2 Sheets—Sheet 1.

A. D. LAWS.

MACHINE FOR TURNING, DRILLING AND TAPPING SUCKER-ROD CONNECTIONS.

No. 191,979. Patented June 12, 1877.

Fig. 1.

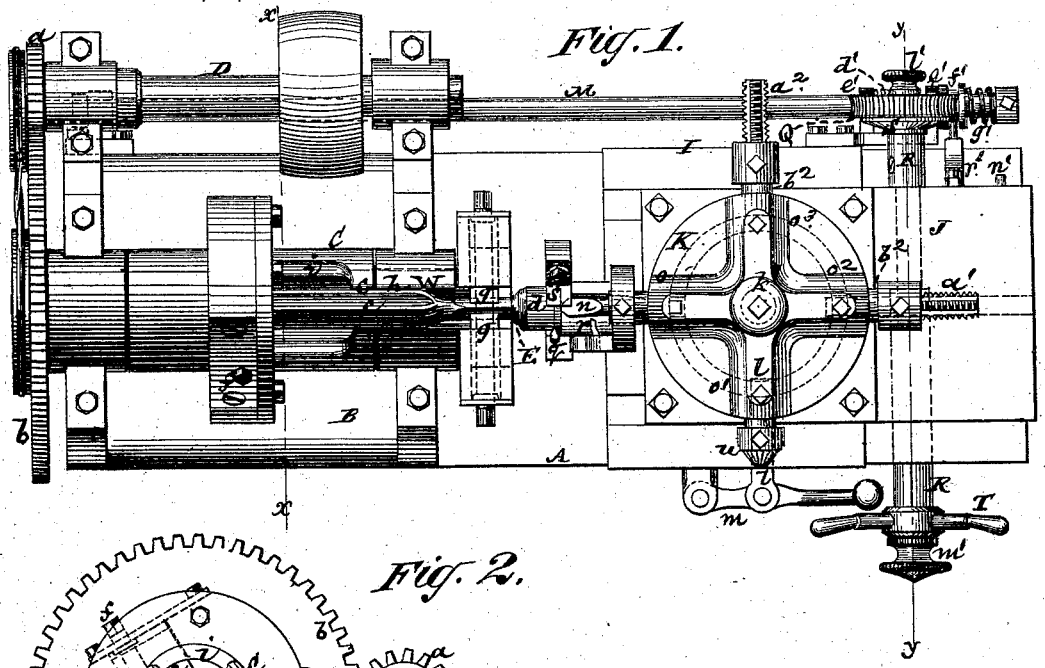


Fig. 2.

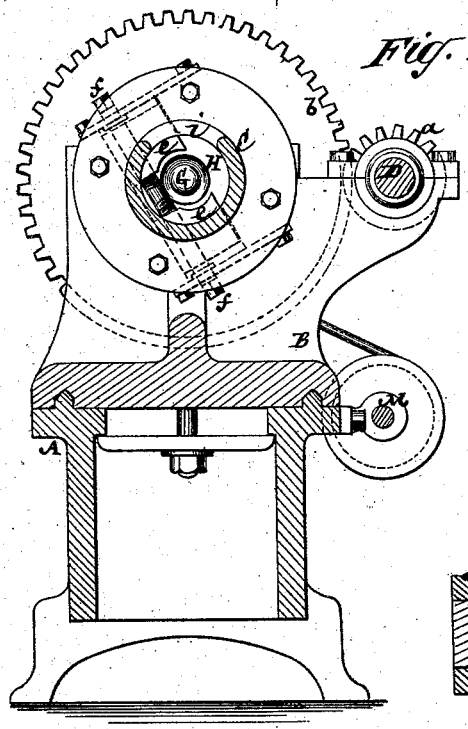


Fig. 3.

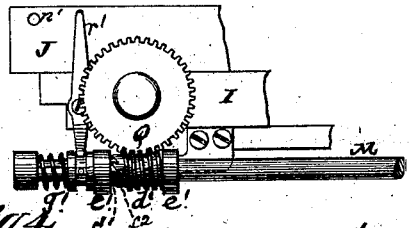


Fig. 4.

