F. M. HAWKINS.

COMBINED TUBE EXPANDER AND CUTTER.

APPLICATION FILED DEC. 11, 1907.

906,797. Patented Dec. 15, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

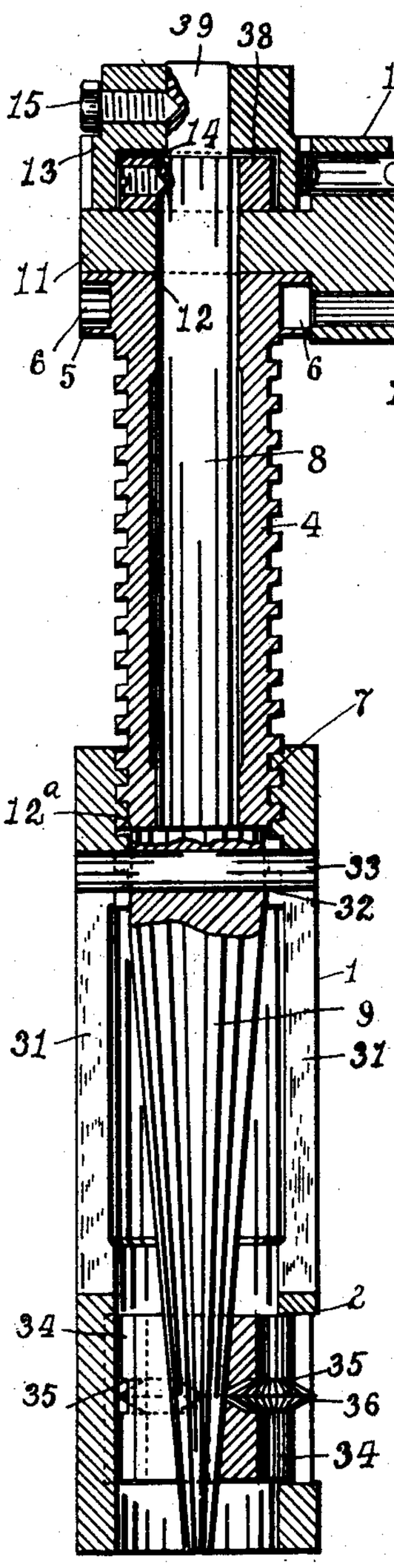

Fig. 2.

