C. THIBODEAU.

APPARATUS FOR AUTOMATICALLY PERFORATING TUBES.

APPLICATION FILED APR. 20, 1908.

924,203.

Patented June 8, 1909.

4 SHEETS—SHEET 1.

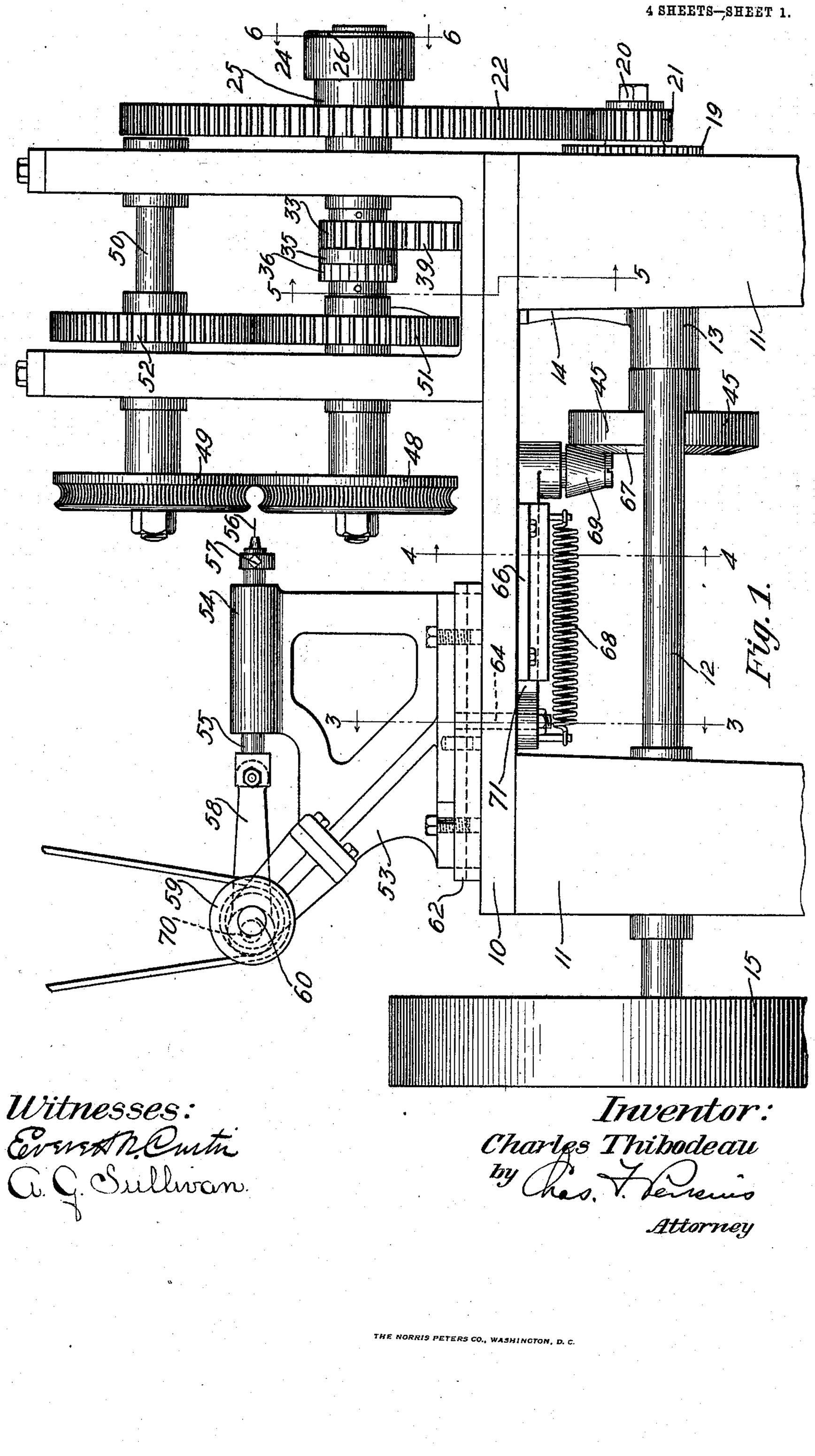

Fig. 1.

Witnesses:
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A. G. Sullivan.

