No. 683,274. Patented Sept. 24, 1901.

F. G. HAMPSON.

TUBE EXPANDING APPARATUS.

(Application filed June 4, 1901.)

(No Model.) 4 Sheets—Sheet 1.

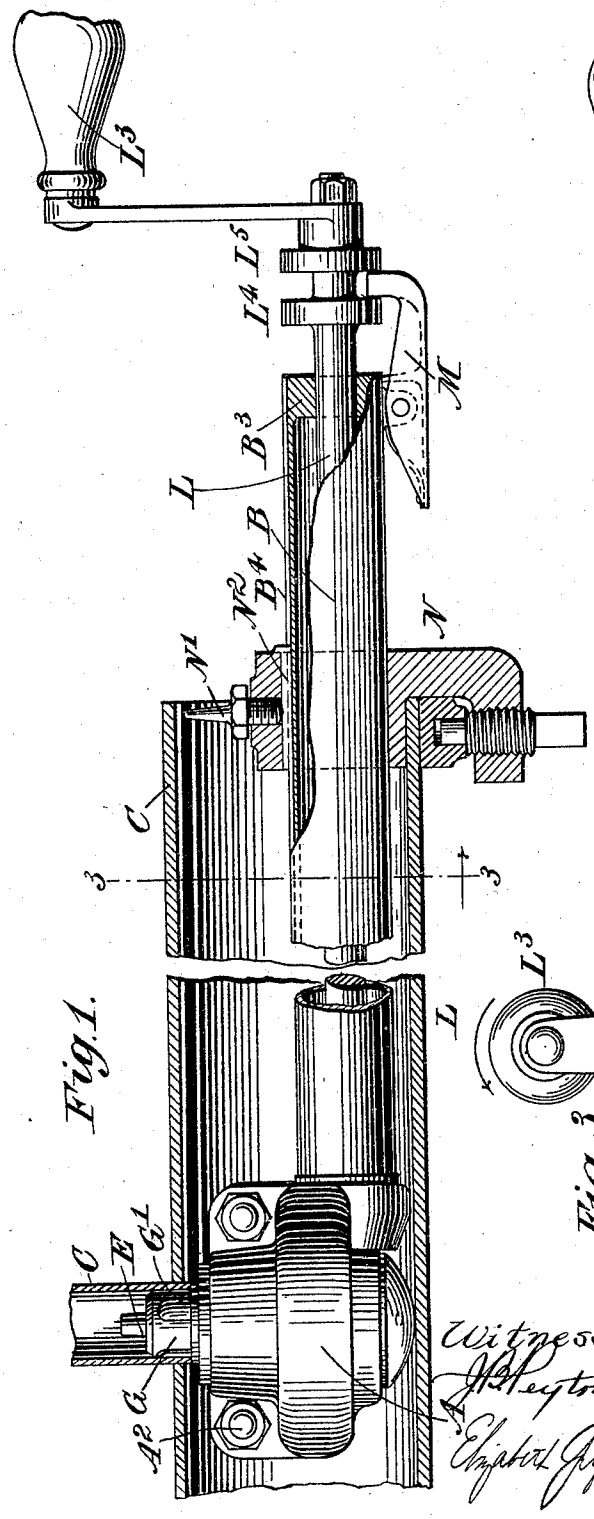


Fig. 1.

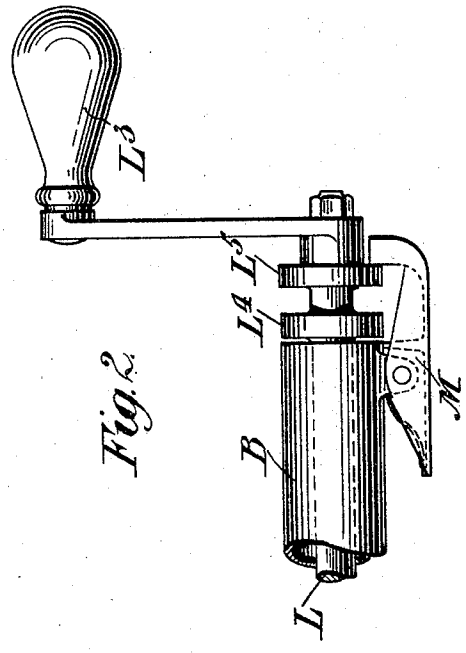


Fig. 2.