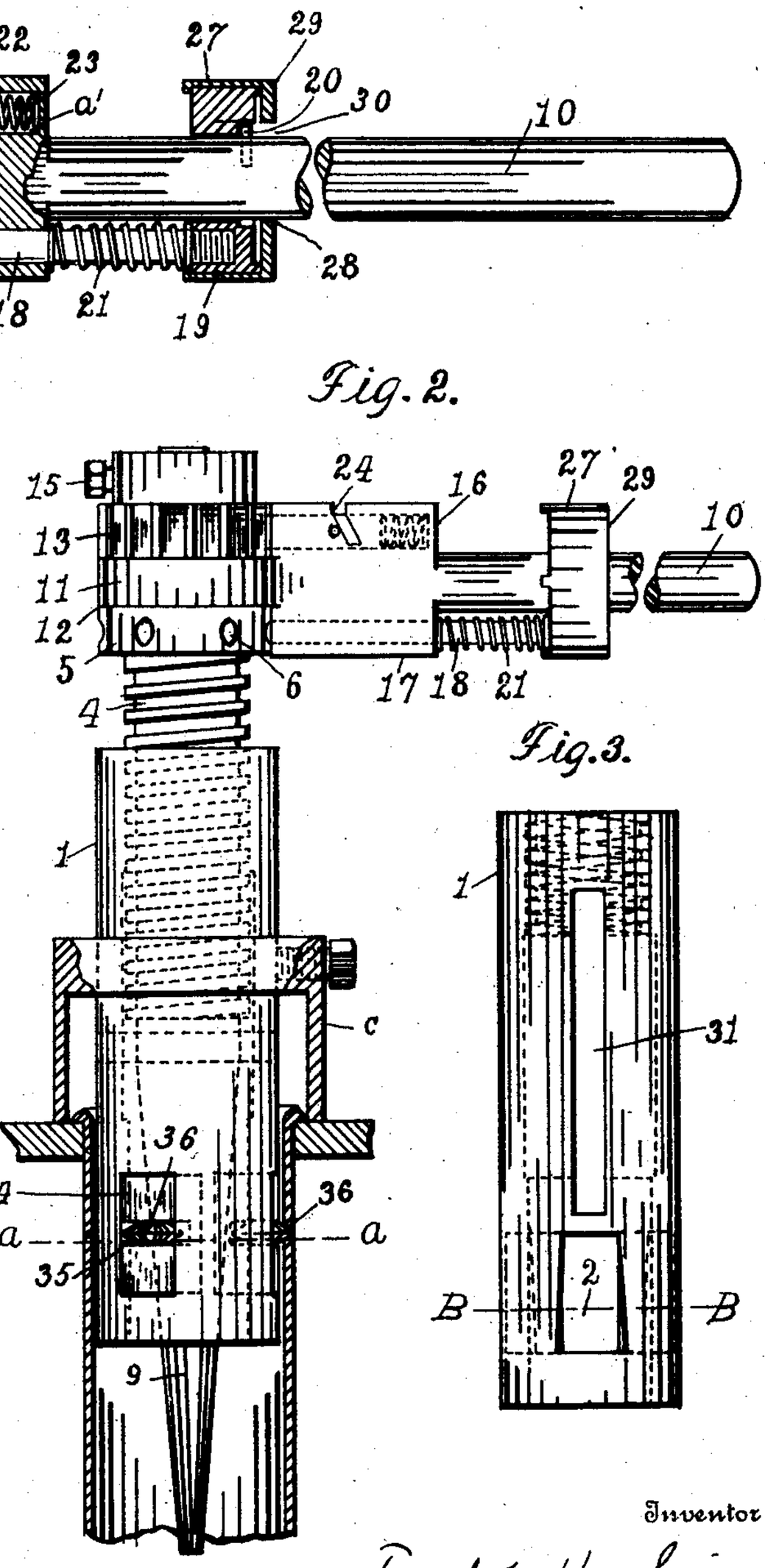

Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 4.

