(No Model.) 7 Sheets—Sheet 1.

C. M. CONRADSON.

TURRET LATHE.

No. 523,327. Patented July 24, 1894.

Fig. 1.

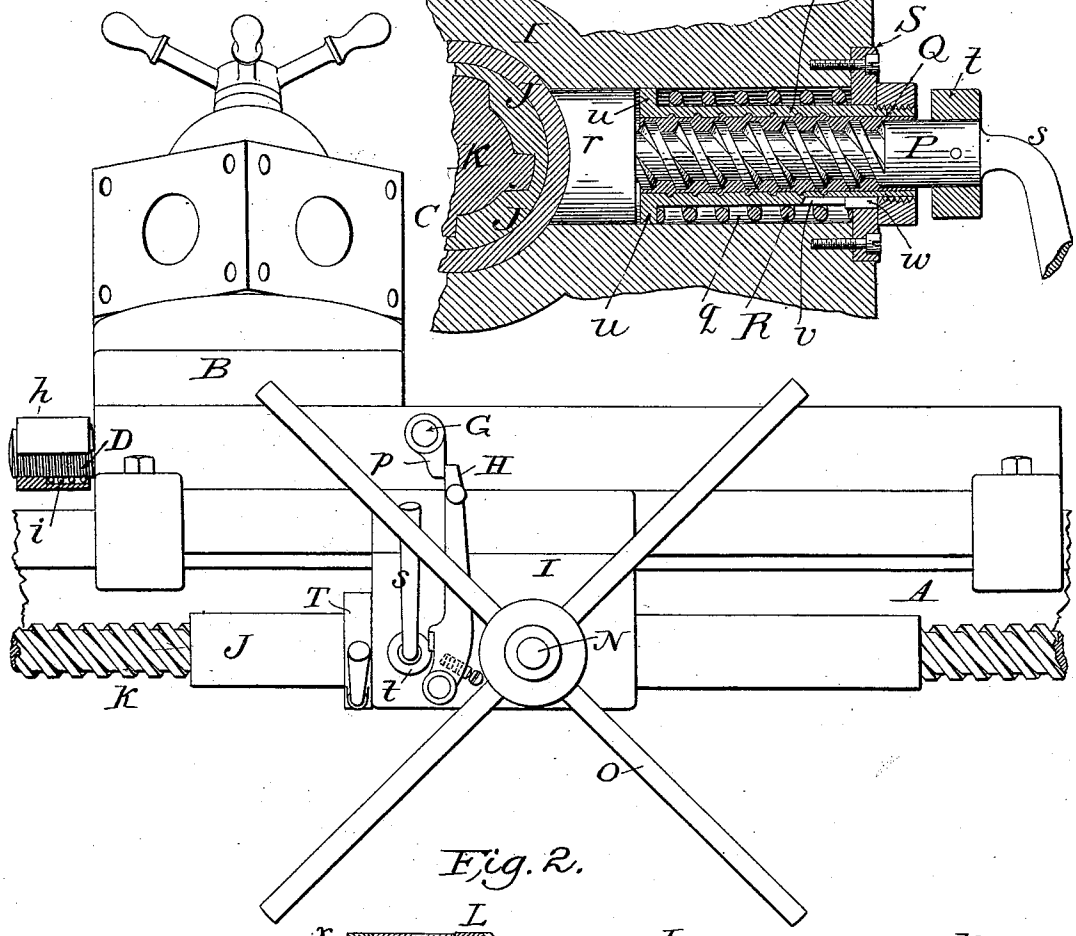
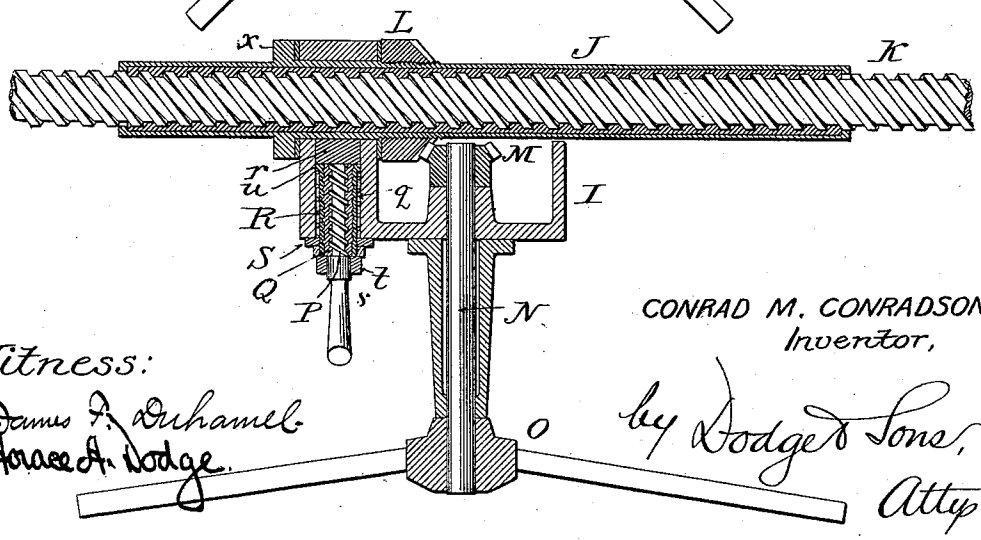


Fig. 3a.

Fig. 2.



Witness:
James F. Duhamel
Horace A. Dodge.

CONRAD M. CONRADSON,
Inventor,
by Dodger & Sons,
Atty.

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C. M. CONRADSON.

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Fig. 3.