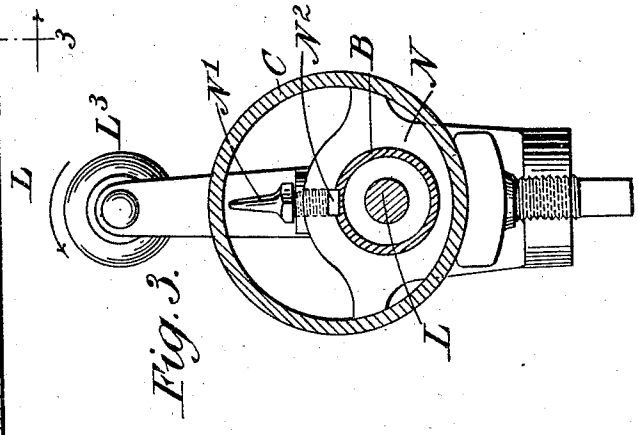


Fig. 3.

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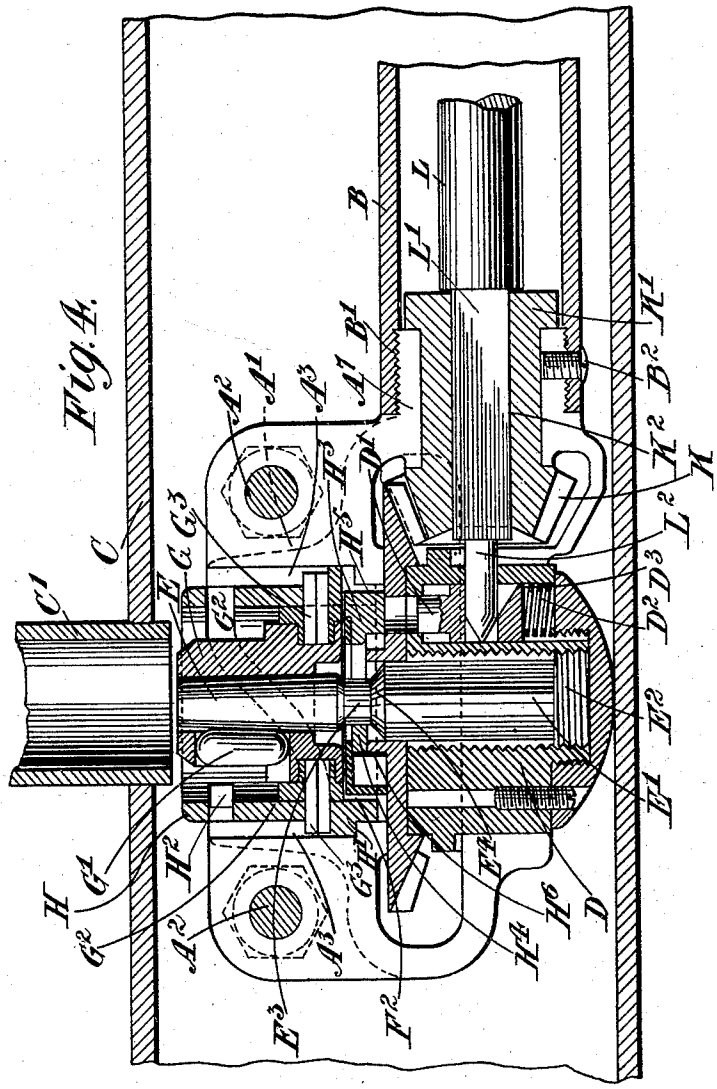
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Fig. 4.