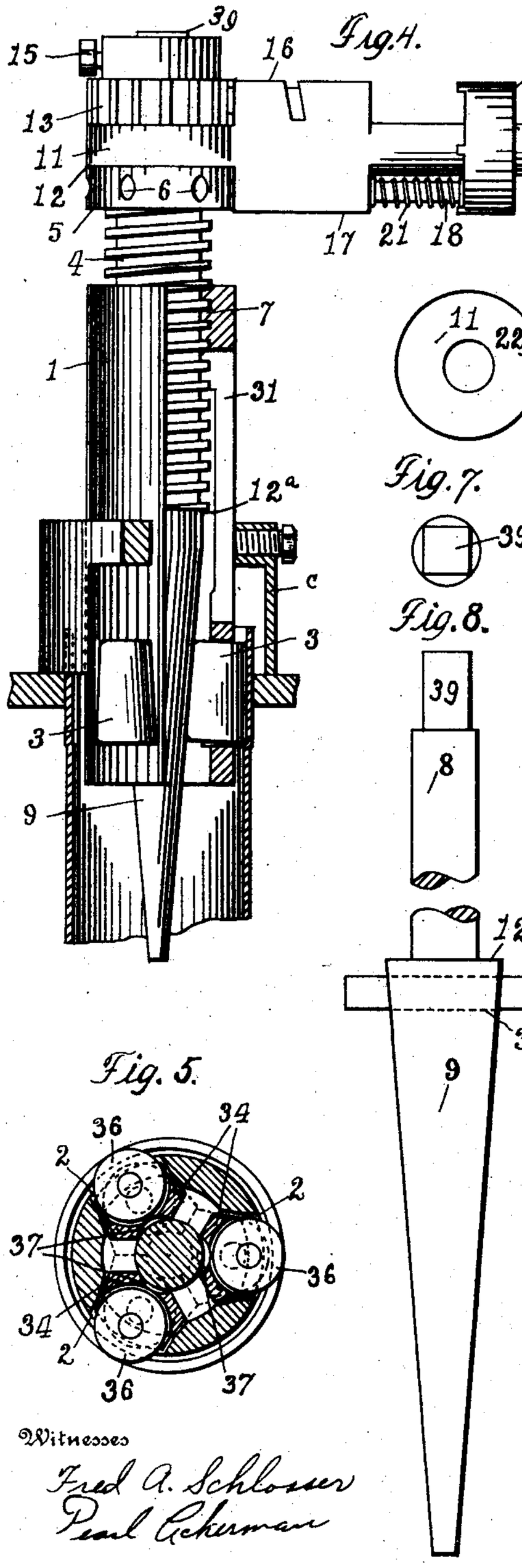


Fig. 16.

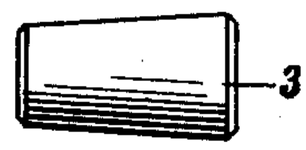


Fig. 6.

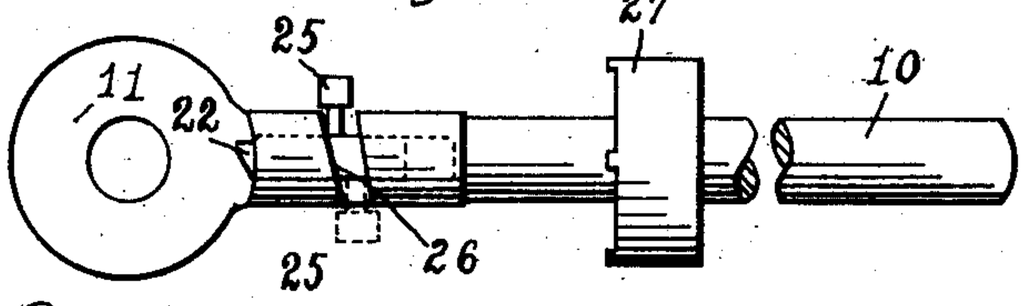


Fig. 7.

Fig. 8.

Fig. 9.

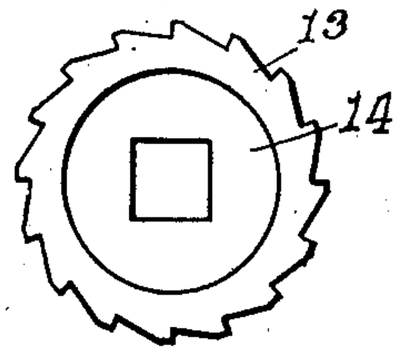


Fig. 10.

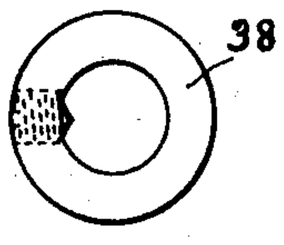


Fig. 11.

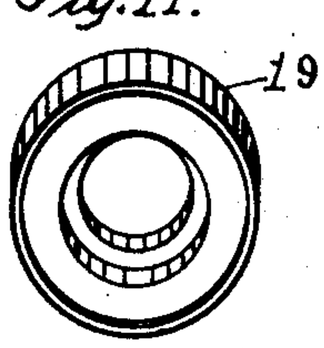


Fig. 12.

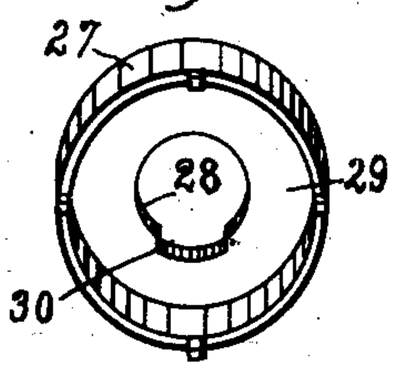


Fig. 13.