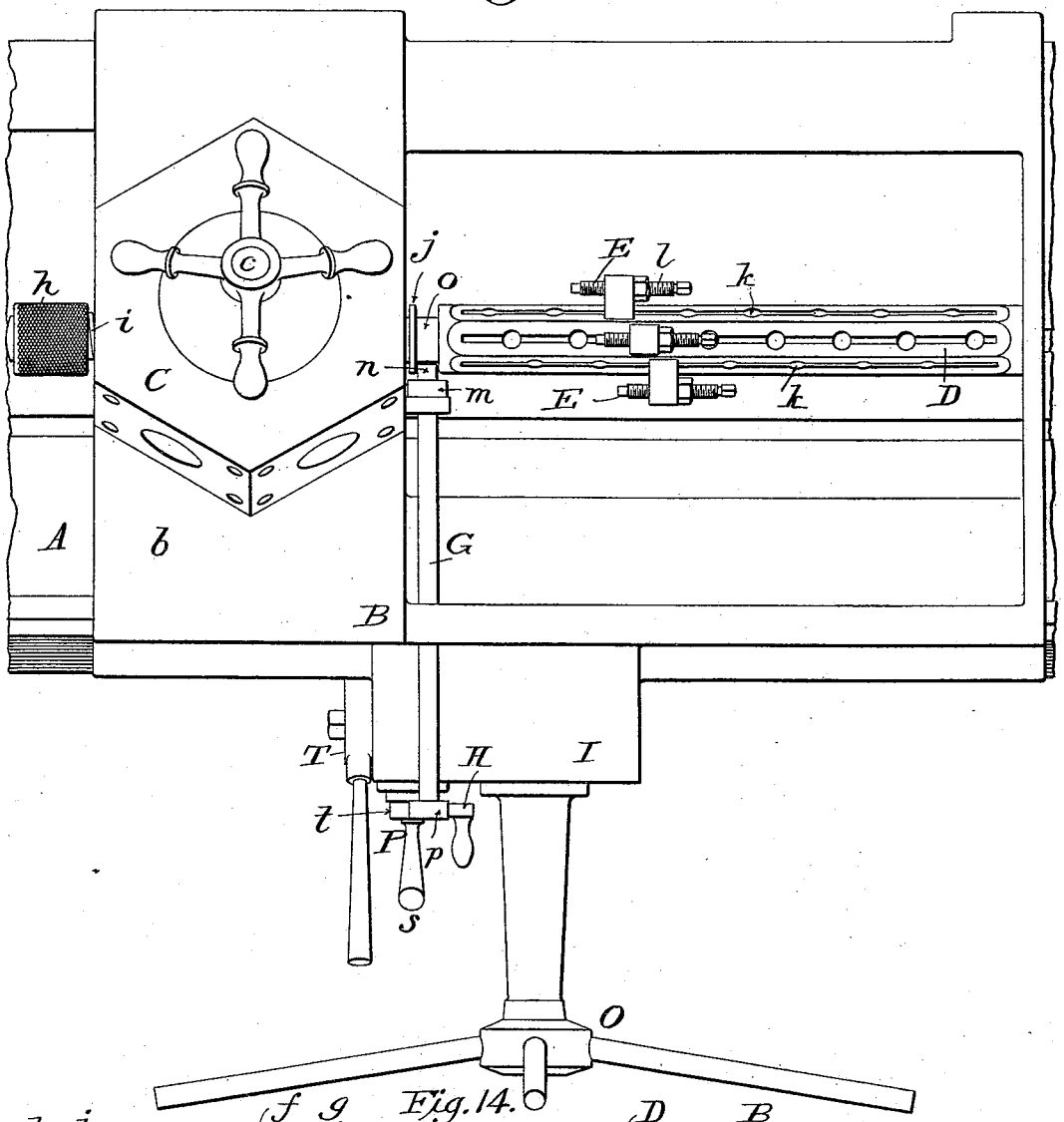
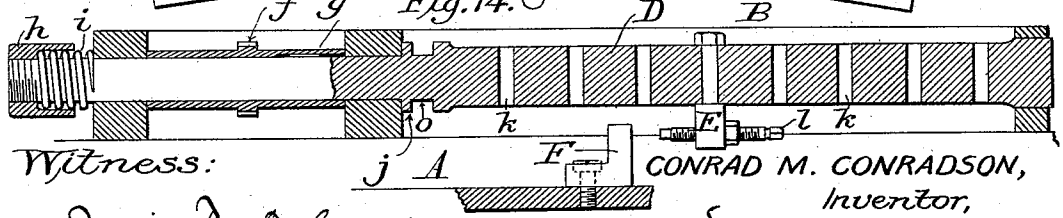


Fig. 14.



Witness:

James F. Duhamel

Horace A. Dodge.

CONRAD M. CONRADSON,
Inventor,

by Dodger & Sons
Attys.

(No Model.) 7 Sheets—Sheet 3.

C. M. CONRADSON.

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Fig. 4.

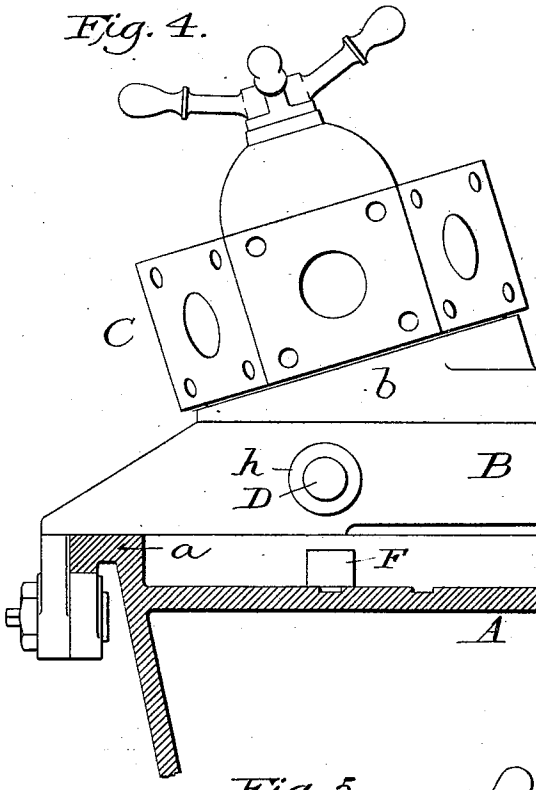


Fig. 6.