Inventor:
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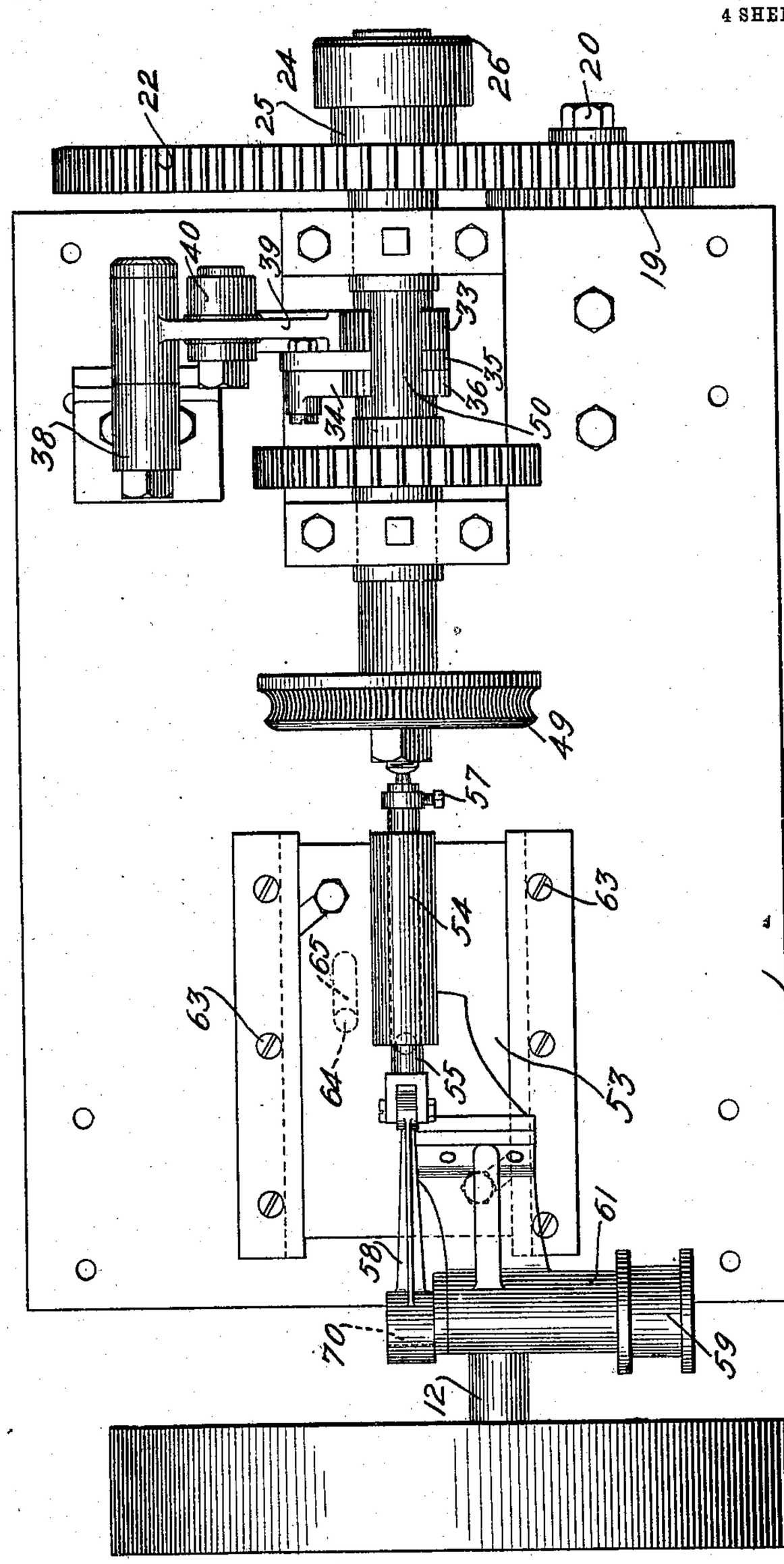

Fig. 2.