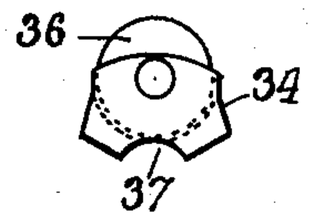


Fig. 14.

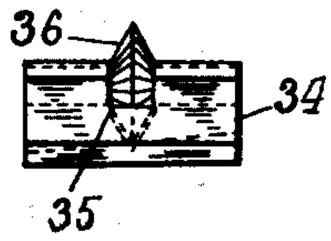
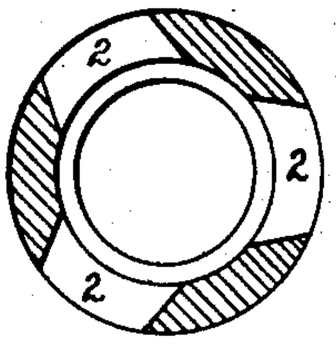


Fig. 5.

Fig. 15.



Witnesses

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3 SHEETS—SHEET 3.

Fig. 17.

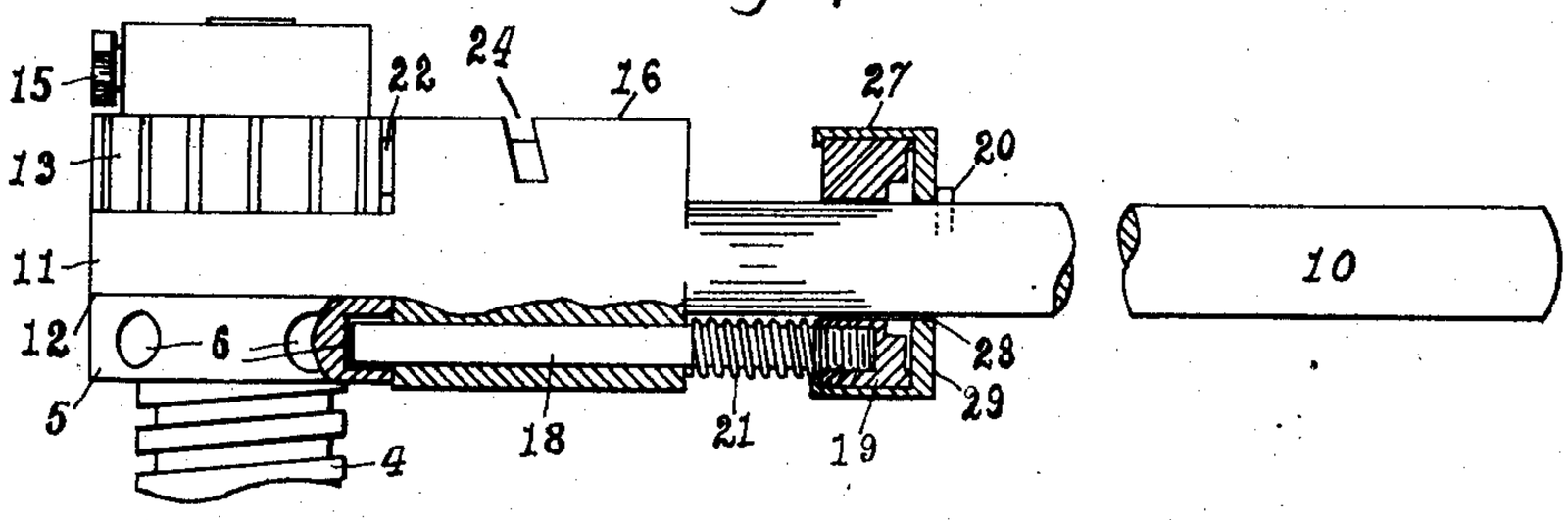

Fig. 18.

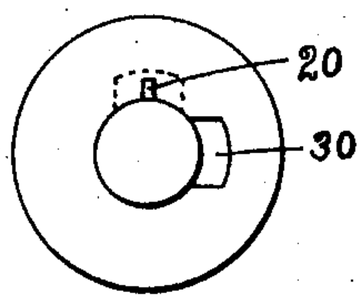

Fig. 19.

33

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UNITED STATES PATENT OFFICE.

