No. 670,910. Patented Mar. 26, 1901.

# W. H. BAUSH.

## FEEDING DEVICE.

(Application filed Dec. 4, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

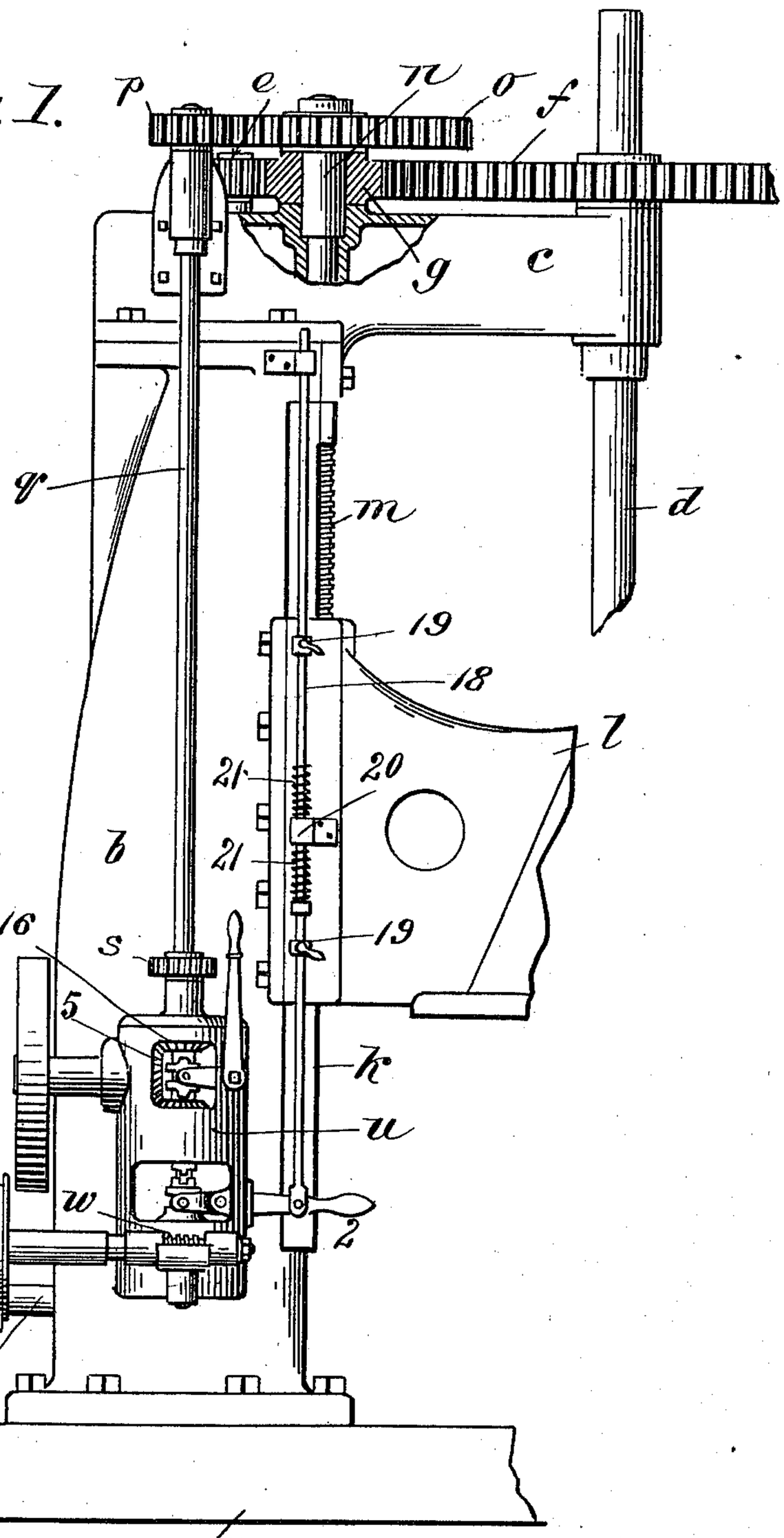
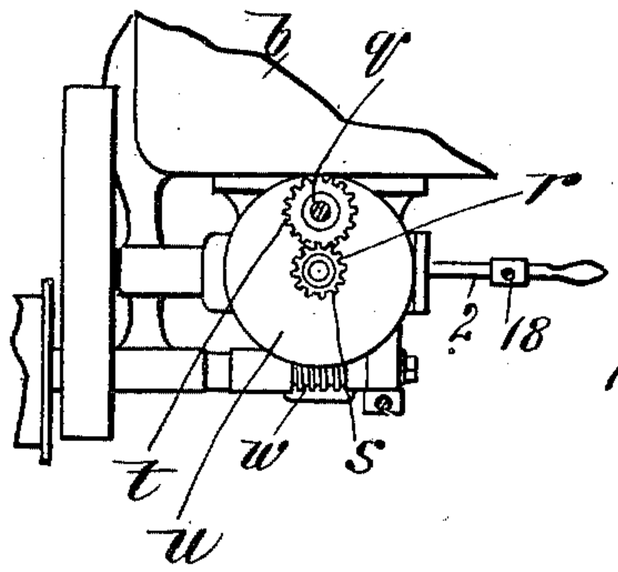