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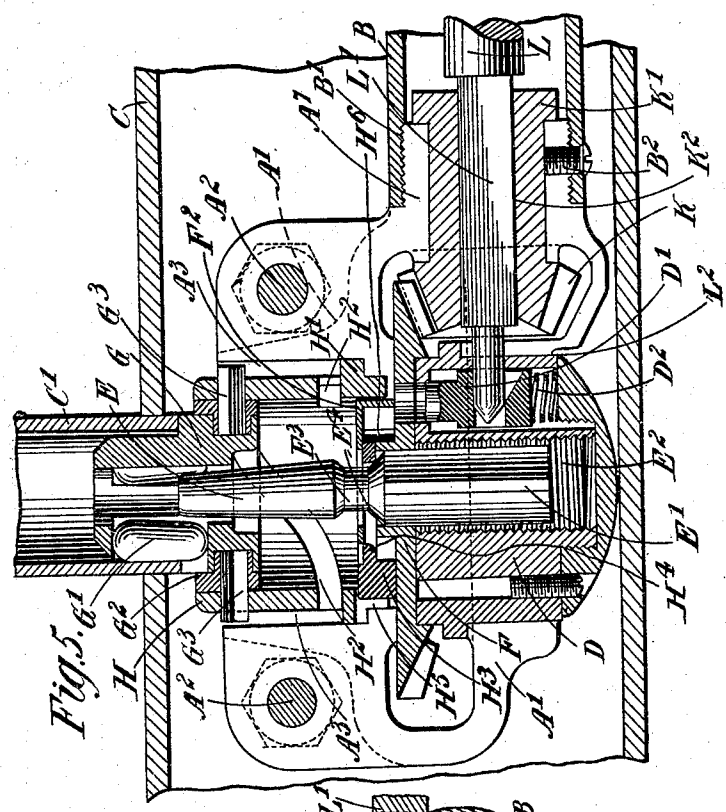


Fig. 5.

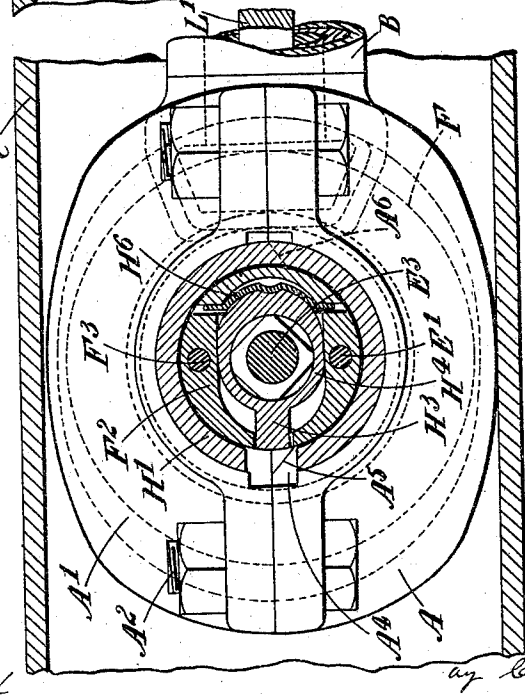


Fig. 8.