FRANK M. HAWKINS, OF MANSFIELD, OHIO.

COMBINED TUBE EXPANDER AND CUTTER.

No. 906,797. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed December 11, 1907. Serial No. 405,993.

To all whom it may concern:

Be it known that I, FRANK M. HAWKINS, a citizen of the United States, residing at Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in a Combined Tube Expander and Cutter, of which the following is a specification:

My invention relates to a combined tube expander and roller and has for its object the construction of a device that can be used for the purpose of expanding or cutting off boiler tubes or the like.

One of the objects of my invention is to provide means whereby the mandrel can be revolved separately or together with the cylindrical head and the feed screw operated to expand the rollers or cutting disks through the medium of the mandrel in either case.

A further object of my invention is to provide means of forcing the cutting disks to expand for cutting purposes without changing the relative longitudinal cutting point of the disks.

Further objects of my improvement are to provide facilities for revolving the tapered mandrel and expanding the rollers for rolling purposes and means for operating the feed screw mounted on the same operating lever, means to lock the operating mechanism of the ratchet wheel out of mesh when desired and also means to lock the operating mechanism of the feed screw in operative position.

A further object of my improvement is to provide means of operating the tube cutter and expander manually combined with means whereby the device can be operated through the medium of applied mechanical or other power preferably compressed air.

In the accompanying drawings; Figure 1 is a central longitudinal sectional view of my device showing the cutters inserted ready for use as a tube cutter. Fig. 2 is a side elevation of my device (used as a tube cutter) inserted in a section of a tube or flue and shows the cutters in operation. Fig. 3 is a side elevation of the cylindrical head of my device showing the driving slot and the apertures for the cutters and rollers. Fig. 4 shows a side elevation of my device partly in section inserted in a section of a tube or flue and used as a flue-expander. Fig. 5 is a cross section of my device taken on the line *a*, *a*, of Fig. 2. Fig. 6 is a plan view of the operating lever and shows the pin and angular slot used for throwing the pawl out of engagement with the ratchet. Fig. 7 is an end view of the shank of the taper arbor. Fig. 8 is a side elevation of the taper arbor showing the driving pin inserted therein. Fig. 9 is a plan view of the ratchet wheel. Fig. 10 shows a plan view of the collar used for retaining the operating lever in place when the ratchet wheel is removed to allow the application of other driving means. Fig. 11 is a perspective view of the annular collar attached to the end of the feeding pin. Fig. 12 is a perspective view of the annular cap used for locking the feeding pin in engagement with the feed screw. Figs. 13 and 14 are end and side elevations of the disk shoes showing the cutting disks mounted therein. Fig. 15 is a cross section of the head taken on the line B. B. of Fig. 3. Fig. 16 is a side elevation of one of the tube rollers. Fig. 17 is a sectional view of the feed pin locking mechanism and shows the position of the same when the feed pin is locked in engagement with the feed screw. Fig. 18 is an end view of the operating lever shown in Fig. 17. Fig. 19 is a detail view of the taper driving pin.

Referring to the drawings, reference numeral 1 represents a cylindrical head having one end internally screw-threaded and the opposite end provided with a series (preferably three) of recesses forming pocket bearings 2 into which hardened steel tapered rollers 3 are fitted and adapted to rotate therein as will be described hereinafter (see Fig. 4 and Fig. 16).

A feed screw 4 having a collar 5 formed on one end with a series of circular or similar shaped apertures 6 formed in the periphery thereof is provided. The outer surface of the feed screw is screw-threaded and adapted to engage with the screw-threaded inner periphery 7 of the cylindrical head. The feed screw has an aperture formed in the center thereof into which the reduced straight portion 8 of a tapered mandrel 9 is rotatably journaled.

One extremity of the mandrel 9 is preferably formed rectangular or its equivalent to receive a wrench or other driving means.

An operating lever 10 is provided having

an eye 11 formed on one end and rotatably mounted upon the straight portion of the mandrel and abutting against the face 12 of the collar 5 formed on the feed screw thereby leaving the feed screw interposed between the eye and the shoulder 12^a formed on the tapered mandrel.