Witnesses:
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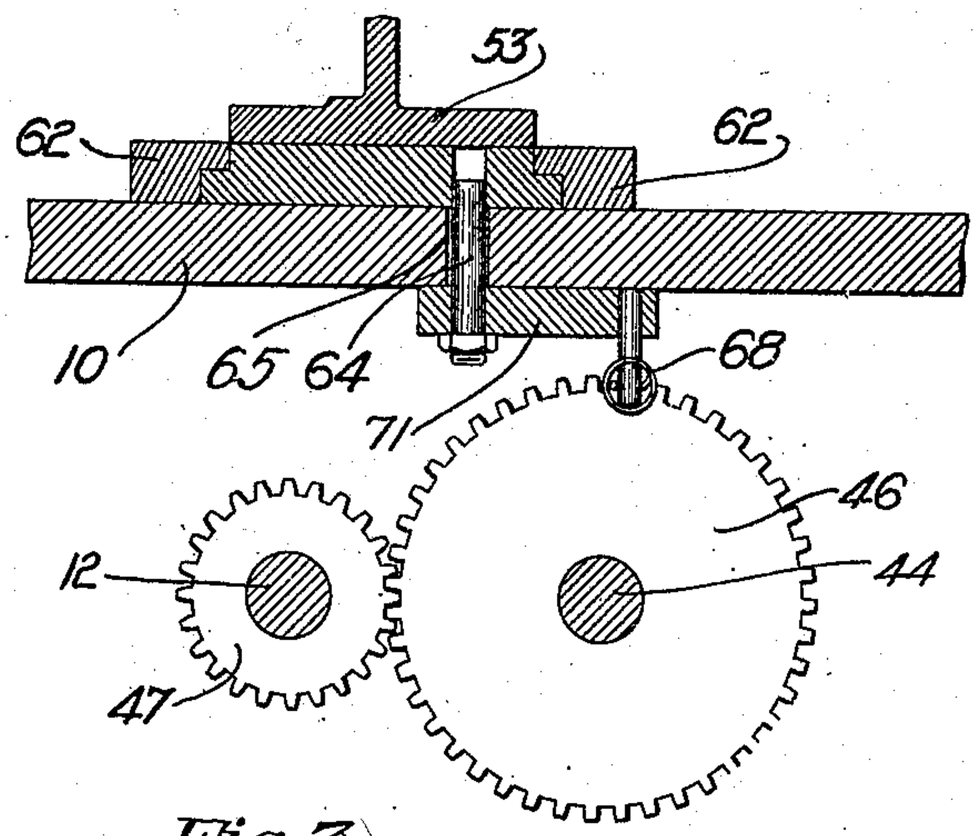

Fig. 3.

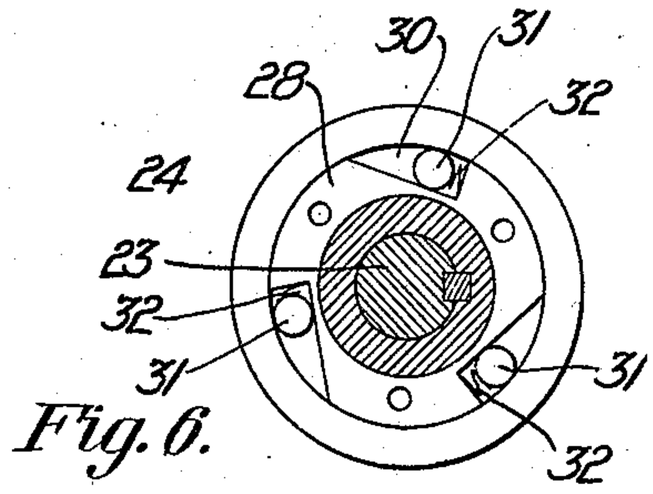

Fig. 6.

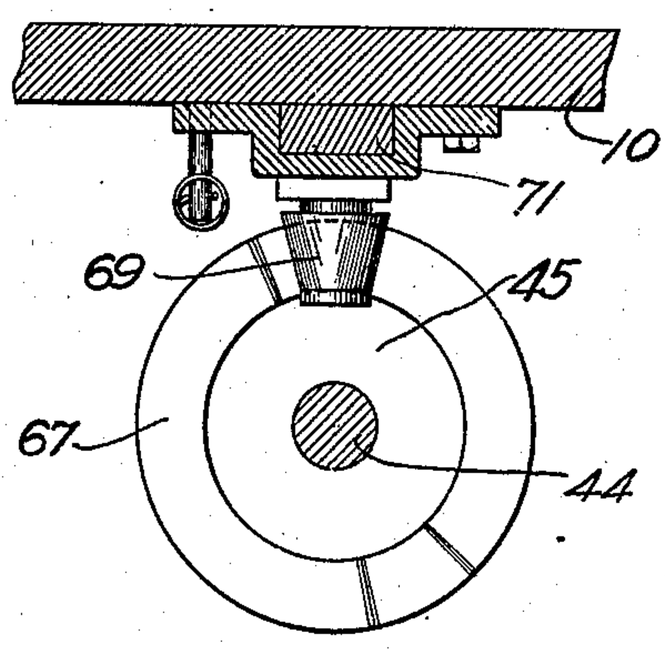

Fig. 4.