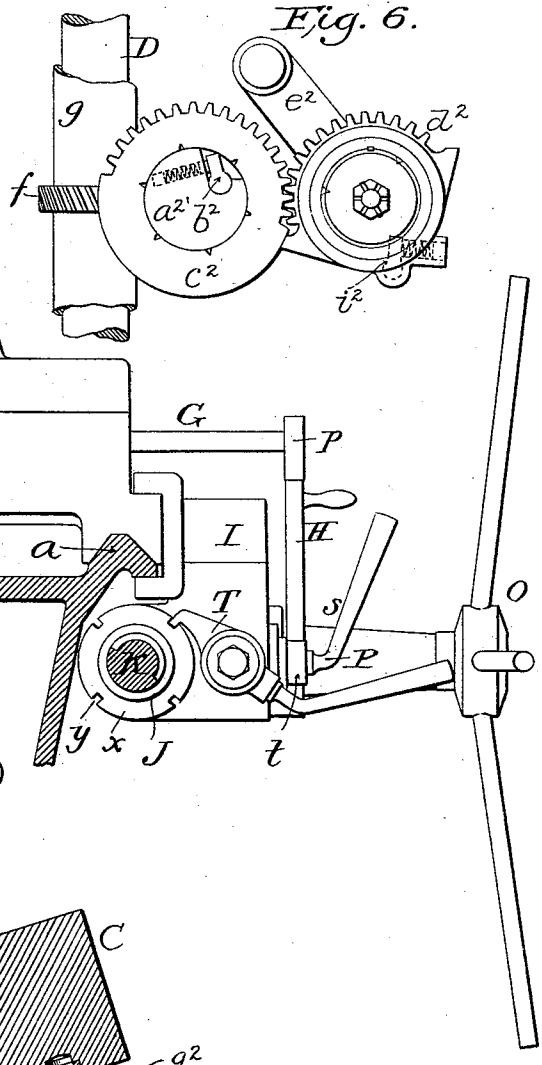
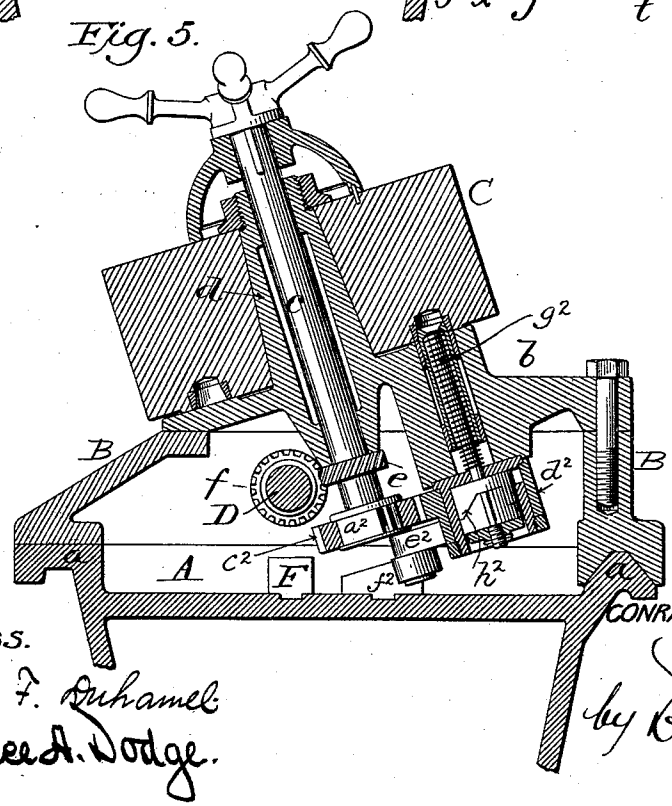


Fig. 5.



Witness.
James F. Duhamel.
Horace A. Dodge.

CONRAD M. CONRADSON,
Inventor,
by Dodger & Sons,
Attys.

(No Model.) 7 Sheets—Sheet 4.

C. M. CONRADSON.

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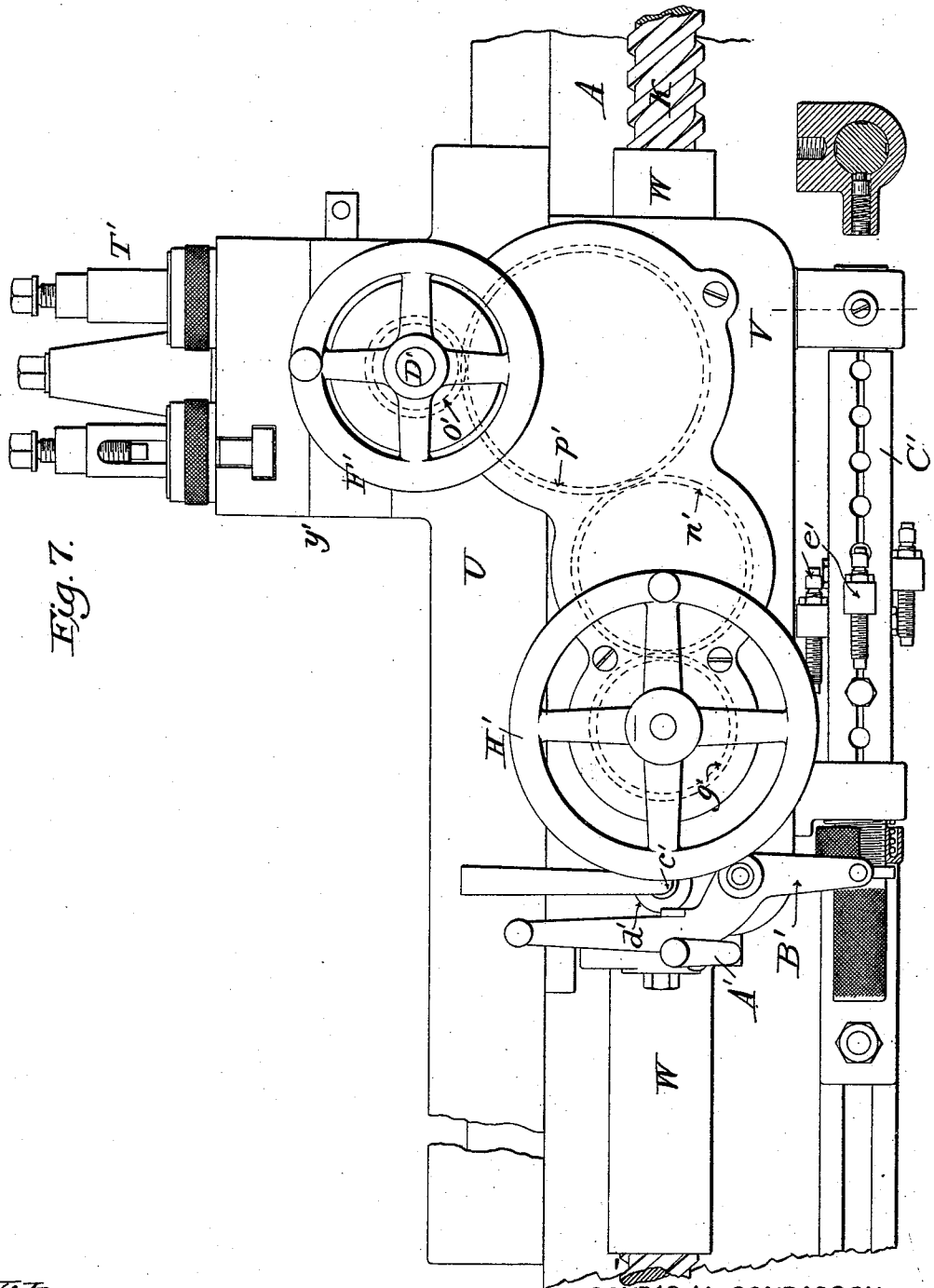

Fig. 7.

Witness:
James F. Duhamel
Horace A. Dodge.

CONRAD M. CONRADSON,
Inventor,
by Dodger & Sons,
Attys.

(No Model.) 7 Sheets—Sheet 5.

C. M. CONRADSON.

TURRET LATHE.