Fig. 1a.

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2 Sheets—Sheet 2.

Fig. 2.

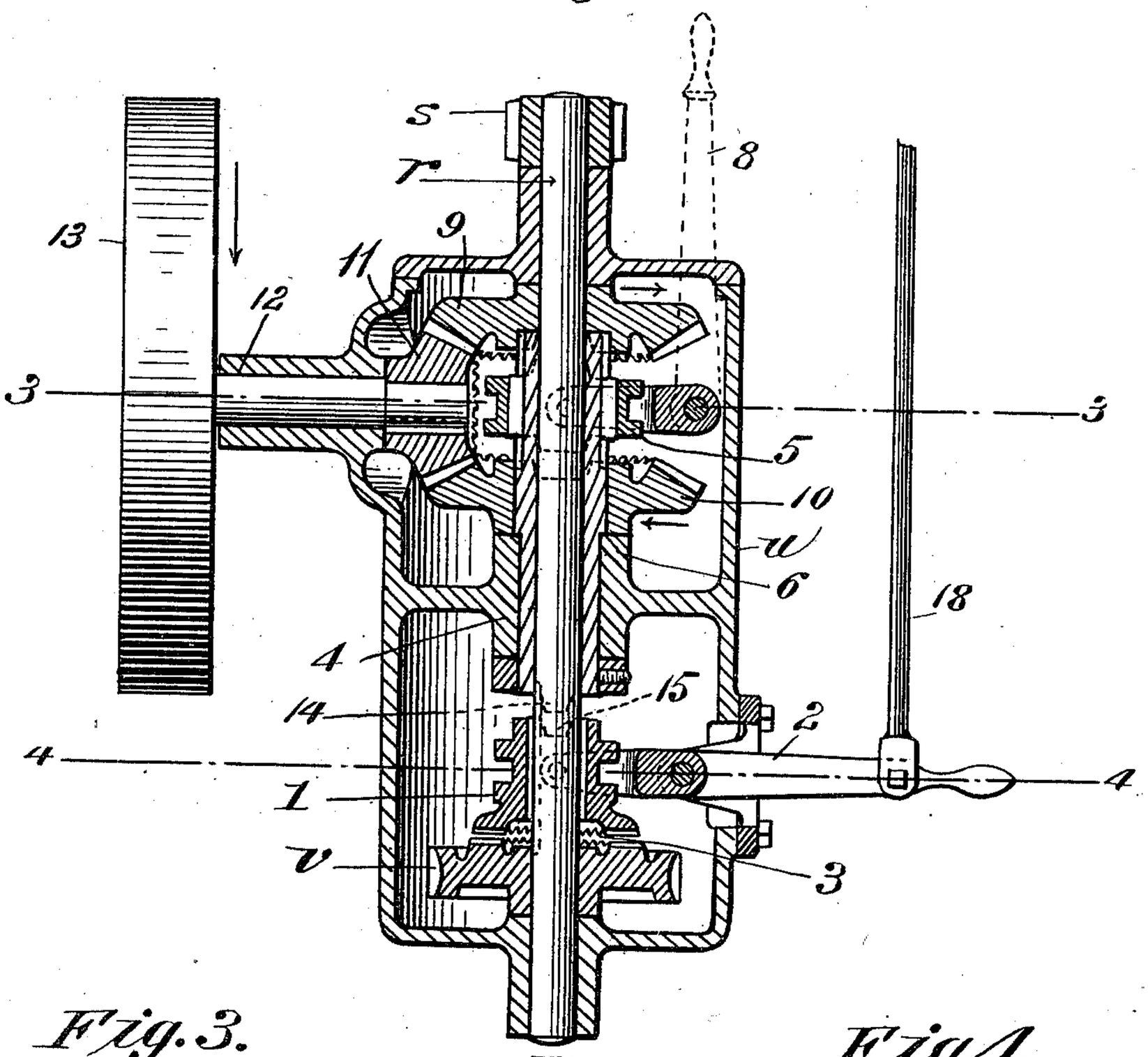



