No. 784,244. PATENTED MAR. 7, 1905.

E. ZEH.

MACHINE FOR SCREW THREADING SHEET METAL PIPES.

APPLICATION FILED JUNE 13, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

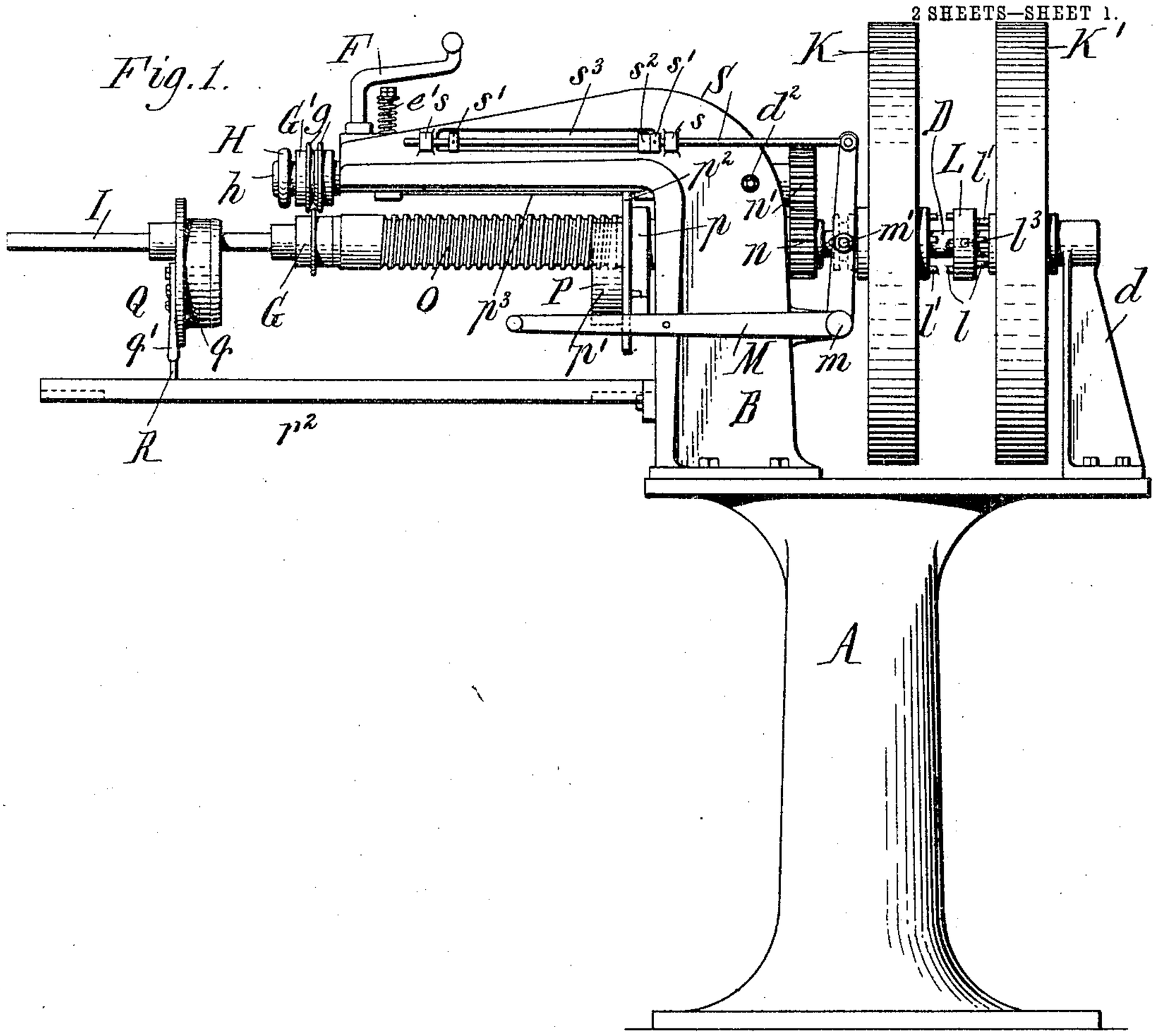
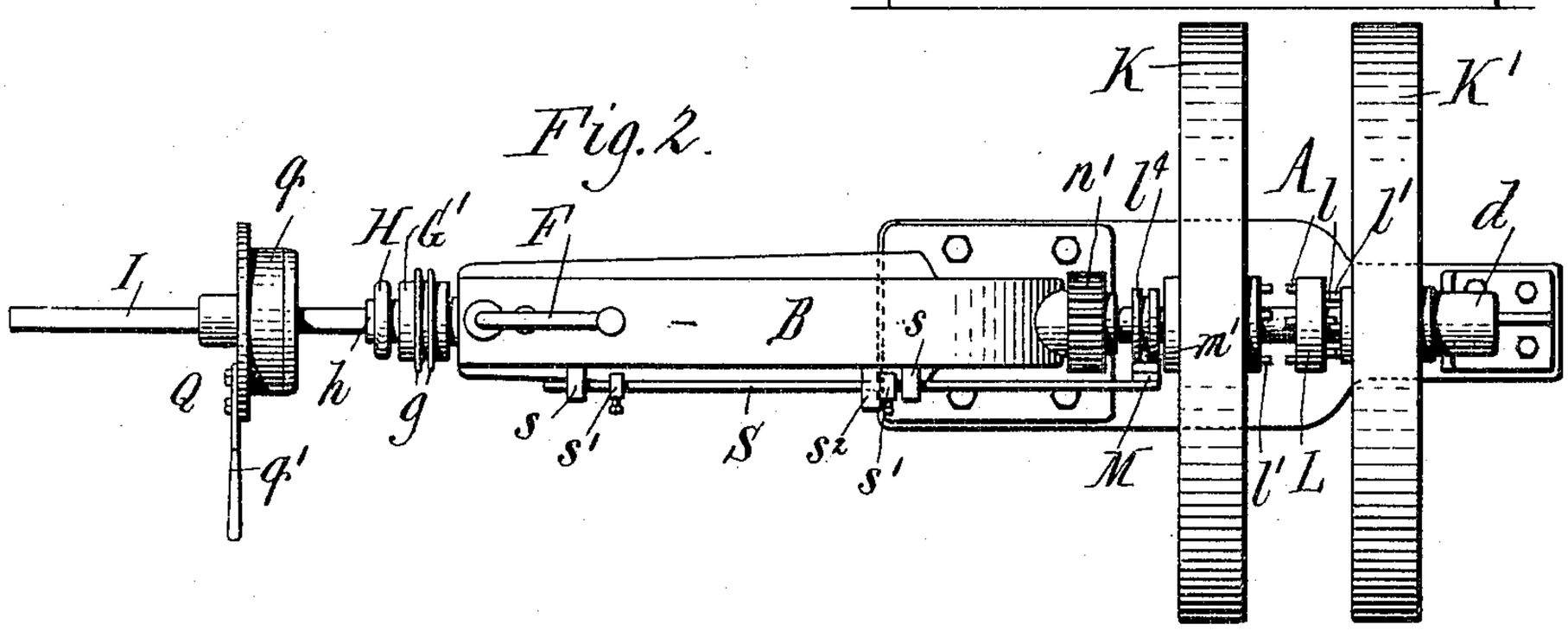