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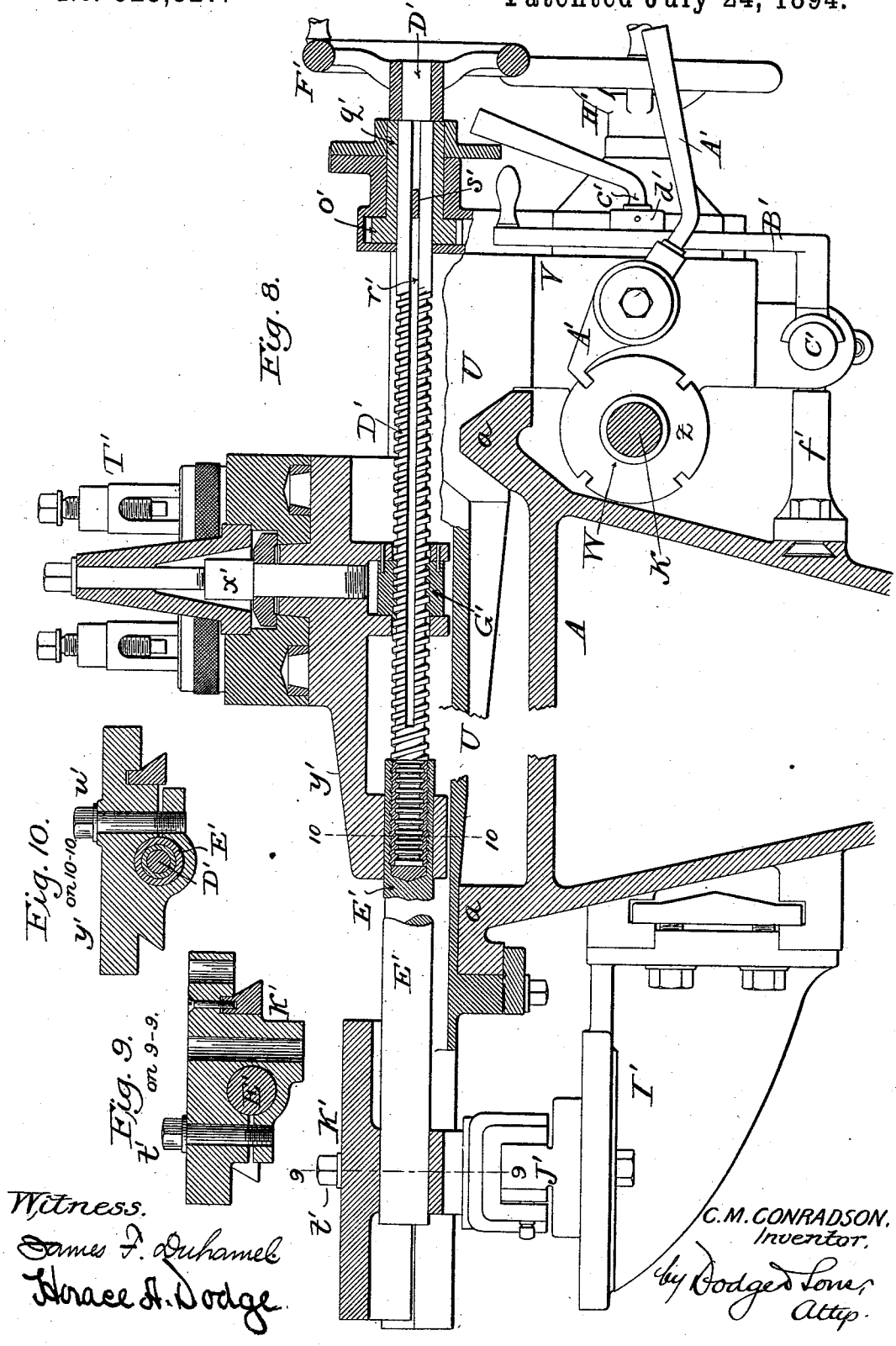

Witness.
James F. Duhamel
Horace A. Dodge

C. M. CONRADSON.
Inventor.
by Dodger & Sons,
Attys.

(No Model.) 7 Sheets—Sheet 6.

C. M. CONRADSON.

TURRET LATHE.

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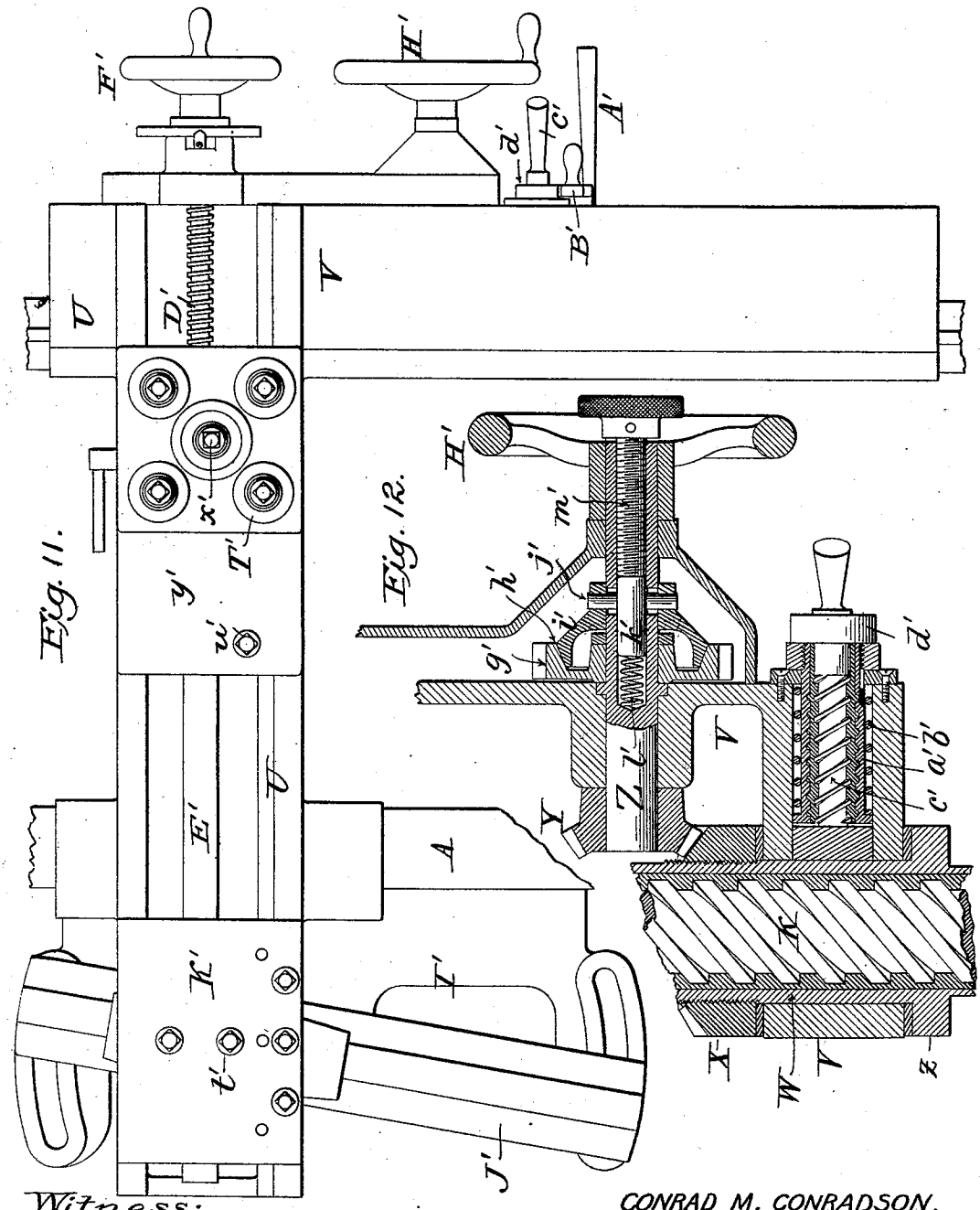

Witness:
James F. Duhamel
Horace A. Dodge.