A ratchet wheel 13 having a counter bore 14 formed in one end (for a purpose hereinafter described) is rigidly secured to the straight portion of the mandrel adjacent to one end through the medium of the set screw 15 leaving the eye of the operating lever interposed between the outer face of the collar 5 and the inner face of the ratchet.

In the operation of rolling boiler tubes or the like, the feed-screw is threadably connected to the cylindrical head and the tapered mandrel is rotatably mounted within an aperture formed in the feed-screw. The rollers 3 are placed within the cylindrical head and are adapted to rest upon the tapered portion 9 of the mandrel and extend into pocket bearings formed in the cylindrical head. When the feed-screw is turned to the right, the mandrel is carried forward forcing the rollers 3 to expand in cylindrical outline and contact with the inner periphery of the boiler tube or the like for the purpose of rolling the tube. When the rollers 3 are forced through the medium of the feed-screw and mandrel to their proper outline, the mandrel itself is rotated through the medium of the operating handle 10 and ratchet mechanism, as herein described.

Depending from and adjacent to the eye of the operating lever 10 outwardly extending winged portions 16 and 17 are provided. In the outer projecting portion 17, an aperture is provided to receive a pin 18, the outer end of which is connected to a collar 19 which is loosely fitted to the lever 10. The collar 19 is counter-bored on one end. A pin 20 is fitted in a suitable aperture in the lever 10 and adapted to contact with the shoulder of the collar to provide a stop for the collar 19.

A coil spring 21 is interposed between the projecting portion 17 and the inner face of the collar 19 exerting its pressure or tension outwardly against the collar and normally keeping the pin 18 from engaging with the apertures 6 formed in the collar 5 of the feed screw when it is not desired to operate the feed screw for the purpose intended.

When it is desired to impart movement to the feed screw, pressure is exerted against the collar forcing the end of the pin to engage with the apertures 6 in the collar 5 and, when the lever 10 is rotated, movement is imparted to the feed screw for the purpose of expanding the cylindrical outline of the rollers or disks.

In order to impart movement to the mandrel through the medium of the lever 10, a pawl 22 is inserted in an aperture provided in the projecting or winged portion 16 of the lever and normally held in mesh with the teeth of the ratchet wheel by means of a coil spring 23 which is inserted in the space (a') in the rear of the pawl and constantly exerts a pressure against the rear end of the pawl whereby the pawl is made to normally engage with the teeth of the ratchet wheel 13. When the lever 10 is rotated, it rotates the mandrel 9 by the pawl and ratchet mechanism described.

A slot 24 is provided on the projecting portion 16 leaving the body of the pawl 22 exposed. A pin 25 is fitted to an aperture provided in the pawl registering with the slot and adapted to move freely within the angular slot 24 and to contact with the wall 26 of the slot 24 which is formed to correspond with an inclined plane. When the pin is turned to the position shown in Fig. 1 and Fig. 6 the pawl is in engagement with the ratchet wheel and when the lever 10 is rotated it revolves the mandrel separately, or with the cylindrical head, when connected therewith. When the pin is forced in the position shown in Fig. 6 by dotted lines, the pawl is held out of engagement with the teeth of the ratchet wheel when the operating lever 10 may be freely rotated for the purpose of operating the feed screw in either direction independent of the tapered mandrel 9. This describes the mechanism used for the purpose of rolling tubes or the like.

A cap 27 is loosely mounted on the collar 19 and is provided with an aperture 28 formed in the wall 29 of the cap 27 to receive the lever 10. A notch 30 is provided in the wall 29 to permit the cap to pass freely over the pin 20.

When it is desired to lock the pin 18 in engagement with the apertures 6 formed on the collar 5 of the feed screw 4, the collar 19 and cap 27 are forced forward until the outer surface of the cap 27 is in front of and contacting with the pin 20. The cap 27 is then rotated until the notch 30 is out of alinement with the pin 20. The pin 20 will then be in contact with the outer surface of the cap 27 thereby holding the pin 18 in engagement with the apertures 6 until released. (See Figs. 17 and 18.) When the pin 18 is released from the apertures 6 formed on the feed screw, the cap and collar are in the position shown in Fig. 1. It will be understood that the pin 18 is normally held out of engagement with the apertures 6 by the coil spring 21.