Fig. 3.

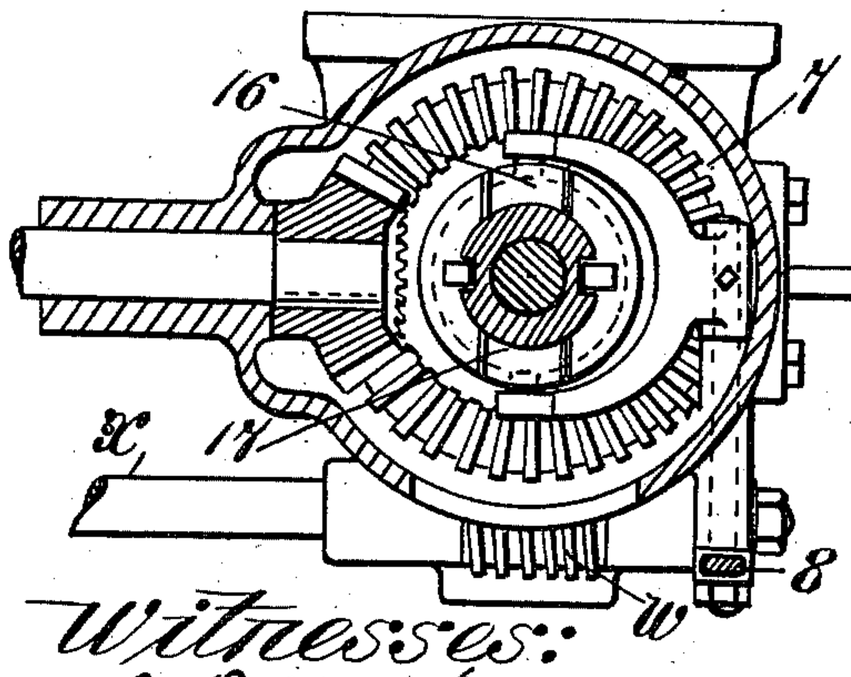
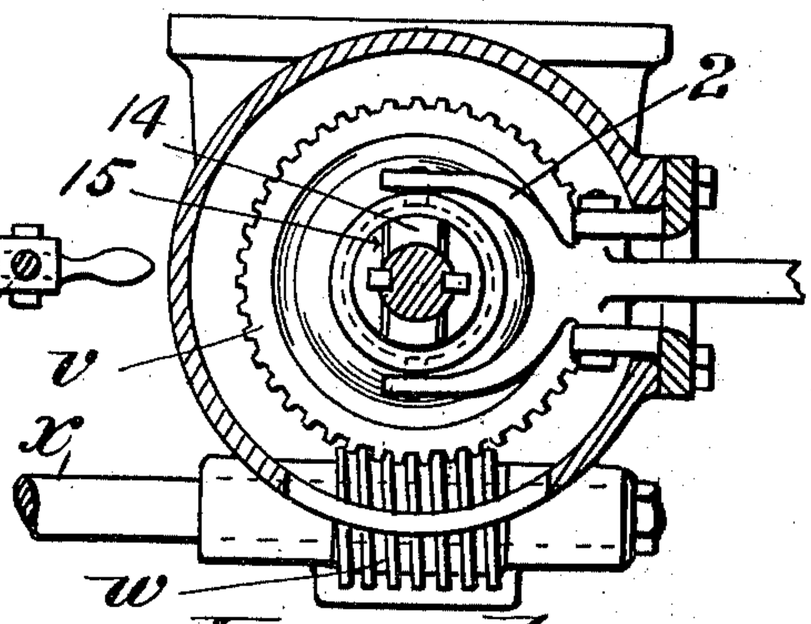



Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## FEEDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 670,910, dated March 26, 1901.

Application filed December 4, 1900. Serial No. 38,664. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. BAUSH, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Feeding Devices, of which the following is a specification.

This invention relates to feeding devices for machine-tools, and has special reference to devices of this character for imparting a feed movement to the head of a multiple drilling-machine, whereby the requisite slow feed may be obtained in one direction and a quick return in the opposite direction, together with means connected with the feeding devices for automatically shifting from one speed to the other at the end of a feed movement in either direction and with manually-operated shifting devices whereby the quick-feed movement may be imparted to said movable head in either direction.

The invention consists in the construction fully described in the following specification and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of a part of a multiple drilling-machine embodying my invention. Fig. 1ª is a top plan view of that part of Fig. 1 which contains the variable-speed mechanism. Fig. 2 is a vertical section on line 2 2, Fig. 1ª. Fig. 3 is a cross-section taken on line 3 3, Fig. 2. Fig. 4 is a cross-section on line 4 4, Fig. 2.

Referring now to the drawings, in which like characters indicate like parts in the various figures, *a* indicates the base of the machine, which is provided with an upright standard *b*, bolted thereto. To the upper end of this standard is secured the arm *c*, extending out over the base *a* and serving as a support for the main drill-driving shaft *d*, which is driven by a vertical shaft *e*, (see Fig. 1,) with which it is connected by the gears *f g h*, the former being secured on said shaft *d* and the latter on the shaft *e*, the gear *g* being merely an intermediate gear. Said vertical shaft *e* extends downward inside of the standard *b* and by bevel-gears (not shown) is connected with the counter-shaft *i*, on which is a cone-pulley *j*, whereby rotary movements are imparted to the drill-driving shaft *d* in the manner common to machines of this class.

The above-described construction is common to a variety of machines of this class.