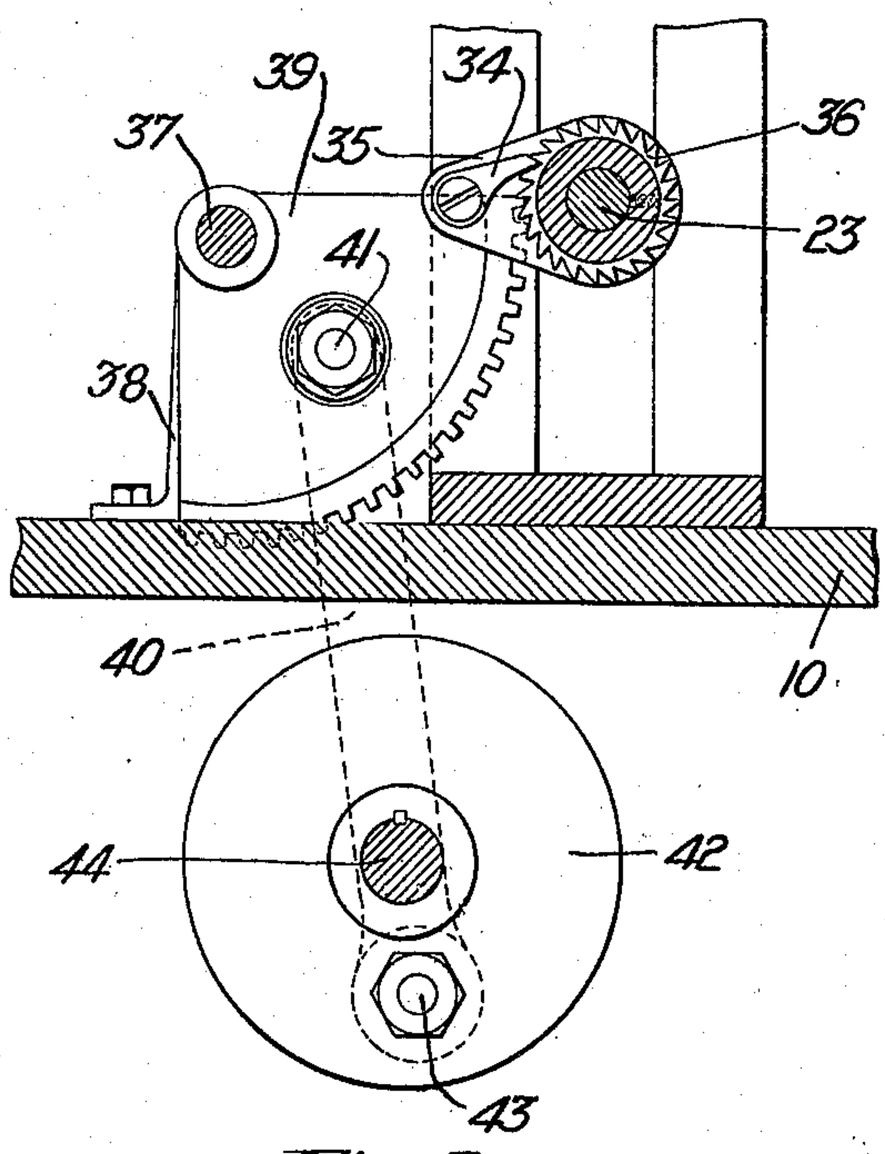

Fig. 5.

Witnesses:
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4 SHEETS—SHEET 4.