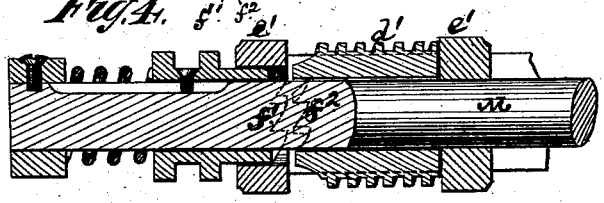
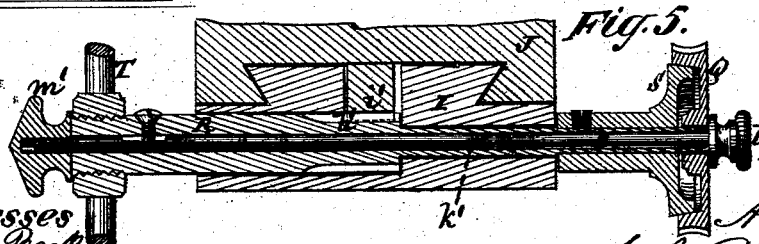


Fig. 5.



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2 Sheets—Sheet 2

A. D. LAWS.

MACHINE FOR TURNING, DRILLING AND TAPPING SUCKER-ROD CONNECTIONS.

No. 191,979. Patented June 12, 1877.

Fig. 6.

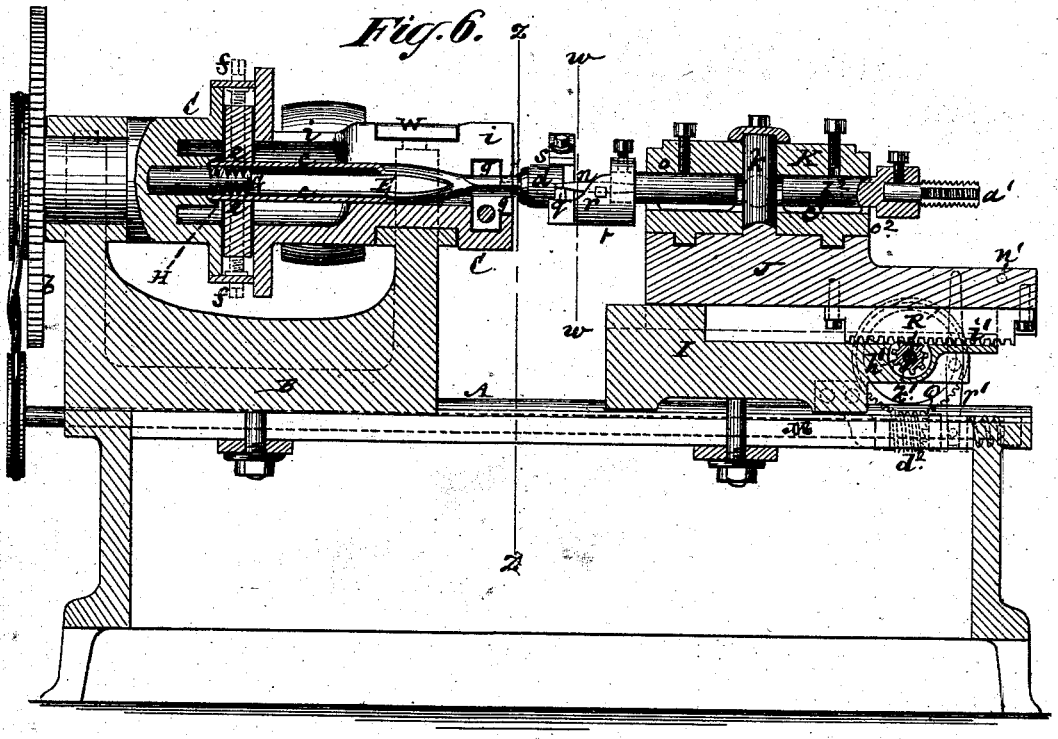


Fig. 7.