Mounted upon suitable slideways *k* of the standard *b* is a sliding head *l*, a portion of which only is shown in Fig. 1. This head *l* in a multiple drilling-machine acts as a support for the several drills driven by the shaft *d*. In other machines to which this invention is applicable it might be a tool-holding head movable on said slideways *k*. To move the head *l* vertically, a feed-screw *m*, Fig. 1, engages with a suitable nut in said head, and by mechanism to be described for rotating said feed-screw the head may be moved vertically in either direction. The driving mechanism for the feed-screw *m* is constructed as follows: Said screw extends upward to the arm *c* and through a bushing *n*, on which the gear *g* rotates, and at the upper end of the screw *m* a gear *o* is fixed. This gear meshes with a smaller gear *p*, secured to the upper end of the driving-shaft *q*, parallel with the feed-screw *m*, whose lower end is stepped in a suitable bearing on the standard *b*. Parallel with the shaft *q* and near the lower end thereof is the shaft *r*. (Clearly shown in Figs. 2, 3, and 4.) This is, in effect, a counter-shaft and is operatively connected with the shaft *q* by means of the gear *s*, the latter meshing with the gear *t* on the counter-shaft, as shown in Fig. 1ª. Rotary movements at variable speeds and in opposite directions may be imparted to this counter-shaft and through the above-described connections to the feed-screw *m*. The driving and speed-changing mechanism of this counter-shaft is constructed as follows: The shaft *r* is supported in a box-like structure *u*, secured to or cast on the side of the standard *b*, near the lower end thereof, and in suitable bearings at the upper and lower ends of *u* the shaft *r* is supported in a position substantially central thereof. Said box-like structure *u* serves as a housing for the various gears and other parts of the mechanism to be described. The worm-gear *v* turns loosely on the shaft *r*, near the lower end thereof, and is engaged by the worm *w* on a shaft *x*, provided with the cone-pulley *y*, which lies opposite another similar reversed cone *z* on the shaft *i*. A belt running over said cones will by the rotation of the shaft *i* rotate the counter-shaft *r*, the vertical driving-shaft *q*, and through

the described gear connections the feed-screw *m*. Above said gear *v* a clutch member 1 is splined on the shaft *r*. This clutch member may be moved vertically on said shaft by means of the forked clutch-lever 2, and it has formed on the lower end a series of clutch-teeth 3, adapted to enter similar teeth on the upper side of the gear *v*, whereby when the clutch is thrown into engagement with the gear the counter-shaft *r* may be rotated, and when it is thrown out of engagement with the gear, as shown in Fig. 2, said shaft will remain stationary, the worm-gear *v* rotating idly thereon. On the shaft *r*, above the clutch member 1, is a loose sleeve 4, onto which is splined a second clutch member 5, having a vertical sliding movement thereon and rotating therewith. Said sleeve is supported in a bearing 6, cast within said housing *u*, and is held in proper position in said bearing, whereby endwise movement thereof is prevented. The said clutch member 5 may be given vertical movements on the sleeve 4 by engagement with a forked clutch-arm 7 (shown in Figs. 2 and 3) and secured to a shaft which extends to a point outside of the housing, on the end of which shaft is a lever 8, (shown in dotted lines in Fig. 2,) whereby said clutch may be operated. Above and below the clutch are located the bevel-gears 9 and 10, one loose on the sleeve and the other loose on the shaft *r*. These two gears, in connection with a pinion 11, keyed to a shaft 12, driven by pulley 13, form a part of the quick-speed reversible driving mechanism of the counter-shaft, and either of the gears 9 and 10 may have a positive rotative engagement with the clutch member 5 by means of the engagement of the projections 16 on the clutch member with similarly-shaped depressions 17, formed in the said gears 9 and 10. The clutch member 5, with the projections 16 thereon, is shown in Fig. 1 in side elevation and in plan in Fig. 3.

The lower end of the sleeve 4 and the upper end of the clutch member 1 may be brought into positive rotative engagement one with the other by means of the depending lugs 14 on the lower end of the sleeve 4 becoming engaged in the slots 15, cut in the upper edge of the clutch member 1. These parts may be clearly seen by referring to Figs. 1 and 4 and are also shown in dotted lines in Fig. 2.

When the clutch-lever 2 is operated to effect the engagement of the clutch member 1 with the sleeve 4, said clutch member becomes disengaged from the slowly-rotated driving-shaft *d* and becomes rotatably engaged with the more rapidly rotated sleeve 4. Thus the counter-shaft *r* may be rotated by the movement of the clutch member 1 at two different speeds by the shifting of said clutch.