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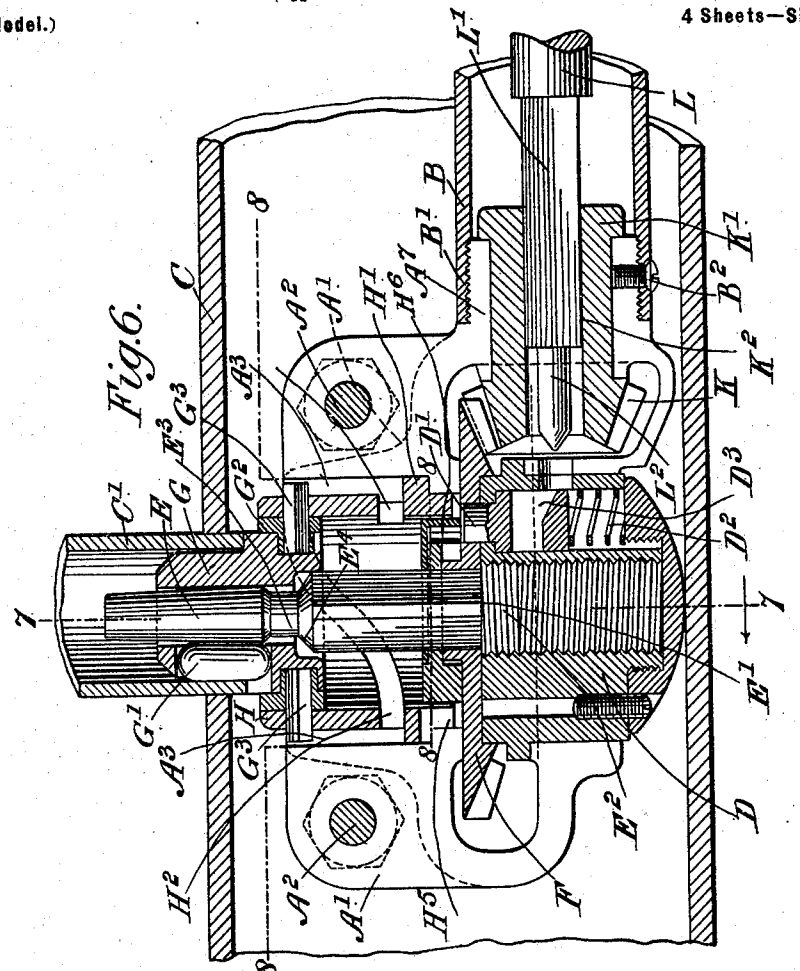


Fig. 6.

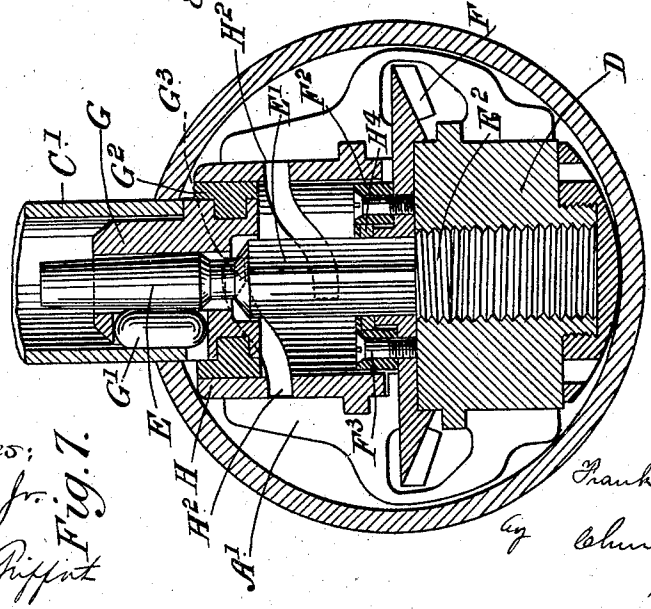


Fig. 7.

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UNITED STATES PATENT OFFICE.

FRANK GEORGE HAMPSON, OF CLAPHAM, ENGLAND.

TUBE-EXPANDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 683,274, dated September 24, 1901.

Application filed June 4, 1901. Serial No. 63,130. (No model.)

To all whom it may concern:

Be it known that I, FRANK GEORGE HAMPSON, a subject of the King of England, residing at Clapham, in the county of London, England, have invented certain new and useful Improvements in or Relating to Tube-Expanding Apparatus, (for which I have made application for Letters Patent in Great Britain under No. 8,186, dated April 20, 1901,) of which the following is a specification.

This invention relates to improvements in apparatus for the expanding of one tube in an opening in the wall of a larger tube or in a tube-plate or the like, and more particularly in tube-expanding apparatus of the type such as is described in the specification of Letters Patent No. 629,354 already granted to me and specially adapted for the treating of small tubes in positions difficult of access.