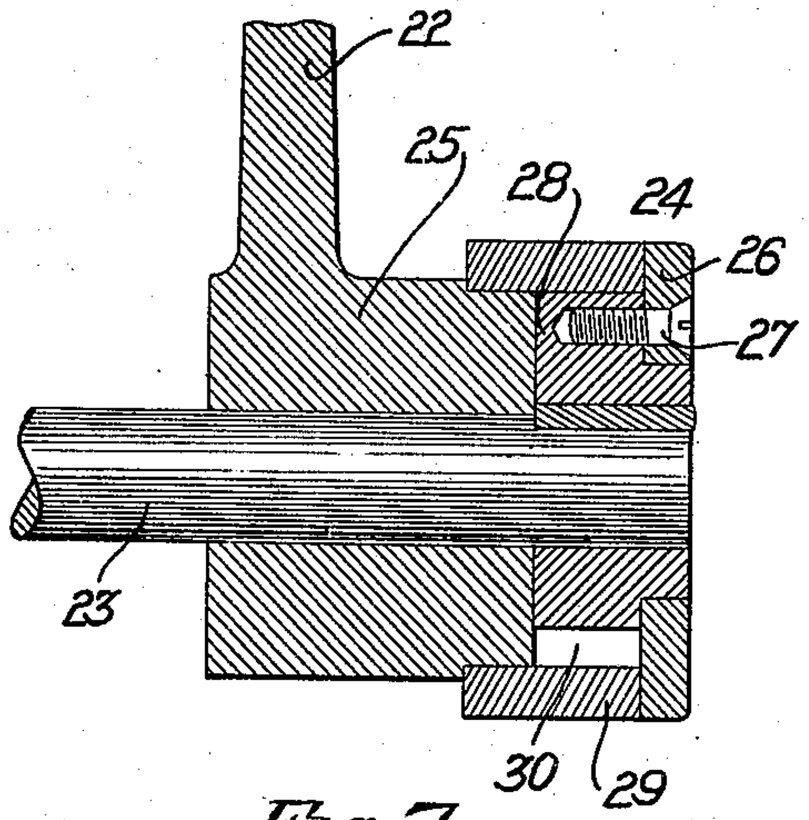

Fig. 7.

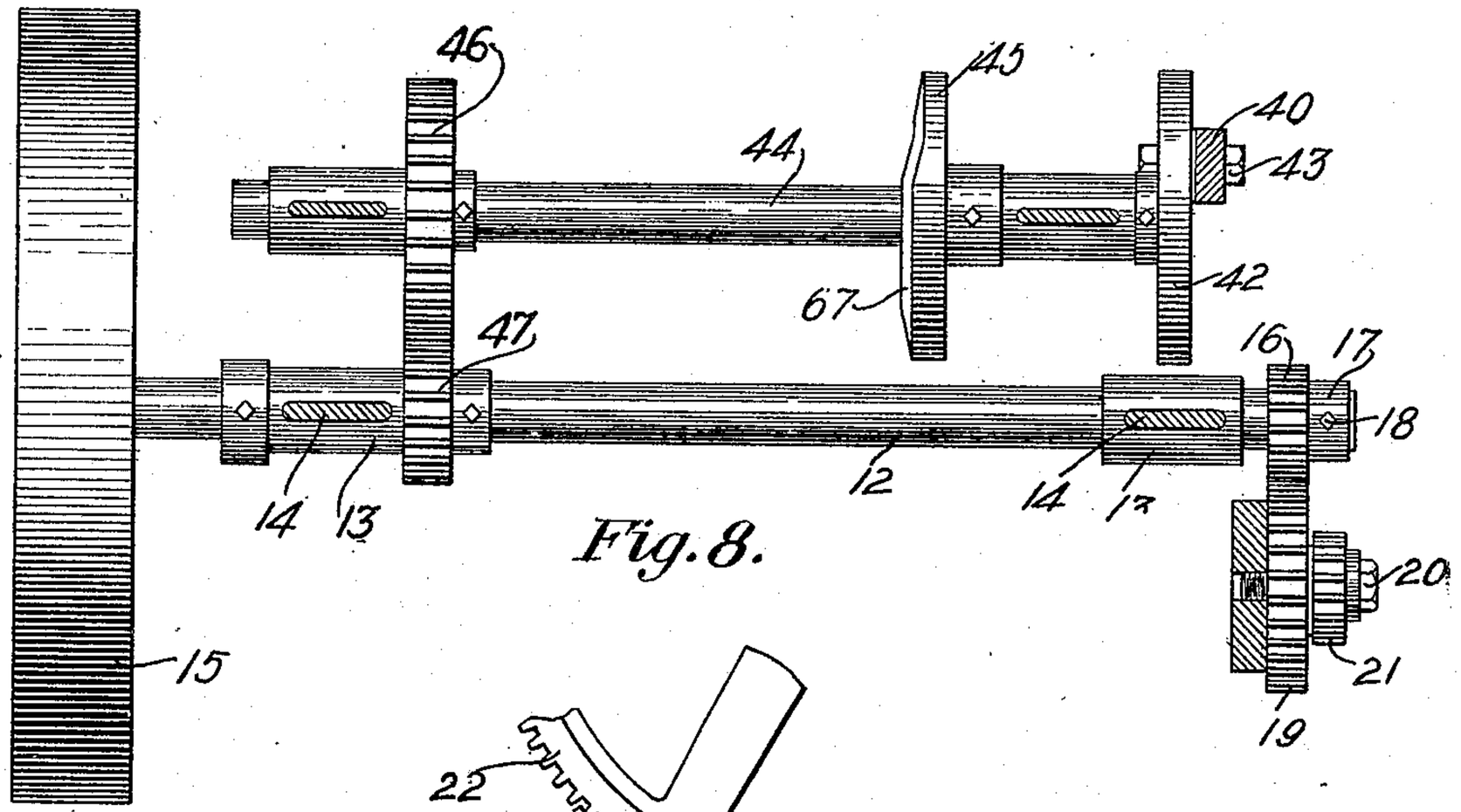

Fig. 8.