The gears 9 and 10, together with the pinion 11 and the clutch 5 on the sleeve 4, constitute the reversing high-speed mechanism. The pulley 13 is driven from a source independent of the counter-shaft *i* and is adapted to rotate the sleeve 4 at a relatively rapid speed. If now the clutch member 5 is moved upward into engagement with the gear 9, then, assuming the pulley 13 to be rotating in the direction of the arrow, the pinion 11 will drive the gear 9 in the direction of the arrow shown in Fig. 2, and said gear through the spline-and-groove connection of the clutch 5 with the sleeve 4 will rotate the latter. This is assuming, of course, that the clutch member 1 would be out of engagement either with the sleeve 4 or the worm-gear *v*. If now the clutch member 5 be thrown down into engagement with the gear 10, the sleeve 4 would be rotated in an opposite direction without change of speed. When the clutch 5 is brought back to the position shown in Fig. 2, whereby both gears 9 and 10 may turn idly, then by the manipulation of the clutch-lever 2 the clutch 1 may be thrown down into engagement with the worm-gear *v*, whereupon the rotation of the shaft *r* at a very much reduced rate of speed will take place.

When it is desired to use the above-described mechanism to impart to the head *l* a slow down feed and a quick return and which may operate automatically to shift the clutch-lever 2, whereby at the end of the slow down-feed movement the clutch 1 may be disengaged from the worm-gear *v* and become interlocked with the more rapidly rotating sleeve 4, turning in the opposite direction, a vertically-moving rod 18, supported on the sides of the standard *b* and adapted to have a vertical movement, is secured by its lower end to the arm 2, and movable collars 19 are applied to said rod, which by the engagement at the end of the down-feed movement of the head of a short arm 20, secured on the side of the latter and through which the rod 18 passes, with one of said collars 19 the rod 18 may be given the aforesaid endwise movement, and thereby operate the clutch-arm 2 to disengage it from the worm-gear *v* and throw it into engagement with the lower end of the sleeve 4, which has been set to rotate in the opposite direction to the gear *v*, thus stopping the slow down feed and changing the rotation of the shaft *r*, and consequently of the feed-screw *m*, to a quicker feed in the opposite direction.

By holding the clutch member 1 in engagement with the sleeve 4 and by manipulating the clutch 5, whereby said sleeve may be rotated in different directions, the head *l* may be moved up and down on the slideways *k* at will.

While the clutch 1 is in engagement with the worm-gear *v* the clutch 5 cannot be operated to engage the counter-shaft *r*, for the sole driving connection between the counter-shaft and the sleeve 4, with which the clutch has a spline-and-groove connection, is through the medium of the clutch member 1, which

cannot be thrown into engagement with the sleeve 4 without being thrown out of engagement with the worm-gear *v*, and vice versa.

On each side of the arm 20 on the clutch-operating rod 18 is a spring 21, the upper one resting on the said arm and the lower one attached thereto by its upper end. When the head *l* descends, the spring 21, which comes in contact with the lower collar 19 and is more or less compressed before the pressure of the descending head, will force said rod downward and operate the clutch-lever 2. At the moment said lever releases the clutch member 1 from its engagement with the worm-wheel *w* the reaction of the spring 21 will tend to throw the said clutch upward into engagement with the lower end of the sleeve 4, which, as stated, runs in an opposite direction to and at a higher rate of speed than the worm-gear *w*, and thus rotates the feed-screw at a comparatively rapid rate in a direction which will carry the head *l* upward again.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination in a machine of the class described, of a feed-screw, a driving-shaft and a counter-shaft supported on the machine, the latter having a driving engagement with said driving-shaft, and the driving-shaft with said feed-screw, a sleeve and a gear-wheel on said counter-shaft each having independent driving means for rotating them at different speeds; a clutch on the counter-shaft rotatable therewith and having a sliding movement thereon, and movable into engagement either with said sleeve or said gear-wheel, whereby said counter-shaft may be rotated at two different rates of speed, combined with means for reversing the direction of rotation of the sleeve independently of the position of said clutch, substantially as described.