In order to provide means for cutting tubes or the like, diametrically disposed longitudinal slots 31 are formed in the cylindrical head 2 as shown in Figs. 1 and 3. An aperture 32 is formed in the mandrel into which a pin 33 preferably tapered is fitted leaving both ends projecting beyond the periphery of the mandrel and extending

therefrom into each of the slots. This pin is for the purpose of preventing the separate rotation of the mandrel when the cutting operation is being performed. Attention is called to the fact that the pin 33 is used only when the operator is performing the cutting operation. The purpose of the pin 33 is to connect the cylindrical head 1 and mandrel 9 together so that both can be rotated together when it is desired to cut off a tube rather than to expand the tube.

It is obvious that in a device constructed as shown it is necessary, when the cutting operation is being performed to revolve the cylindrical head and mandrel together. In the rolling operation, however, the mandrel is made to revolve independent of the cylindrical head by removing the pin 33.

Shoes 34 are provided having slots 35 formed at right angles to the body into which cutting disks 36 are journaled. The shoes are fitted to the pocket bearings formed in the cylindrical head with the bottom of said shoes resting upon the tapered portion of the mandrel so that when the mandrel is moved longitudinally through the medium of the feed screw, the cutting disks, which are journaled in the shoes, are forced to expand or contract in cylindrical outline for the purpose intended.

The shoes 34 are provided with grooves 37 which are adapted to fit the periphery of the tapered mandrel 9 when the said mandrel is in the position shown in Fig. 5 by full lines. The purpose of the grooves 37 is to cause the shoes 34 to aline themselves with the tapered arbor when pressure is exerted against the cutting disks.

When it is desired to cut the tubes or the like, movement is imparted to the feed screw in the same manner as described in the rolling process. When, however, it is desired to perform the cutting operation, I provide means to rotate the mandrel and cylindrical head together.

The pin 33 connects the mandrel and cylindrical head together so that when the pawl is permitted to mesh with the teeth of the ratchet wheel and movement is imparted to the operating lever, the mandrel and cylindrical head are made to revolve together. This permits the cutting operation to be performed without changing the relative longitudinal position of the disks and at the same time permits expansion of the cutters. The independent movement of the feed screw 4 permits the mandrel to be moved longitudinally for the purpose of expanding or contracting the cylindrical outline of the disks independent of the movement of the operating lever 10.

If it is desired to operate the feed screw whether for the purpose of expanding or releasing the cutting disks or the rollers, the pin 18 can be locked in engagement with the aperture 6 on the feed screw and the pawl 22 thrown out of engagement with the ratchet wheel and the operation of feeding can be performed independent of the ratchet mechanism.

When it is desired to operate the tube expander or cutter through the medium of mechanical or other power, the ratchet wheel 13 is removed from the mandrel and the collar 38 is provided and fitted to the shank of the tapered mandrel and held against the eye of the operating lever 10 thus retaining the lever in its place. The end of the mandrel is connected to the operating mechanism through the medium of the rectangular or similar shape end 39.

The hereinbefore described counter-bore 14 in the ratchet wheel 13 is provided to permit the said ratchet wheel to be replaced in its position on the end of the mandrel without removing the collar 38. Reference letter (*c*) represents a gage which is used for the purpose of gaging the length of the tube it is desired to cut off and the extent of the tube it is desired to expand.

Having fully described my invention, what I claim and desire to secure by Letters Patent is:

1. In a tube roller and expander, comprising a cylindrical head having recesses formed on one end thereof for bearings and the opposite end internally screw-threaded, said cylindrical head having diametrically opposed slots formed therein, a feed screw adapted to engage with the screw threaded end of said head, a mandrel journaled in and supported by the feed screw, means to connect the mandrel to the head, a ratchet wheel secured to said mandrel, an operating lever loosely journaled on one end of the mandrel and adapted to contact with the face of the feed screw, said operating lever having two outwardly projecting wing portions, one of said wing portions having a pawl fitted thereto and adapted to mesh with said ratchet wheel for rotating the mandrel separately or in conjunction with the cylindrical head.