CONRAD M. CONRADSON,
Inventor,
by Dodger & Sons,
Attys.

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C. M. CONRADSON.

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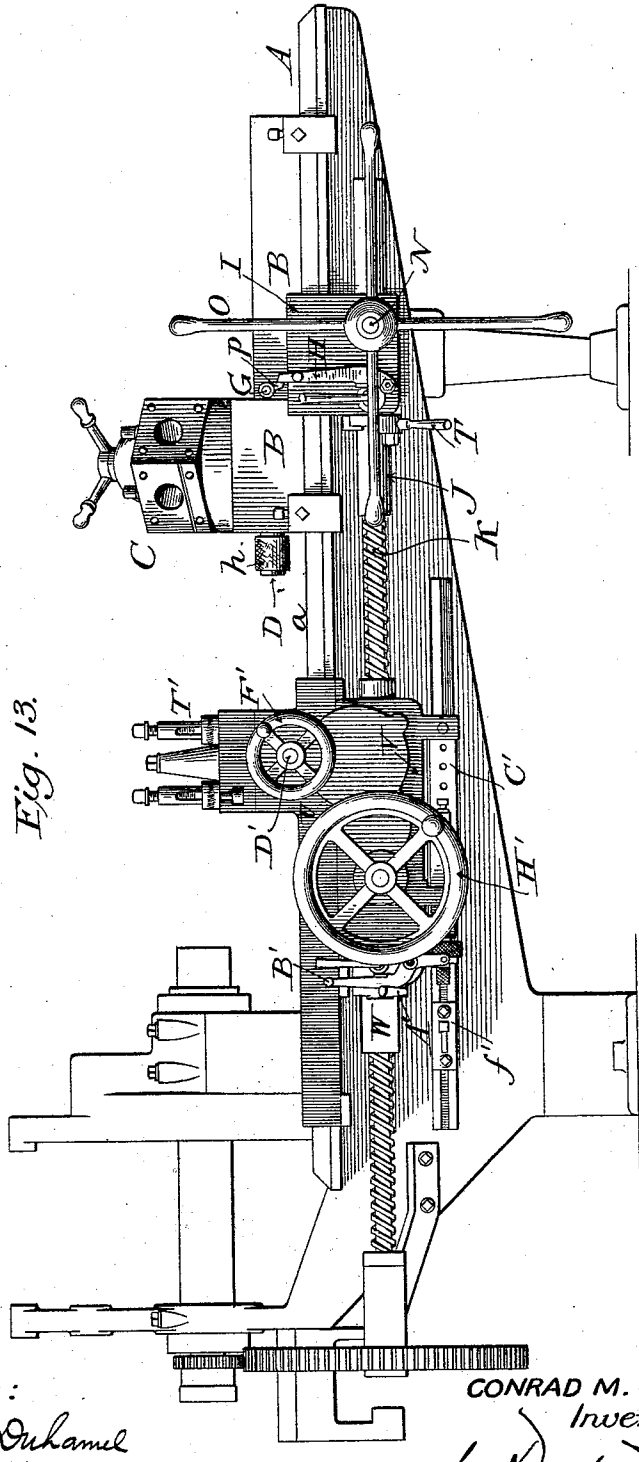

Fig. 13.

Witnesses:
James F. Duhamel
Horace A. Dodge.

CONRAD M. CONRADSON.
Inventor,
by Dodger Sons,
Attys.

UNITED STATES PATENT OFFICE.

CONRAD M. CONRADSON, OF MADISON, WISCONSIN.

TURRET-LATHE.

SPECIFICATION forming part of Letters Patent No. 523,327, dated July 24, 1894.

Application filed March 16, 1892. Serial No. 425,119. (No model.)

To all whom it may concern:

Be it known that I, CONRAD M. CONRADSON, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Turret-Lathes, of which the following is a specification.

My invention relates to turret lathes and similar machines, and consists in various features hereinafter set forth and claimed.

In the drawings,—Figure 1 is a front face view of a portion of a turret lathe showing my improvements for feeding the turret and its apron or bed; Fig. 2, a horizontal sectional view through the hand wheel and attendant parts shown in Fig. 1; Fig. 3, a top plan view of a portion of the machine; Fig. 3ª, an enlarged sectional view of the clamping screw shown in Fig. 3; Fig. 4, a vertical transverse sectional view of the machine taken at one side of the turret; Fig. 5, a vertical transverse sectional view, through the turret; Fig. 6, a bottom plan of the gearing, &c., connecting the turret with the stop bar; Fig. 7, a front face view of tool holder and attendant mechanism; Fig. 8, a transverse sectional view of the same with some of the parts in side elevation; Figs. 9 and 10, vertical sectional views, taken, respectively, upon the lines 9—9 and 10—10 of Fig. 8; Fig. 11, a top plan view of the mechanism for imparting a taper-movement to the tool carriage or holder; Fig. 12, a horizontal sectional view of the devices for feeding the carriage by power or by hand; Fig. 13, a front face view of a turret lathe having my improvements applied thereto; and Fig. 14, a longitudinal sectional view through the stop bar and turret.

A indicates the bed or frame of the machine, having the ways or guides *a a* on its upper face, as usual. Mounted upon these ways or guides so as to be capable of moving lengthwise of the machine, is the turret slide B carrying the turret C. The uppermost plate *b* of the turret slide is provided with an upright but inclined tubular post or stem *d*, as clearly shown in Fig. 5, upon which is journaled the turret. Passing through the post or stem and connected with the turret by the handle is a shaft or spindle *c* which, as shown in Fig. 5, is provided near its lower end with a gear wheel or pinion *e* whose teeth are at an angle of forty-five degrees more or less. This wheel or pinion *e* gears into a corresponding gear or pinion *f* mounted upon a shaft or bar D which I term a stop-bar, said bar being keyed to the pinion so as to turn therewith but at the same time free to move lengthwise therethrough a limited distance, as shown in Fig. 14. The pinion *f* will advisably be formed with a sleeve *g*, as shown in Figs. 6 and 14, so as to prevent its binding upon the shaft when the latter moves lengthwise.