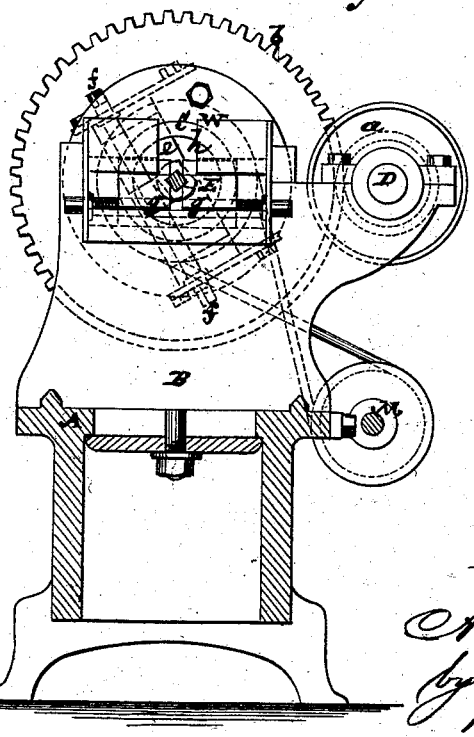


Fig. 9.

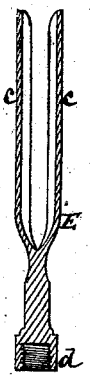
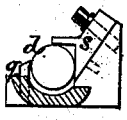


Fig. 8.



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UNITED STATES PATENT OFFICE.

ALBERT D. LAWS, OF BRIDGEPORT, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR TURNING, DRILLING, AND TAPPING SUCKER-ROD CONNECTIONS.

Specification forming part of Letters Patent No. **191,979**, dated June 12, 1877; application filed April 17, 1877.

To all whom it may concern:

Be it known that I, ALBERT D. LAWS, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Machines for Turning, Drilling, and Tapping Sucker-Rod Connections and other articles, which improvements are fully set forth in the following specification and its accompanying drawing.

Heretofore in the manufacture of sucker-rod connections for pumps used in oil-wells, mines, and other places, or for various purposes—that is, sucker-rod connections which consist of a screw-socket at one end of the connection and a bifurcated strap formed at the other end thereof—it has been customary to turn, drill, and tap the socket portion of said connection by or at as many different operations and removals of the connection from the machine, and the turning of said connections has been done with a center at the socket end of the connection and a clamp at the other or strap end thereof, to insure the true turning of the socket. Such diversified manipulations add greatly to the cost of the production of said connection, and, no matter what the particularity that may be observed, it is not always practicable to produce accurate work.

One of the objects of my invention is to perform all these several operations in regular or consecutive order, in one and the same machine, without displacement of the work for each operation. Various features or parts of the invention are applicable, however, to other and different distinct uses, as will appear in the course of the description, which will here be more particularly confined to turning, drilling, and tapping sucker-rod connections.

The invention consists in a combination of a center mandrel, arranged inside of a hollow main spindle, with a female centering device and compressor arranged to bear upon the exterior of the work at its one end inside of the hollow main spindle, whereby the work may be automatically centered and securely held at its inner end. It also consists in a novel and advantageous construction of said devices.

Furthermore, the invention consists in a combination, with the hollow main spindle, of both front and rear chucking or clamping devices for centering and holding both or opposite ends of the work.

Again, the invention consists in certain combinations of a stop-motion with the tool-feeding devices and carriage, with which the same are connected, whereby, when the feed is stopped by throwing a screw by which the carriage is operated out of gear, said carriage remains locked, and whereby, also, after the facing of the work has been done, the carriage may be run back by hand. This provides for one operator to attend to several machines at the same time, and avoids any injury or breakage by neglect or delay in running back the carriage.

Figure 1 of the accompanying drawing represents a plan of a machine for turning, drilling, and tapping sucker-rod connections, and showing one of such connections as in the act of being operated on. Fig. 2 is a transverse vertical section of the same on the line *x x*. Fig. 3 is a side view of a stop-motion and feeding devices connected with the carriage which holds the tools for performance of the work. Fig. 4 is a longitudinal section, upon a larger scale, of the carriage-feeding screw-shaft and devices connected therewith. Fig. 5 is a transverse section, also upon a larger scale, upon the line *y y* of the carriage, in part, with a friction-clutch and means for feeding and running back the carriage. Fig. 6 is a longitudinal vertical section of the machine; Fig. 7, a transverse section thereof on the line *z z*; and Fig. 8, a transverse section of the turning and drilling tool holder on the line *w w*. Fig. 9 is a longitudinal section of a sucker-rod connection for turning, drilling, and tapping which the machine, as its parts are arranged, is adapted.

A is the shears or bed-piece of the machine, having a head-stock, B, at its one end, and a sliding carriage holding the tools at its opposite end.