2. In a tube roller and expander, the combination of a head having recesses formed in one end thereof for bearings with the opposite end internally screw-threaded, a feed screw adapted to engage with the screw-threaded end of the cylinder, a mandrel journaled in and supported by the feed-screw, an operating lever loosely journaled on one end of the mandrel and adapted to engage with the feed screw, said operating lever having two outwardly projecting portions, a ratchet wheel secured to one end of the mandrel, one of said projecting portions having a pawl fitted thereto and adapted to mesh with said ratchet wheel, means to hold said pawl out of engagement with said ratchet wheel, a pin journaled in the other projecting portion and adapted to mesh with apertures formed in

the feed screw whereby movement is imparted to said feed screw when the operating handle is rotated.

3. The combination of a tube expander and roller comprising a cylindrical head having a hollow central portion, recesses formed in one end of the head with the opposite end internally screw-threaded, a hollow feed screw fitted to one end of said cylindrical head and provided with a series of apertures formed in the periphery thereof, a mandrel rotatably supported by the feed screw, a ratchet wheel rigidly secured to the one end of the mandrel having its face contacting with the operating handle whereby it is retained in place, means on said operating handle to rotate the mandrel independent of the cylindrical head, means to rotate the mandrel and the cylindrical head simultaneously, and also means on said operating handle to rotate the feed-screw as described and for the purpose set forth.

4. In a tube expander and cutter, comprising a cylindrical head having bearings provided therein to receive cutting disks or rollers and also provided with diametrically opposed slots, a feed-screw connected to said cylindrical head, a mandrel journaled in the hollow central portion of said feed-screw and adapted to be rotated therein independent of the rotation of the cylindrical head, a pin fitted to the mandrel and adapted to engage with said slots, means to rotate the mandrel and cylindrical head simultaneously or independent of each other.

5. In a tube expander and cutter comprising a cylindrical head having recesses formed on one end to receive cutting disks or rollers and also provided with diametrically opposed slots, a feed-screw threadably connected to said cylindrical head having a hollow central portion, a tapered mandrel having a straight portion adapted to be journaled within the hollow portion of said feed-screw and rotatably supported thereby, an operating lever provided with winged portions loosely journaled on the straight portion of said mandrel provided with winged portions, means to expand the cylindrical outline of the rollers or cutting disks, means to rotate the tapered mandrel and cylindrical head together, means to lock the operating mechanism of the mandrel in or out of operative position, and also means to lock the operating mechanism of the feed-screw in or out of operative position substantially as and for the purpose described.

6. In a combined tube expander and cutter, the combination of a cylindrical head having a series of pockets formed in one end, rollers adjustably carried by the pockets a feed-screw threadably connected to the opposite end; of a mandrel rotatably mounted in said feed-screw, said cylindrical head being provided with diametrically opposed slots extending to the periphery thereof, removable means mounted on said mandrel and adapted to engage with said slots to revolve the cylindrical head with the tapered mandrel as and for the purpose described.

7. The combination of a tube expander and cutter comprising a cylindrical head having one or more pockets formed therein adapted to receive rollers or shoes having rollers or cutters journaled therein, means to revolve the mandrel independent of the cylindrical head for rolling purposes, removable means mounted on said mandrel and adapted to engage with slots formed in the cylindrical head to rotate it simultaneously with the mandrel for cutting purposes.

8. The combination of a tube expander and roller comprising a cylindrical head, said cylindrical head being provided with a series of pockets, rollers fitted to said pockets, shoes also adapted to fit said pockets, rotary cutters mounted in said shoes, a feed-screw fitted to said cylindrical head, a mandrel rotatably mounted in said feed-screw, said mandrel being adapted to expand the cylindrical outline formed by the cutters and rollers as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK M. HAWKINS.

Witnesses:

JOHN H. COSS,

PEARL ACKERMAN.