In Figs. 5 and 6 I have shown a means for rotating the turret; a locking pin for holding said turret against turning; and means for withdrawing said pin. Secured to the lower end of shaft or spindle *c* (which carries the gear *e*) is a disk a^2 carrying a pawl b^2 to engage a mutilated gear c^2 when the latter turns in one direction,—said gear c^2 engaging a second mutilated gear d^2 suitably supported on the under face of the turret-slide B. Gear d^2 has projecting from its hub an arm e^2, which when the turret slide moves in one direction, comes into contact with a fixed stop f^2 and thus causes a partial rotation of the mutilated gears c^2 d^2, and also of the turret C. The motion thus given to the turret is by means of the gearing *e f* transmitted to the stop bar or carrier D. The locking pin g^2 has at its lower end a two-part cam h^2, one part of which when rotated, (by the engagement of the pawl i^2 shown in dotted lines in Fig. 6,) acting upon the other and lower part, forces the attached pin g^2 down out of contact with the turret. The parts should be so arranged that the pin g^2 may be withdrawn from the turret before the pawl b^2 locks the gear c^2 to the spindle *c*. The present invention is not to be considered as restricted to the specific means shown for rotating the turret.

The stop bar D to which I have alluded is journaled in the turret slide and is provided at one side of the turret with a hand nut *h*, Figs. 1, 3, 4, and 14, and a coiled spring *i*, and at the other side with a collar *j* (Fig. 3) or other suitable stop, by means of which devices the longitudinal movement or play of the said bar through the base of the turret is regulated and controlled. This bar D, as will be noticed upon reference to Figs. 3 and 14, extends lengthwise of the machine or in the direction of the feed, and is preferably made

angular in cross section in that portion outside of the turret base; the number of faces on the bar corresponding to the faces of the turret. In other words, if the turret has six faces the bar will be provided with six.

To the bar D are applied stops E, which, as shown in Fig. 3, are not only adjustable with reference to the bar by being secured in any one of a number of holes *k*, but are adjustable in themselves by being made in the form of threaded bolts *l*. If the bar be slotted lengthwise instead of being provided with holes, *k*, then the stops need not be made adjustable in themselves. These stops E are designed to come into engagement successively, that is after each partial rotation of the turret and the bar, with a stop or abutment F secured in position in the bed or frame of the machine beneath the said bar, as shown in Figs. 4 and 14. As the bar is geared to the turret, it will, when the turret is turned through an arc of sixty degrees, be also turned through an arc of sixty degrees; or if the turret be turned or rotated through a greater arc, the bar will be correspondingly turned.

The turret is supposed to have different tools on or in its different faces, and of course the stops on the different faces of the bar will be adjusted or secured thereon with reference to the particular tool in the corresponding face of the turret.

As the turret slide moves lengthwise with the bar, relatively to the bed or frame of the machine, that stop E on bar D which is adjusted with reference to the operating face of the turret, will strike the stop F, Figs. 4 and 14, secured to the bed of the machine, and arrest the bar against further longitudinal movement while permitting the turret slide and other parts to move a distance limited or controlled by the nut *h* on the end of the stop bar.

Journaled in the turret slide, at right angles to the stop-bar, is a rock shaft G, carrying at its inner end a radial arm *m* having a roller stud or projection *n*, Fig. 3, which latter projects into a circumferential groove *o* in the stop-bar; one wall of said groove being formed preferably by the collar *j*. At its outer end, the rock shaft is provided with a second arm *p*, as shown in Figs. 1, 3 and 4, to engage the upper end of a locking lever H. When the stop bar is arrested in its movement, as before stated, and the turret slide or carriage continues to travel, the stud or projection *n* projecting into the groove *o*, will cause the shaft to rock or oscillate and throw the radial arm *p* up so as to rock or tip the lever H and thereby automatically disconnect or throw out of action the power-feed mechanism. One advantage of this construction is that in no case can the dead or final stop act until after the feed has been automatically thrown out of action as just stated, thus saving the latter from breakage. In the present case (see Figs. 3 and 14) the distance between the point of action of the dead stop, and feed-disconnecting mechanism, may be varied by turning the hand nut *h*.

The turret slide or carriage is provided on the front side of the machine with a depending apron I in which is journaled the elongated internally-threaded sleeve or nut J, Figs. 1 and 2, adapted to receive the feed screw K which will be driven by any suitable mechanism.

Secured to the nut J is a bevel pinion L which is designed to mesh with a similar pinion M secured to the inner end of the shaft N, which latter carries at its outer end the hand wheel O, Fig. 2.

P indicates a quick-pitch screw which passes through a sleeve or nut Q mounted in a recess *q* in the apron; the said screw bearing at its inner end against a block *r* interposed between the main nut J and the said screw P, and having at its outer end a handle *s* and a notched or shouldered collar *t*, as shown in Figs. 1 and 2. The sleeve or nut Q is shouldered at its inner end as at *u*, to receive a coiled spring R which latter bears at its outer end against a confining plate or cap S secured to the apron. The nut Q is further provided with a groove *v* to receive a key or feather *w* carried by the front plate S, so that while the said nut may move inward and outward, it cannot turn or rotate independently of the screw P. Now when the screw P is turned to the right, the block *r* is pressed against the said nut J sufficiently to prevent the rotation of the said main nut J within the apron. Of course, so long as the main nut J is held against rotation, and the screw K be turned or rotated, the turret-slide will be fed along; but if the pressure of the block *r* upon nut J be relaxed, the nut will turn with the screw and effect no feeding of the turret slide.

When the block *r* is bearing against the nut J with sufficient force to prevent the rotation of the latter, the notch or shoulder of the collar *t* will be in position to be engaged by the lever H,—see Fig. 1,— and by reason of this engagement the screw P is prevented from releasing the block *r* and nut J until the stop bar comes into action as before stated and trips the lever H through the instrumentality of the rockshaft. In order to insure the bringing of the notch or shoulder directly opposite the lever H, the screw P is provided with the sliding nut Q and spring R before mentioned. The screw is designed to lock the block against the feed nut just before the notch or shoulder of the collar *t* comes opposite the lever H, so that by continuing the turning of the screw P, the nut Q will be caused to slide outward, lengthwise through the plate S, and in thus moving outward, compress the spring R. Then of course, when the lever H is tripped the spring serves to carry the nut inward, and thus give an initial backward movement to the clamping screw. The screw being once started, will continue to turn,—owing to the weight of its

handle and the quick pitch of its thread, and release the block *r* and the feed nut J. From this it will be seen that the power feed mechanism of the turret slide will be automatically thrown out of action by each of the different stops upon the stop bar, and at a time in the travel of the turret slide corresponding to the position of such stop on the stop-bar, or, in other words, corresponding to the character of the tool on the operative face of the turret.

