release it from the lathe-bed when desired, the guide-bar pivoted upon the backing-off attachment, the slip-block fitted to slide on the guide-bar, the tool-block fitted to slide on the carriage and having a rearwardly-extending arm connected to the slipper, the longitudinal shaft journaled in bearings at the rear edge of the lathe-bed, a pinion secured on said shaft and meshing with the gearing of the head-stock whereby the said shaft is actuated, eccentrics splined upon said shaft, arms pivoted upon the stud-shafts in the arms of the reciprocating backing-off support and having eccentric-straps engaging said eccentrics, and the cross-feed screw coupled to the sliding tool-block and moving with it under control of the slipper of the taper attachment whereby the tool-block is moved relative to the work parallel with the guide-bar and at the same time given an independent reciprocating movement controlled by the backing-off attachment, substantially as shown and described.

5. In a taper attachment for lathes the carriage having a depending bracket at its rear, the restraining-bar fitted to slide in said bracket cored out upon its upper face and having transverse dovetailed blocks and an end turned inwardly and upwardly, the support for the backing-off attachment having ways on its under side to receive the blocks on the upper face of the restraining-bar, an upwardly-projecting pivot to enter the guide-bar, the guide-bar pivoted on said support and capable of angular adjustment, and a shoe fitted to slide on said bar and capable of being coupled to the sliding tool-block by which combination of said parts the taper attachment is also adapted to serve as a backing-off attachment without interfering with the functions of the lathe or taper attachment when the backing-off attachment is disconnected, substantially as shown and described.

6. In a taper attachment for engine-lathes the combination of a support for the backing-off attachment interposed and fitted to slide transversely between the restraining-bar and guide-bar of the taper attachment, a shaft journaled in bearings at the rear of the lathe-bed passing through the taper attachment and provided with gearing to revolve said shaft, inner eccentrics splined upon said shaft, outer eccentrics capable of adjustment upon the inner eccentrics for the purpose of regulating the throw of the backing-off attachment, said outer eccentrics having laterally-extending clutch members to engage opposite clutch members extending from sliding collars upon said shaft to lock the inner and outer eccentrics together when the desired adjustment is made, said collars having grooved hubs and yokes fitting the grooves in said hubs to throw the sliding clutch members into and out of engagement with the eccentrics, eccentric-straps fitting said outer eccentrics and having arms connected to the backing-off attachment, substantially as shown and described.

7. In a backing-off attachment for taper lathes the combination of the eccentrics, the outer one of which is provided with clutch members, the sliding clutch members to engage said eccentrics, a shaft journaled in bearings secured to the restraining-bar and held against longitudinal movement in its bearings, said shaft being threaded at each end with a right-hand screw upon one end and a left-hand upon the other, the hand-wheel for revolving said shaft in either direction, yoke-arms adapted to engage the screw-threads on said shaft and bifurcated at their inner ends to enter grooves in the clutch members whereby a movement of the hand-wheel in one direction simultaneously disengages the clutches from the eccentric and when moved in the opposite direction brings the clutches into engagement with the clutch members on the eccentrics, substantially as hereinbefore set forth.

8. In a backing-off attachment for taper lathes in combination with the eccentrics for actuating the backing-off attachment and the sliding clutch-collars for engaging clutch

members on the outer eccentrics, the shaft for actuating said eccentrics, the hand-wheel and coupling secured upon said shaft whereby when the clutches are disengaged and the coupling member disengaged from the head end of said shaft the eccentrics may be adjusted to the angle desired by turning the hand-wheel, and the adjustment retained by coupling the clutches and the shaft-coupling to the gearing of the head-stock by tightening the screw in the hub of the coupling and hand-wheel, substantially as shown and described.

WILLIAM T. S. JOHNSON.

Witnesses:
W. F. MURRAY,
EMMA LYFORD.