The invention consists in an improved construction of the roller-carriage carrying or operating frame and connecting parts of the mandrel and of the operative mechanism whereby all the movements of the roller-carriage and of the mandrel required to place these within the tube to expand the same and then withdraw them are controlled by a single spindle, rod, or the like.

A further improvement consists in a device for fixing the apparatus in operative position, which also accurately indicates to the workman the angle at which the expanding apparatus is in position in the larger tube.

The accompanying drawings illustrate a convenient construction of apparatus for carrying out the invention.

Figure 1 is a side elevation, partly in section, showing the complete apparatus with the mandrel and roller-carriage in operative position. Fig. 2 is a detail view of the handle and one end of the operating-spindle, showing the second position of the latter relatively to the casing-shaft. Fig. 3 is a cross-section on the line 3 3 of Fig. 1. Fig. 4 is a central longitudinal section of the expander proper in position beneath a small tube, but with the roller-carriage and mandrel within their frame. Fig. 5 is a similar view to Fig. 4, but with the roller-carriage in operative position within the tube. Fig. 6 is a similar view to Fig. 5, but showing the mandrel in position for rotation. Fig. 7 is a section on the line 7 7 of Fig. 6, and Fig. 8 is a sectional plan on the line 8 8 of Fig. 6.

Like letters of reference indicate like parts in all the figures.

The apparatus comprises a frame, preferably for constructional purposes formed in halves A A′, held together by screw-bolts A^2 and fixed on one end of a hollow shaft B of sufficient length to enable the said frame to be placed within the large tube C, in which the work is being executed, in position beneath the smaller tube C′ to be expanded. A threaded nut D is journaled in the frame, so as to be capable of rotating, but not of movement in other directions, and a tapered mandrel E, having a square or angular prolongation E′, engages the thread of the nut with screw-threaded end E^2. Placed above the nut D and having a central hole through which the portion E′ of the mandrel passes is a bevel-wheel F, engaged in a recess in the frame, so as to be free to rotate, but not to move in other directions. The wheel F is provided with a recess F′, and a bolt D′, adapted to engage therewith, is carried in a recess in the nut D and normally held, under the tension of the spring D^2, engaged within the recess of the wheel, locking the latter and the nut together. The taper portion E of the mandrel is surrounded by the roller-carriage G, having rollers G′, carried in recesses therein in usual fashion.

The above-described mechanism is not novel, being similar to that described in the specification of Patent No. 629,354, before referred to. The following is what constitutes my invention:

The roller-carriage G is rotatably carried on a ring G^2, which itself is capable of sliding motion within a hollow cylinder H. The cylinder H is carried in the frame A A′ so as to be capable only of rotatory movement therein, say as shown in the figures, by means of a flange H′, engaged in a recess in the frame. The cylinder is provided with two cam-slots H^2, similar but opposed to each other and each extending from about the top to about the bottom of the cylinder while passing around one-half of its circumference. Each slot is engaged by a stud or pin G^3, fixed in the ring G^2, before referred to, and each pin extends beyond the cylinder H

into a vertical guideway or slot A^3 in the frame. With this construction it is evident that giving a half-turn to the cylinder H will raise or lower the roller-carriage a distance equal approximately to the depth of the cylinder relatively to the cylinder or the frame of the apparatus. The following is a convenient arrangement for giving the requisite movement to the cylinder.