When the feed nut J is free to turn, and the feed screw is at rest, the nut may be rotated in either direction by hand after withdrawing lever T, by merely turning the shaft N, thereby causing the turret slide to move in one direction or the other as desired.

The feed nut is provided with a collar *x*, Fig. 4, having four notches *y* adapted to be engaged by a lever T pivoted to the side of the turret-slide apron. When the lever is in engagement with the collar, the nut is prevented from turning, but if the lever be thrown out of engagement with the collar the nut may be turned by the gearing L M to effect the return movement of the turret slide.

By the employment of the notched collar and lever, and by making the number of notches conform or bear a certain relation to the pitch of the feed screw, the cutting tool can be withdrawn from the work, run back, and correctly engaged for the next cut. In the lathe illustrated the feed screw is made with a lead of four inches, and it is apparent that the turret and its tool must move one inch as the collar and its nut turn a distance equal to the space between two notches. By this means it is possible to cut any thread that is an aliquot part of an inch without care or attention on the part of the operator.

By arranging the turret at an angle as shown, the tools in the tool carriage do not interfere with those of the turret thereby enabling both sets to be used at the same time.

The mechanism for imparting motion to the tool carriage is in many respects similar to that employed for giving motion to the turret-slide. This tool carriage slide U is provided with an apron V in which is journaled a rotatable feed nut W to receive the feed screw K that actuates the turret slide. This rotatable feed nut carries a pinion X to engage a similar beveled pinion Y on a shaft Z, and is further provided with a notched collar *z* to be engaged by a lever A′ pivoted to the apron V, as shown in Fig. 8. There is also mounted in the apron a nut *a′*, spring *b′*, and a quick pitch screw *c′* having a notched or shouldered collar *d′* to receive or be engaged by a lever B′ also pivoted to the apron, as shown in Figs. 7 and 8. The screw *c′* and attendant parts are constructed and arranged for operation in the same manner as in their application to the turret slide, and hence their method of operation need not be here repeated.

The lever, B′, which releases the clamping screw *c′* is under the present arrangement adapted to be actuated directly by the stop bar C′, as shown in Figs. 7 and 8; the said stop bar being journaled in the apron and provided with stops *e′* adapted to engage an abutment *f′* secured to the front side of the frame of the machine as shown in Fig. 8.

Mounted loosely upon the shaft Z is a pinion *g′* having on its front side or face, a conical seat *h′* fashioned to receive the conical rim of a disk or plate *i′* which is prevented from rotating independently of the shaft Z by means of a pin *j′* passing transversely through a slot in the shaft, as shown in Fig. 12. This pin *j′* is carried by a block *k′* seated in the hollow shaft, which block is urged outward by a coiled spring *l′* also seated in the shaft. A screw *m′* provided with a knurled head bears at its inner end against the block *k′* and forces the conical surfaces *i′* and *h′* together and in contact, so that when the shaft is rotated the pinion *g′* will turn therewith. If the screw *m′* is turned backward, the spring *l′* throws the plate *i′* out of engagement with the pinion *g′*. The pinion *g′* meshes with another gear *n′* journaled in the apron V and this latter gear *n′* communicates motion to the gear *o′* through an idler *p′* indicated by the dotted lines in Fig. 7. This gear *o′* to which I have just referred is provided with an elongated hub or sleeve *q′*,—see Fig. 8,—and is mounted upon a screw shaft D′ whose inner end is swiveled in a rod E′ at the back of the tool-holder carriage slide *y′*. The shaft is grooved longitudinally as at *r′* to receive a key *s′* carried by pinion *o′*, and carries at its outer end a hand wheel F′ by which it may be turned manually. The screw shaft D′ also passes through a nut G′ carried by the tool holder carriage U, so that when the shaft turns or rotates it will cause the carriage slide *y′* to move back and forth transversely.

The tool holders or clamps T′ are four in number, and are arranged about a vertical spindle or axis *x′* as shown in Fig. 8. A larger or smaller number of tool holders or clamps may be employed but they should correspond in number with the number of stops applied to the stop bar.

So long as the feed nut W remains stationary and the feed screw K is rotated, the carriage U will be fed lengthwise of the machine until the stop *e′* on the stop bar C′ engages the abutment *f′* and causes the tripping of lever B′ and the release of screw *c′*; whereupon the feed nut W will rotate with the feed screw and prevent further power feed of the carriage U. The carriage with its slide *y′* may be fed lengthwise of the machine by hand through wheel H′ and the gearing X, Y, and shaft Z. During all this time the screw shaft D′ remains at rest as the pinion *g′* is mounted loosely upon the shaft Z, and would not turn therewith even though the shaft Z be turned by hand. The screw shaft D′ is, however, free to be turned or rotated should

it be desired to move the carriage slide y' transversely of the machine by hand. But should it be desired to move the carriage slide back and forth transversely by power, the clamping screw c' is released, thereby permitting the feed nut W to turn or rotate with the feed screw K. The small screw m' is now turned so as to connect the disk or plate i' with the pinion g', thereby connecting the said pinion with the shaft Z. Now as the nut W rotates with the screw K, the bevel pinion X turns the bevel pinion Y and causes the rotation of shaft Z, and as the pinion g' is locked to the said shaft the said pinion g' and the intermediate gears n' p' communicate motion to the gear o' keyed to shaft D'.

The feed screw K has a lead of four inches,—a very quick pitch,—and hence when the nut W is released, and the screw rotated, the friction between the screw and the nut is sufficient to cause the nut to turn with the screw as above described.

Secured to the rear side of the machine is a bracket I' which carries a guide rail J' designed to be set upon the bracket at an angle or inclination to the length of the machine, as shown in Figs. 8 and 11. Mounted upon the rail or guide, and also upon the carriage U, is a block K' which is designed to receive the rear end of the rod E', a suitable clamping screw t' Fig. 9, being employed to connect the rod to the block. The carriage slide y' is also provided with a hole or opening at the rear side to receive the forward end of the rod E' which latter is designed to be clamped to the slide by the bolt u' as shown in Fig. 10. When it is desired to use this taper feed, the bolts t' u' are tightened so as to lock the rod E' firmly to block K' and the slide y', so that block K' and the slide y' may move together, and as the carriage U is fed along lengthwise of the machine, its slide y' will move transversely across the machine at the same, and at an angle or taper corresponding to the angle of the rail or guide J'. The screw D' during this action is not turned or rotated, but slides lengthwise through its pinion o'.

When the machine is used on parallel or straight work, the bolt u' is loosened and the bolt t' tightened so that the slide y' may move back and forth upon the rod E', in which the screw is swiveled; the rail J' being previously straightened parallel with the axis of the main feed screw.