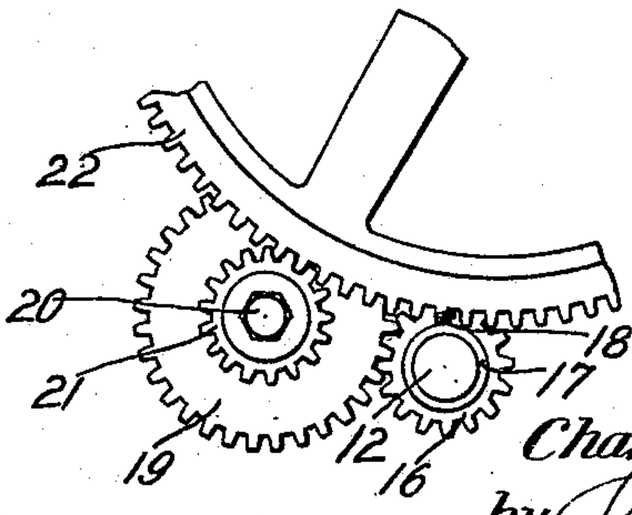

Fig. 9.

Witnesses:

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C. G. Sullivan.

Inventor:

Charles Thibodeau

by Chas. F. Perkins

Attorney

UNITED STATES PATENT OFFICE.

CHARLES THIBODEAU, OF CHELSEA, MASSACHUSETTS, ASSIGNOR TO AMERICAN CIRCULAR LOOM COMPANY, OF CHELSEA, MASSACHUSETTS, A CORPORATION OF MAINE.

APPARATUS FOR AUTOMATICALLY PERFORATING TUBES.

No. 924,203. Specification of Letters Patent. Patented June 8, 1909.

Application filed April 20, 1908. Serial No. 427,991.

To all whom it may concern:

Be it known that I, CHARLES THIBODEAU, a citizen of the United States, residing at Chelsea, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Apparatus for Automatically Perforating Tubes, of which the following is a specification.

My invention relates to a machine for perforating the wall of tubular structures, and its object is to weaken at intervals the helical lining of conduits for electric wires.

My invention primarily consists in mechanism for passing between a pair or pairs of grooved rolls a conduit of the character described in the United States patent to Herrick, No. 456,271, dated July 21st, 1891, and at the same time causing a pointed instrument to cut through the wall of said tube while it is between the said rolls, the said instrument being carried upon a movable carrier, and moved back out of the way automatically when it is not in use; the purpose of cutting said tube being to weaken or cut the spiral lining of said conduit, and thereby cause the same to be pulled out in short sections only when the exposed end is taken hold of and subject to a longitudinal pull or strain.

My invention also consists in the various improvements hereinafter more specifically described and claimed.

Reference is hereby made to the drawing in which similar numerals of designation refer to similar parts throughout the several views.

Figure 1 is a side elevation of my machine showing the various parts thereof. Fig. 2 is a plan view of the machine shown in Fig. 1. Fig. 3 is a section on line 3—3 of Fig. 1 through the carrier and table looking in the direction of the arrows. Fig. 4 is a section of the table on line 4—4 of Fig. 1 looking in the direction of the arrows, showing the cam, cam-roll and connections for operating the carrier. Fig. 5 is a section on line 5—5 of Fig. 1 looking in the direction of the arrows, showing the ratchet and pawl, segmental gear and crank for operating the same. Fig. 6 is a section on line 6—6 of Fig. 1 looking in the direction of the arrows, showing a section of the lower roll-shaft and the construction of the clutch. Fig. 7 is a longitudinal section of said clutch. Fig. 8 is a horizontal section of the lower frame of the table showing the main shaft and gearing connecting the same with the cam-shaft and lower roll-shaft. Fig. 9 is a detail of the lower portion of the large gear on the lower roll-shaft and its connections with the main shaft.

In the drawing, 10 represents the table of my machine supported upon suitable legs 11, which may be of any desired construction. The shaft 12 is mounted in suitable bearings 13 fastened to the table 10 by means of hangers 14. 15 is a pulley connecting the said shaft with a source of power. At the extreme end of the shaft 12 is the pinion 16, (see Fig. 8) which is secured to said shaft by means of the head 17 and set-screw 18.