Fig. 2.



Witnesses:
E. A. Volk
P. W. Penner.

Inventor
Edmund Zeh
By Wilhelm, Parker & Hard
Attorneys.

No. 784,244. PATENTED MAR. 7, 1905.

E. ZEH.

MACHINE FOR SCREW THREADING SHEET METAL PIPES.

APPLICATION FILED JUNE 13, 1904.

2 SHEETS—SHEET 2.

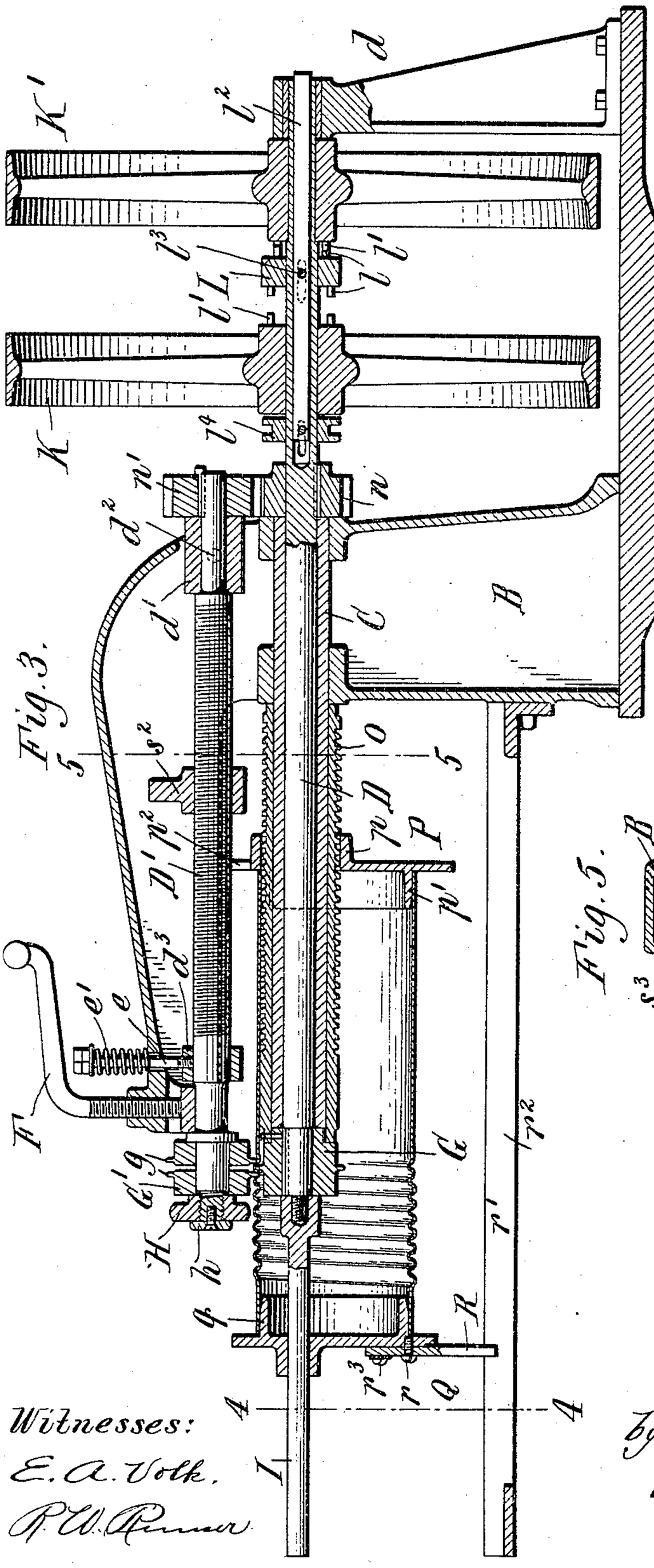


Fig. 3.

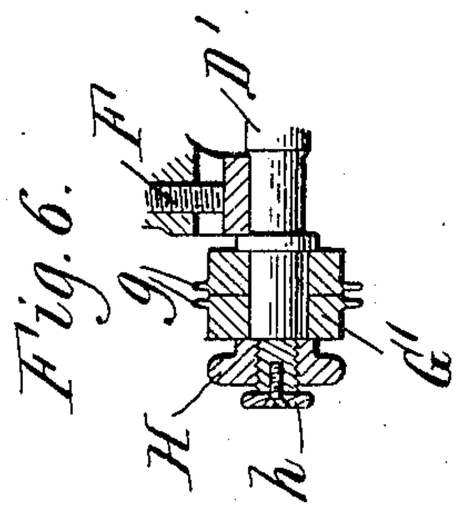


Fig. 6.