Having thus described my invention, what I claim is—

1. In combination with the bed or frame, a slide or carriage movable lengthwise thereof, a carriage feed mechanism, a turret or tool post mounted upon the carriage, a stop secured to the machine, and a stop bar carried by the tool-post carriage to engage the fixed stop and throw the carriage feed mechanism out of action said stop bar being arranged lengthwise of the machine or in the direction of the feed.

2. In combination with the bed or frame, and a fixed stop thereon, a carriage movable upon the bed, a rotatable stop bar journaled in the carriage, a rotatable tool-post or turret geared to the stop bar, and a feed mechanism adapted to be thrown out of action by the arrest of the stop bar.

3. In combination with the bed or frame, the fixed stop thereon; a carriage and a feed mechanism therefor; a turret a stop bar geared to the turret and adapted to move lengthwise relatively to the carriage in which it is mounted, and intermediate connections substantially such as shown and described for throwing the feed mechanism out of action upon the longitudinal movement of the carriage relatively to the stop bar.

4. In combination with the bed or frame A, a tool post carriage movable thereon, a tool post, a stop bar geared to the turret or tool post, a stop with which the stop bar is designed to engage, a screw K for feeding the carriage, a nut carried by the carriage and receiving the screw, and means for holding the nut against rotation, thrown out of action by the engagement of the stop bar with the fixed stop.

5. In combination with frame A carriage B, and turret C, a fixed stop F, a rotatable and slidable stop bar D journaled in the carriage and geared to the turret, the feed screw K, the nut J journaled in the carriage, a clamping device for the nut, a rockshaft G having an arm m to engage the stop bar, and an arm p to actuate a locking lever H for the clamping device.

6. In combination with frame A and fixed stop F; carriage B and turret C; rotary stop bar D geared to the turret and provided with groove o, a rockshaft G provided with arms m and p, a feed screw K for the carriage, a rotary feed nut J journaled in the carriage, a clamping screw P for the nut, provided with a notched collar t, the sliding nut Q and spring R, and the lever H to engage the notched collar and adapted to be released by the arm p.

7. In combination with the feed screw K and its nut J, the apron provided with a socket q and a cap plate S, a flanged nut Q mounted in the socket and held against rotation by a key w, a spring R acting upon the nut; a block r at the inner end of the nut; a quick pitch screw P passing through the nut and bearing upon the block, and provided with a notched collar t, a lever H engaging the collar, and means, substantially such as shown and described for moving the lever and releasing the screw P.

8. In combination with the bed or frame, and a fixed stop thereon; a carriage movable upon the bed; a rotatable stop bar journaled in the carriage and having a longitudinal movement independent of the carriage; a turret geared to rotate with the bar; and a carriage-feed-mechanism adapted to be thrown out of action by the stop bar.

9. In combination with bed or frame A and a

traveling tool-post carriage, a feed screw K therefor, a rotatable feed nut journaled in the carriage, and provided with a notched collar, and a lever pivoted to the carriage and adapted to engage the collar.

10. In combination with a bed or frame and a traveling carriage, a fixed stop on the frame, a stop bar journaled in the carriage and provided at one end with a hand nut and a coiled spring whereby the longitudinal movement of the carriage relatively to the stop bar may be controlled.

11. In combination with bed or frame A and carriage U, a tool post slide y' mounted upon the carriage, a screw D′ provided with hand wheel F′ for moving the slide transversely a feed screw and nut for the carriage,—said nut being rotated by frictional engagement with the screw,—and intermediate connections between the nut and screw shaft D′, whereby the said shaft may be actuated by hand or power, as desired.

12. In combination with bed or frame A and carriage U, a tool-post slide y' mounted upon the carriage, a screw D′ having a hand wheel F′ for moving the slide transversely, a feed nut W and feed screw K for causing proper travel of the carriage, a hand wheel H′ and shaft Z adapted to turn or rotate the nut, a gear wheel g' mounted upon shaft Z, intermediate gearing between the gear g' and the screw shaft D′, and a clutch for connecting the said gear wheel g' with the shaft.

13. In combination with the frame A and carriage U, a stop f' secured to the frame, a stop bar C′ provided with stops e' and journaled in the carriage, a rotatable feed nut W and screw K; a clamping screw c' for the nut W, and a lever B′ mounted upon the carriage, and engaging the screw, and adapted to be acted upon directly by the stop bar.

14. In combination with frame A and carriage U, the rotatable feed nut W and screw K, bevel pinion X secured to the nut, a hollow shaft Z provided at one end with pinion Y and at the other end with hand wheel H′, a gear wheel g' mounted loosely upon the shaft, a disk i' rotating with the shaft and adapted to engage the gear g', the screw m' for locking the gear to the disk, a tool-post slide movable transversely upon the carriage, a screw shaft D′ for actuating the slide, and gears n' o' p' connecting the shaft D′ with the gear g'.

15. In combination with frame A, having inclined bar J′, the carriage U provided with tool-post slide y', a block K′ mounted in the carriage, and engaging the rail, a rigid connection E′ between the block and slide, a feed screw D′ for the slide a pinion o' adapted to receive motion from a power mechanism to actuate the slide, and a sliding connection between the screw shaft D′ and its pinion o'.

16. In combination with frame A having inclined bar J′, the carriage U provided with block K′ and slide y', a rod E′ connecting the block and slide, and a screw shaft D′ swiveled at its inner end in the rod and provided at its outer end with a hand wheel.

17. In combination with frame A having inclined bar J′, the carriage U provided with block K′ and slide y', a rod E′ extending from the block to the carriage, and clamping screws t' and u' by means of which the rod may be connected with and disconnected from the block and slide.

18. In a turret lathe, the combination with the main frame; of a turret slide; a turret mounted upon the slide; a stop carrier or bar; adjustable stops carried by said bar; and means connecting the turret with the stop carrier or bar, substantially as and for the purpose set forth.

19. In a turret lathe, the combination with the main frame; of a stop secured thereto; a turret slide or carriage; a turret mounted upon the slide and adapted to rotate thereon; and a stop carrier or bar provided with adjustable stops and geared to rotate with the turret to bring the adjustable stops successively into working position.

20. In a turret lathe, the combination with the main frame, and a stop secured thereto; of a turret slide having a turret revolubly mounted thereon; the stop bar journaled in the turret slide and carrying adjustable stops; and means connecting the turret with the stop bar to have corresponding movements.

21. In combination with the turret slide; the turret revolubly mounted thereon; an independent stop bar or carrier; adjustable stops carried by said carrier; and means actuating the stop-carrier with the turret.

22. In combination with the main frame having a fixed stop; the turret slide; the turret mounted thereon; a stop bar or carrier arranged with its axis in the line of travel of the slide and provided with stops, and means actuating the stop-carrier with the turret.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CONRAD M. CONRADSON.

Witnesses:
JOHN T. LYDON,
W. R. BAGLEY.