19 is an intermediate gear suitably mounted upon a portion of the frame of the table and secured thereto by the pin 20. Connected with said gear 19 and moving on the same pin 20 is the pinion 21, which meshes with the large gear 22 on the lower roll-shaft 23. Upon said shaft 23, at the right thereof, is a clutch 24 secured on hub 25 of said gear 22. The clutch 24 is shown in detail in Figs. 6 and 7, the end of which, the cap 26, is secured by screws 27, or other suitable means, to the friction disk 28. 29 is the circular casing of the clutch surrounding said friction-disk and secures the same to the hub of the gear 22 as aforesaid. The said disk 28 is keyed to the shaft 23 and has portions of its periphery in contact with the wall of the casing 29, and wedged-shaped openings 30 between the said friction-disk and the wall of said casing. It contains movable pins 31 and springs 32, and operates in the manner well known to the art when the large gear 22 is moved normally in its direction of rotation on the shaft 23. On the said lower pulley shaft 23 is loosely mounted the gear 33 to which is fastened the pawl 34 by means of the pawl carrier 35, all of which are carried loosely upon said shaft. 36 is a ratchet firmly secured to said shaft 23.

Upon the stud 37, which is mounted in the stand 38 upon the table 10, is secured the segmental gear 39, which meshes with said gear 33 on the pulley shaft 23. At the lower portion of said segmental gear 39 is pivotally connected by means of a pin 41, the crank 40, the lower end of which is pivoted to one side of the disk 42 by means of the crank pin 43. The disk 42 is secured to one end of the shaft 44, which is mounted in suitable bearings under the table 10 and bears thereon the

cam 45 and the gear 46, which latter meshes with the gear 47 on the main shaft 12.

Upon one end of the lower roll shaft 23 is mounted the roll 48, the periphery of which is preferably grooved and one edge thereof slightly cut away to permit the introduction of the sharp instrument hereinafter described. The upper roll 49 is mounted upon the upper roll shaft 50, which is journaled in suitable bearings above the lower pulley-shaft 23, and connected therewith by the gears 51 and 52, the effect of which is to make the rolls rotate in opposite directions.

53 is a carrier and has at the top thereof the guide 54 in which slides the plunger 55, in one end of which is secured a sharp instrument 56, by means of the set-screw 57 or other suitable means. The said plunger 55 is driven by a rod 58, which is connected with a crank 70 on the shaft 60. At the rear of the carrier 53 and at the upper portion thereof is the bearing 61, in which is journaled the shaft 60 having on one end thereof the pulley 59 which is connected with some suitable source of power. The carrier 53 is secured to the table 10 and runs freely in the track 62, which is secured to the table by screws 63 or by any suitable means. To the base of said carrier is secured a pin 64 which engages with the groove 65 extending through the table in a direction with the axis of movement of said carrier, and to the lower end of which is fastened the rod 71 in any suitable manner. The rod 71 is secured to the bottom of the table 10 by means of the supporting guide 66. To the other end of the rod 71 is secured in any suitable manner the cam-roll 69, which engages with the cam-surface 67 of the cam 45, and is kept in such engagement by the spring 68.

The mode of operation of my machine is as follows:—The pulleys 15 and 59 are connected to the source of power and started in motion. The movement of the shaft 12 is transmitted through gears 16, 19, 21 and 22 to the shaft 23, which in turn through gears 52 and 51 causes the rotation of the shaft 50 in the opposite direction. In consequence the feed rolls 48 and 49 are revolved and slowly advance the conduit when placed between their opposing peripheries. At regular intervals the speed of the said feed rolls is accelerated and the conduit thereby moved forward more rapidly. This rapid movement is accomplished by the segmental gear 39 (see Fig. 5) which is actuated by the connecting rod 40 and disk 42 on shaft 44 connected with the main shaft 12 by gears 46 and 47. As the said segmental gear moves upwardly it communicates a rapid movement to the shaft 23 by means of the gear 33 and pawl carrier 35 loosely mounted thereon, but restrained from rotation by being connected with the pawl 34 which is kept in engagement with the ratchet 36 firmly secured to said shaft 23. As the segmental gear moves downwardly the said pawl is released from engagement with said ratchet and the gear 33 is thereby moved without affecting said shaft 23. In close proximity to the space between the rolls is placed the pointed instrument 56 which is caused to be in constant reciprocation by reason of the sliding plunger 55 and its connection with the crank 70 on shaft 60. The carrier is moved to and from the rolls, and the perforating instrument therefore carried into and out of engagement with the work by the following means:—The pin 64, extending down through the groove 65 in the table 10 and secured to said carrier, is connected at its lower end with the sliding arm 71; and is thereby moved back and forth in said groove by the cam 45 and cam-roll 69. The spring 68 serves to keep the cam face 69 always in engagement with said roll. The mechanism for moving the carrier is so timed that while the rolls 48 and 49 are revolving at their slowest speed, the carrier will be nearest the rolls, and the perforating instrument thereby caused to vibrate between them. When the speed is accelerated by the segmental gear 39, the carrier is moved out of the way and the said instrument released from engagement with the conduit.