Between the tapered operative portion E of the mandrel and its square or angular prolongation E′ a recess E^3 is provided, having beveled edges E^4, and the mandrel is so proportioned that when in its lowest position, as shown in Fig. 4, the recess E^3 is placed above the bevel-wheel F, before referred to. Movably resting on the upper surface of the bevel-wheel F is a catch H^3, having a body H^4, which is preferably in the shape of a flattened oval and has a circular orifice through which the mandrel passes, this orifice being of a size to make a working fit with the corners of the angular portion E′ of the mandrel. Conveniently these corners are flattened and curved, as shown in Fig. 8. A slot H^5 is provided in the bottom edge of the cylinder H, adapted to receive the catch H^3, which, with its body, is so proportioned that when the mandrel is raised so that its angular portion E′ is engaged in the orifice in the body the catch is held entirely within the cylinder, as shown in Figs. 6 and 8; but when the mandrel is in its lowered position, as shown in Figs. 4 and 5, and the recess E^3 coincides with the hole in the catch-body the catch H^3 is engaged within the slot H^5. A spring, which may be a flat spring, such as H^6, (shown in the figures,) tends to hold the catch constantly engaged with the cylinder-slot. The catch is held from turning on the wheel F by means of a guide-plate F^2, fastened to the wheel by screws F^3, and which is provided with a central guiding-recess, allowing the catch to engage and disengage with the cylinder-slot H^5. Part of the plate F^2 overlaps a portion of the catch-body to prevent any possibility of the same being raised along with the mandrel. The plate also serves as a holder for the spring H^6, as seen in Fig. 8.

Formed integral with or secured onto the half A of the frame is a flange or offset A^4, extending under one-half of the wall of the cylinder H between the latter and the bevel-wheel F and terminating in beveled ends A^5 A^6, these ends corresponding with the slot H^5 when the roller-carriage is in its highest and lowest position, respectively, Figs. 7 and 8.

The bevel-wheel F is geared with a second bevel-wheel K, formed on a boss K′, rotatably carried in a bearing in an extension A^7 of the frame, onto the outside of which extension the hollow shaft B is secured, say, by a screw-thread B′ and set-screw B^2. The boss K′ is provided with a central longitudinal hole K^2 to receive the end L′ of the operating-spindle L, carried within the shaft B. The part L′ forms a working fit in the hole K^2 and is adapted to slide longitudinally therein, and they may be of any cross-section which does not admit of their rotating independently of each other. The part L′ terminates in a pin L^2, adapted to engage a recess D^3 in the spring-controlled bolt D′, previously referred to, so that when the spindle L, and consequently the pin L^2, is in its forward position, as shown in Fig. 4, the bolt D′ is withdrawn from the recess in the bevel-wheel F, which is thereby disengaged from the nut D. The spindle L extends beyond the shaft B, and its free end is provided with a handle L^3 or other convenient means for rotating the same. A bearing B^3 is formed in the end of the shaft to support the spindle. The spindle is provided with two collars L^4 L^5, and pivotally carried on a lug on the end of the shaft B is a spring-controlled catch M, adapted to engage between the collars L^4 L^5 when the spindle is in its drawn-back position and the pin L^2 is disengaged from the locking-bolt D′, as shown in Figs. 1 and 6, and to engage behind the collar L^5 when the spindle is in its forward position and the pin L^2 engaged in the recess of the bolt D′, as shown in Fig. 2 and 4, thus holding the spindle at the will of the operator in either of its two operative positions.

The action of the apparatus is as follows: The roller-carriage and mandrel are in their lowest position within the frame A A′, as shown in Fig. 4, the pins G^3 being in the lowest portion of their respective slots H^2 and the recess E^3 of the mandrel corresponding with the catch H^3. The latter is engaged in the slot H^5 of the cylinder H. The spindle L is in its forward position, as shown in Fig. 2, and the pin L^2, Fig. 4, engaged in the recess D^3 of the locking-bolt D′, so that the nut D is disengaged from the bevel-wheel F and held from rotation. The expander is placed in position in the tube C, so that the mandrel and roller-carriage are located directly beneath the tube C′ to be expanded. The handle L^3 is now rotated in the direction of the arrow in Fig. 3, and when a half-turn has been made, the wheel K rotating the bevel-wheel F, the roller-carriage will have been raised into the position shown in Fig. 5 by the action of the cam-slots H^2. The mandrel has also commenced to rise, and the catch-body H^4, engaging the beveled edge E^4 of the mandrel-recess E^3, has commenced to withdraw the catch from the cylinder-slot H^5, the catch, however, if still engaged in the slot, comes in contact with the beveled edge A^5 of the offset A^4 and is pushed out of the slot, the cylinder H consequently remaining stationary, while the mandrel still revolves and rises. As the mandrel rises its angular portion E^2, engaging the hole in the catch-body, holds the catch out of the cylinder-slot against the pressure of the spring H^6. When the mandrel has been raised sufficiently to put pressure on the rollers G′, the operator pulls back