The head-stock B serves to carry a hollow main spindle, C, to which rotary motion is communicated from a counter-shaft, D, by means of gearing *a b*, or otherwise. This hollow main spindle serves to carry the sucker-rod connection E concentrically and longitudinally within it, the bifurcated strap portion *c*

c of said connection occupying a rear position therein, and the socket portion *d* of the connection a forward and exposed front position relatively to the head-stock. Arranged concentrically within the hollow main spindle C, toward the rear end thereof, is a center mandrel, G, which rotates in concert with said spindle C, and which may be roughened or toothed on its forward end, to receive over it and drive or rotate the strap end of the sucker-rod connection E. The hollow main spindle C also has arranged concentrically within it, back of the forward end or portion of the center mandrel G, a female centering device, H, which may be in the form of a bell-shaped or hollow conical chuck or clamp, and which not only serves to automatically center the strap end of the connection E, but to act as an outer compressor to hold the bifurcated strap portion *c c* of the connection E on the center mandrel G. External pressure may also be brought to bear upon the strap end of the connection E where it fits over the center-mandrel G by means of radial clamps or sliding holders *e e*, carried by the hollow main spindle C, and adjustable by one or more screws, *f*, from the exterior of said spindle.

The hollow main spindle C is also provided at its forward end with adjustable chucking or clamping jaws or devices *g g*, by which and the rear clamping or holding devices hereinbefore referred to, the work or sucker-rod connection is properly centered and securely held at or near both ends. To facilitate the entry and removal of the work or sucker-rod connection E, the head-stock B is provided with a bearing, W, having a radial opening, *h*, in it, thus constituting what may be termed an open bearing, and the hollow main spindle C is constructed with a similarly-arranged longitudinal opening, *i*, in its side. Such open bearing, however, and longitudinal opening in the hollow main spindle, may, in some cases, be dispensed with.

I is the carriage-base on the opposite end of the shears or bed-piece A, and J the carriage, adjustable backward or forward along said base in direction of the length of the machine. This carriage supports or carries upon it a turret-head or turning tool-holder, K, which is adjustable on or around an upright pivot, *k*, to successively bring each one of a series of radially-arranged tools with which said holder K is provided opposite and in central or longitudinal line with the work to be acted upon, a stop, *l*, actuated by a lever, *m*, serving to lock said tool-holder in its required position after it has been adjusted.

The tools with which said holder K is provided for turning, drilling, and tapping the sucker-rod connection E will now be described. First, a drill, *n*, arranged to enter, and secured by set-screw within a radial socket, *o*, of the tool-holder, and having combined with it, or carrying upon its stem, a stock, *p*, that is fitted or provided with a cutter, *q*, for externally dressing or turning the side of the socket *d*, which the drill *n* serves to bore out or dress internally, and a facing-cutter, *r*, for trimming or truing the outer end of the socket, also an adjustable steadying-block or rest, *s*, arranged to bear down and against the socket *d* of the work during the operation on and in it of the drill *n*, and cutters *q* and *r*, as the carriage J is fed forward with the tool-holder K turned or adjusted so that said drill and cutters face the work. The next tool in order with which the turret-head or holder K is provided is a rose-head cutter, *u*, which is carried by a socket, o^1, that is adjusted into line with the work to bring the cutter *u* into operation on the mouth of the socket *d* for the purpose of countersinking said mouth. The tool-holder K also has sockets o^2 o^3, which, respectively, carry an entering or taper tap, a^1, and straight or plug tap a^2, that are successively brought into operation by suitably turning and feeding up the holder K by its carriage, to cut the necessary screw-thread in the socket *d* of the work after said socket has been drilled and prepared, as described.

It is not necessary, however, that the tool-holder K should be fed up by its carriage to complete the work of cutting the thread by the taps, but only so that the taps should enter the work, inasmuch as each of said taps is fitted within its respective carrying-socket o^2 or o^3 by its stem or mandrel b^2, which carries the tap, so that, after the carriage has been fed up to enter the tap by the rear interior end of the socket o^2 or o^3 bearing on the back end of the tap or its mandrel, said tap, or the mandrel which carries it, is free to slide outward within its socket o^2 or o^3, to follow up the work, and is prevented from turning while doing so by means of a feather, c'. This mode of holding a tap provides for its relief both in running it in and out, and prevents stripping of the thread by the weight or sticking of the carriage, as when the tap is a fixture to the carriage, and, in doing its work, exerts a pull or thrust on the carriage.