2. In a machine of the class described, a sliding head, a suitable support therefor, a feed-screw engaging said head, a counter-shaft and connection between the latter and said feed-screw, a clutch on said shaft, slidable thereon and rotatable therewith, high and low speed rotating mechanisms on the counter-shaft located respectively on opposite sides of said clutch; means for operating said clutch by the movements of said head, whereby the latter at the end of its movement in one direction will disengage the clutch from one of said counter-shaft-rotating mechanisms, and effect its engagement with the other, combined with means independent of said clutch mechanism for reversing the direction of rotation of the said high-speed counter-shaft-rotating mechanism, substantially as described.

3. In a feeding device of the class described, a feed-screw, a counter-shaft, a clutch slidable thereon and rotatable therewith, two driving members on said shaft located one on each side of said clutch, and provided with clutch-engaging means, said members consisting of a sleeve rotatable loosely on the shaft, and a gear-wheel also rotatable loosely thereon; means for rotating said sleeve in opposite directions, and means for rotating said gear-wheel at a different speed in one direction; a member connected with said clutch for moving it into engagement either with said sleeve or said gear-wheel, mechanism for reversing the direction of rotation of said sleeve, and suitable connections between said counter-shaft and feed-screw, substantially as described.

4. In a feeding device of the class described, a feed-screw, a variable-speed counter-shaft whereby said screw is rotated, a sleeve on said shaft, means for rotating the latter in opposite directions, a clutch on said counter-shaft slidable thereon and rotating therewith and adapted to engage said sleeve, a rotating clutch member loose on the counter-shaft, and adapted to be engaged by said clutch, and means for moving the clutch into engagement either with said sleeve or said loose clutch member, whereby rotary movements may be imparted to the counter-shaft in either direction at different speeds, and suitable connections between said counter-shaft and said feed-screw, substantially as described.

5. A feed mechanism of the class described comprising a feed-screw, a counter-shaft and suitable connections between the latter and said screw, a clutch on said shaft slidable thereon and rotatable therewith, a high and a low speed rotating mechanism for said counter-shaft located thereon, one on each side of said clutch, independent driving means for each of said speed mechanisms, and means for shifting said clutch out of engagement with one of said mechanisms and into engagement with the other during the rotation of both, in combination with a second clutch whereby the direction of rotation of said high-speed mechanism may be reversed, substantially as described.

6. A two-speed mechanism of the class described comprising a driving-shaft, a counter-shaft rotatively connected therewith, a driving-clutch for the counter-shaft movable endwise thereon and rotating therewith, a sleeve loose on the counter-shaft, a clutch on the sleeve, two bevel-gears, and means for effecting the engagement of said clutch on the sleeve with one or the other of said gears; an intermediate gear in mesh with both of the aforesaid gears whereby they are rotated in opposite directions, and a pulley for rotating said intermediate gear; a gear-wheel loose on the counter-shaft and adapted to be engaged by the clutch on the latter; and means for effecting the engagement of said clutch on the counter-shaft either with said gear-wheel or with said sleeve, whereby different speeds of rotation in the same direction may be imparted to the counter-shaft or whereby different speeds of rotation in opposite directions may

be imparted thereto by the shifting of said clutches on the counter-shaft and sleeve, substantially as described.

7. In a machine of the class described comprising a sliding head, a suitable support therefor, and a feed-screw for moving the head on its support, the combination therewith of a driving-shaft, a counter-shaft supported on the machine, said counter-shaft having a driving connection with said driving-shaft, and the latter with said feed-screw; a sleeve and a gear-wheel on the counter-shaft, each having independent means of rotation at different rates of speed; a clutch on the counter-shaft rotatable therewith and having a sliding movement thereon, and movable into engagement either with the end of said sleeve, or said gear-wheel, whereby said counter-shaft may be rotated at two different rates of speed; means for reversing the direction of rotation of the sleeve, and a clutch-operating mechanism actuated by the movement of said head, for shifting said clutch, substantially as described.

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