the catch M and draws back the spindle, so that the catch engages between the collars, as shown in Fig. 1, withdrawing the pin L^3 from engagement with the locking-bolt D', which, under pressure from the spring D^2, enters the recess in the bevel-wheel K, thus locking the latter and the nut together, as shown in Fig. 6. If now the spindle L be revolved, the nut D, the wheel F, and the mandrel E rotate together, and the rotating mandrel forces the rollers B' to travel over the inner surface of the tube C' and expand it in the usual way. When it is desired to withdraw the mandrel and carriage, the spindle L and with it the pin L^2 are returned to the first position, Figs. 2 and 4, and the spindle is rotated in the opposite direction. The mandrel is screwed down into the nut D, and when the recess E^3 coincides with the catch-body H^4 the catch H^3 again engages the cylinder H and causes it to make a half-turn, the slots H^2 lowering the roller-carriage again within the frame. The cylinder H is prevented from making more than the half-turn when rotated in this direction by the beveled end A^6 of the offset A^4.

In order to hold the apparatus in position while in use, the casing-shaft B may be provided with a clamp N, having a screw-controlled jaw to clip the end of the tube C, as shown in Figs. 1 and 3. The clamp is adapted to slide on the casing-shaft B, and a set-screw or the like may be provided for clamping it on the latter when the apparatus has been placed in position. Conveniently the clamp is provided with a pointer or index, such as N', projecting in the same longitudinal plane as the mandrel, so that the operator can know the angle at which the apparatus is located within the tube C. In this case to prevent the clamp (and the pointer) rotating on the shaft B a key N^2 is provided, arranged in a keyway formed by a longitudinal slot B^4 in the shaft and a corresponding slot in the clamp. As shown in Fig. 1, the index or pointer N' may be employed as the set-screw for fixing the clamp to prevent lengthwise movement of the latter on the shaft. The shaft B may, if desired, be provided with a scale, so that the operator can see at once the distance to which the apparatus has been advanced within the tube C.

It is evident that the construction described above may be varied without departing from the spirit of this invention. For instance, instead of raising or lowering the roller-carriage by one half-revolution of the cylinder the mechanism may be arranged so that more or less than a half-revolution of the same is employed to give the required range of movement to the carriage. Moreover, if the recessed portion of the mandrel be exactly proportioned and positioned relatively to the spring-controlled catch H^3, the offset A^4, with its beveled ends, may be dispensed with.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a tube-expander the combination of a supporting-frame, a cylindrical frame capable of rotatory movement therein, a roller-carriage free to rotate within the cylindrical frame means operated by the rotation of the latter for imparting endwise movement to the carriage, means for rotating the cylindrical frame and means for controlling and arresting the rotation of the same.

2. In a tube-expander the combination of a supporting-frame a hollow cylinder capable of rotatory movement therein, a roller-carriage free to rotate within the cylinder an expanding-mandrel arranged centrally of the carriage, means operated by the rotation of the cylinder for imparting endwise movement to the carriage, means for rotating the mandrel and moving it endwise and means, controlled by the mandrel, for giving rotatory movement to the cylinder and for arresting the same.

3. In a tube-expander the combination of a supporting-frame, having two vertical slots, a hollow cylinder capable of rotatory movement within the frame and having two cam-slots each extending around part of its circumference, from above downward a ring adapted to slide within the cylinder and having two pins each engaging one of the cam-slots and one of the vertical slots, a roller-carriage engaged with the ring so as to freely rotate therein, and means to partially rotate the cylinder within the frame to impart endwise movement to the ring and the carriage substantially as set forth.