The taps a^1 a^2 may be run back by reversing the motion of the main spindle C.

The carriage J is made capable of being fed forward along its base I both by hand and by power, and is always designed to be worked back by hand, also forward by hand to enter the taps; but in drilling and turning or facing the work the forward or feeding motion of the carriage is automatic or by power, and the automatic feeding devices are so constructed, and have a stop-motion so combined with them, that, although the shaft which actuates the feed is a continuous revolving one, the feed is arrested as the work is completed, and the carriage which has the tool-holder attached to it remains locked. Thus, M is the continuously-revolving shaft for automatically feeding the carriage. This shaft, which may receive its motion by band and pulley from the main spindle C, or otherwise, is fitted with a loose feeding-screw, d', arranged between collars e' e'. Said screw is held in

gear with the shaft M by means of a rag-clutch, f^1 f^2, one half or portion, f^2, of which is formed on the outer end of the loose screw d', and the other half or portion, f^1, of which is in longitudinally-sliding connection with the shaft M, and is forced up into gear with the half-clutch f^2 by a spring, g', as seen more clearly in Fig. 4. The screw d' gears with a worm-wheel, Q, which is loose upon a hollow cross-shaft, R, that passes through the base I of the carriage J, and has on it a pinion, h', for giving motion to the carriage by the gear of said pinion with a rack, i', fast on the carriage.

The driving-connection of the loose worm-wheel Q with the hollow cross-shaft R is effected by means of a conical or other suitably-constructed friction-clutch, S, fast on the hollow cross-shaft R, and held in driving or holding contact with the loose worm-wheel Q by means of a tightening and releasing rod, k', running through said hollow shaft, and in longitudinally-adjustable feather-connection with the hollow cross-shaft R. On the worm-wheel end of the rod k' is a stop or button, l', and on the opposite end a nut, m', the turning of which to the right or to the left serves to liberate or put in driving frictional contact the worm-wheel Q with the friction-clutch S.

When it is required to operate the carriage J by hand, either to move it forward or backward, the nut m' is slackened. The hollow cross-shaft M may then be turned, by means of a hand-wheel, T, to cause the pinion h' of said shaft to work the carriage by its rack i'.

When the nut m' is tightened and the friction-clutch S is in driving contact with the worm-wheel Q, then the automatic feed of the carriage during drilling and turning or facing the work is arrested by a stud or projection, n', on the carriage coming into contact with a lever, r', by which the half-clutch f^1 is slid out of gear with the half-clutch f^2 on the loose worm-wheel Q. This not only constitutes an automatic stop of the feed, but, when the screw d' is thrown out of gear with the carriage J, said carriage remains locked by means of the gear of the worm-wheel Q with the screw d'.

By means of this combined feed and stop motion a number of similar machines to that herein described may be attended to by one operator without any risk of injury or breakage of the parts in case he should be delayed in running back the carriage of any one or more of said machines.

I claim—

1. The combination of the hollow rotating main spindle C, constructed to carry the sucker-rod connection concentrically and longitudinally within it, with a center mandrel, G, rotating with the spindle, and upon which the split end of the sucker-rod connection rests, and a device for automatically centering the split end of said sucker-rod connection, substantially as described.

2. The combination of a hollow cone or female centering device, H, with the inner mandrel G and outer hollow main spindle C, essentially as described.

3. The combination, with the hollow main spindle C, constructed to carry the sucker-rod connection concentrically and longitudinally within it, of a chucking or clamping device for centering and holding the split end of said sucker-rod connection within the main spindle, and a separate chucking or clamping device for centering and holding the forward end of said connection, substantially as and for the purpose described.

4. The loose feeding-screw d' and its half-clutch f^2, in combination with the adjustable half-clutch f^1, the feed-operating shaft M, the carriage J, the worm-wheel Q, by which motion is communicated from the screw to the carriage, and means controlled by the motion of the carriage for throwing the screw out of gear and locking the carriage, substantially as specified.

5. The combination of the hollow cross-shaft R, the loose worm-wheel Q of the carriage-feeding devices, the carriage J, geared with and for operation by the shaft R, the friction-clutch S, and the tightening and releasing rod k' with its adjusting-nut m', essentially as and for the purposes herein set forth.

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Witnesses:

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