In the commercial operation of my machine I have found that to produce the greatest amount of product in a given time, it is necessary to have the conduit move between the feed rolls slowly while it is being perforated, and rapidly when the instrument is out of engagement. If the feed rolls are driven at a maximum and constant rate of speed, it is impracticable to employ an instrument which is caused to vibrate, since the speed of such vibrations must greatly exceed that of the rolls, and tend to render the instrument inoperative. In such cases a wide knife stationary on the carrier must be employed, and a more pronounced slit made in the conduit than with a reciprocating point. If the feed rolls are driven slowly at a constant speed, no difficulty will be found in making the perforations, but the output will be small.

While I have described my machine with particular reference to the electric conduit of Herrick, I by no means desire to limit the same merely to such use, as it is obvious that the parts of said machine may be variously modified and adapted without departing from the spirit of my invention.

What I claim and desire to secure by Letters Patent is:—

1. In a machine for cutting the walls of tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a sharp instrument, means for causing said instrument to weaken the wall of said tube by punching holes in the same, combined with

means for automatically withdrawing said instrument after said tube is punched, and for returning said instrument to its original position at predetermined intervals.

2. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a pointed instrument arranged to be inserted between said rolls and withdrawn therefrom, means for causing said instrument to reciprocate between said rolls, and to weaken the wall of said tube by punching holes in the same, combined with means for automatically withdrawing said instrument from its position between said rolls and for returning said instrument to its said position at predetermined intervals.

3. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a pointed instrument, means for causing said instrument to reciprocate between said rolls and perforate the wall of said tube, combined with means for automatically causing said instrument to engage and disengage with said tubular wall and form lines of perforations therein at predetermined intervals.

4. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a pointed instrument arranged to be inserted between said rolls and withdrawn therefrom, means for causing said instrument to reciprocate between said rolls, and to weaken the wall of said tube by punching holes in the same, combined with a carrier for said instrument, and means for automatically moving said carrier away from said rolls and withdrawing said instrument from its said position between said rolls and for returning said carrier and instrument to their original position.

5. In a machine for perforating tubes, a pair of feed rolls positively driven having their axes parallel to each other, a carrier, an awl secured to one end of an arm arranged to reciprocate on said carrier and to weaken the wall of the tube by punching holes in the same, a track for said carrier arranged to move the same to and from said rolls, combined with means for automatically moving said carrier back and forth on said track at predetermined intervals.

6. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a shaft and gears for slowly revolving said rolls in opposite directions, combined with means for automatically causing the said rolls to revolve more rapidly at predetermined intervals.

7. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a shaft and gears for slowly revolving said rolls in opposite directions, combined with means for automatically causing the said rolls to revolve more rapidly at predetermined intervals, and means for perforating the wall of said tube while the said rolls are moving slowly, and for ceasing to perforate said tube while the said rolls are moving fast.

8. In a machine for perforating tubes, mechanism for feeding the tube, a sharp instrument, combined with means for automatically causing said instrument to weaken portions of the wall of said tube by punching holes in the same at predetermined intervals.

9. In a machine for weakening the spiral lining of electric conduits, mechanism for feeding the conduit, a sharp instrument, combined with means for automatically causing said instrument to cut through and weaken the spirals of said conduit at predetermined intervals.

10. In a machine for perforating tubes, a pair of feed rolls shaped to receive a tube between their opposing surfaces, a carrier, an awl secured to one end of an arm arranged to reciprocate constantly on said carrier, a track for said carrier arranged to move the same to and from said rolls, combined with means for automatically moving said carrier back and forth on said track while said awl is in reciprocation.

11. In a machine for perforating tubes, mechanism for feeding the tube, a carrier, a pointed instrument arranged to reciprocate on said carrier, a track for said carrier arranged to move the same to and from said tube substantially at right angles to the path of the work, combined with means for automatically moving said carrier back and forth on said track at predetermined intervals.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses, this thirty-first day of March 1908.

CHARLES THIBODEAU.

Witnesses:
EVERETT N. CURTIS,
ELMER L. BRIGGS.