4. In a tube-expander the combination of a supporting-frame, having two vertical slots a hollow cylinder capaple of rotatory movement within the frame, having two cam-slots each extending around a part of its circumference from above downward, and a recess in its bottom edge, a ring adapted to slide within the cylinder and having two pins each engaging one of the cylinder cam-slots and one of the frame vertical slots, a roller-carriage rotatably engaged in the ring, an expanding-mandrel arranged centrally of the carriage having a tapered operative portion, an angular prolongation and a recess between these two portions, means to rotate and give endwise movement to the mandrel, a sliding catch adapted to engage the cylinder-recess and having a body through which the mandrel passes, a guiding-plate for the catch and its body, means to rotate the guiding-plate and a spring tending to hold the catch engaged within the recess, the catch and the hole in its body through which the mandrel passes being so proportioned relatively to the angular prolongation and the recess of the mandrel that the catch is engaged in the cylinder-recess when its body corresponds with the mandrel-recess and withdrawn from the same when its body corresponds with the angular prolongation substantially as set forth.

5. In a tube-expander the combination with

a supporting-frame, a hollow cylinder capable of rotatory movement therein and having a recess in its lower edge and a rotatable catch adapted to engage said recess to rotate the cylinder of a plate or offset having beveled ends adapted to engage the catch and remove it from the cylinder-recess when the cylinder has completed one-half of a revolution in either direction substantially as and for the purpose set forth.

6. In a tube-expander the combination of a supporting-frame, a roller-carriage free to rotate and to move endwise therein, an expanding-mandrel arranged centrally of the carriage, and means, operated by a single spindle to impart endwise movement to the carriage and to the mandrel or to revolve the mandrel.

7. In a tube-expander the combination with a supporting-frame, a threaded nut free to rotate therein, an expanding-mandrel with a threaded end engaged in the nut, a gear-wheel above the nut, engaged with the mandrel so as to rotate the latter but permit of its free endwise movement, a sliding bolt controlled by a spring to lock the nut and wheel together and a second gear-wheel engaged with the first to rotate the same, of a spindle capable both of rotation and of endwise movement having an end pin adapted to engage the sliding bolt and force it back against the tension of its spring to release the first gear-wheel from the nut and to lock the latter when the spindle is in its forward position, and to release the bolt and nut when the spindle is drawn back, and having an angular portion engaged with the second gear-wheel, so as to rotate the latter when the spindle is in either position endwise substantially as set forth.

8. In a tube-expander the combination with a frame and casing-shaft and an operating-spindle carried thereby capable both of rotatory and endwise movement and operative in two endwise positions of two collars on the spindle and a spring-controlled catch carried on the casing-shaft adapted to engage between the collars, or behind one collar substantially as and for the purpose set forth.

9. In a tube-expander the combination with a casing-shaft of a clamp carried thereon, so as to be capable of endwise but not of rotatory movement, means to fix the clamp on the shaft at any desired point and a screw-controlled jaw adapted to engage the tube within which a smaller tube is to be expanded, substantially as set forth.

10. In a tube-expander the combination with the casing-shaft of a clamp carried thereon so as to be capable of endwise but not of rotatory movement, means to fix the clamp on the shaft at any desired point and a screw-controlled jaw adapted to engage the tube within which a smaller tube is to be expanded and an index or pointer lying in the same longitudinal plane as the mandrel substantially as and for the purpose set forth.

11. In a tube-expander, the combination with the casing-shaft of a clamp carried thereon so as to be capable of endwise but not of rotary movement, a set-screw for fixing the clamp on the shaft and a screw-controlled jaw adapted to engage the tube within which a smaller tube is to be expanded said screw constituting an index or pointer lying in the same longitudinal plane as the mandrel; substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK GEORGE HAMPSON.

Witnesses:

HAROLD WADE,

HARRY B. BRIDGE.