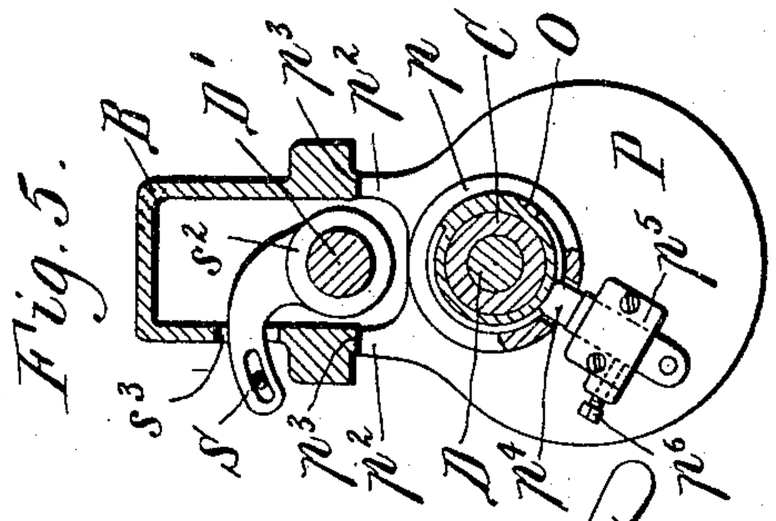


Fig. 5.

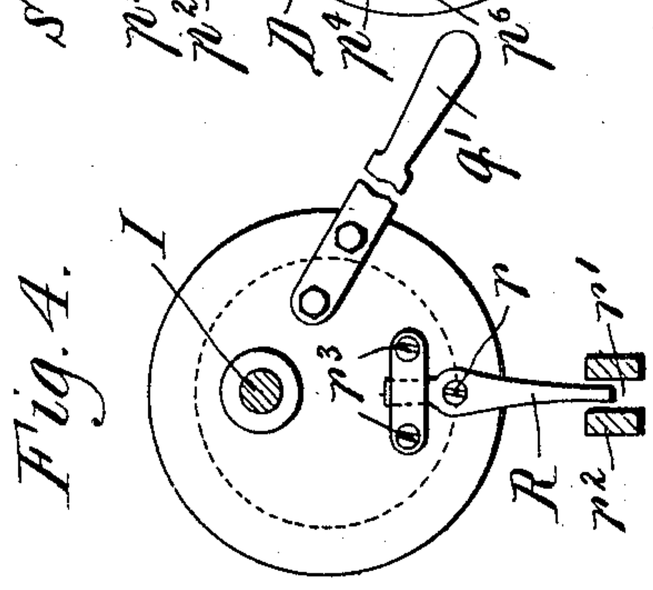


Fig. 4.

Witnesses:
E. A. Volk.
P. W. Penner

Inventor.
Edmund Zeh
by Wilhelm, Parker & Hard
Attorneys.

No. 784,244. Patented March 7, 1905.

UNITED STATES PATENT OFFICE.

EDMUND ZEH, OF BUFFALO, NEW YORK, ASSIGNOR TO NIAGARA MACHINE & TOOL WORKS, OF BUFFALO, NEW YORK.

MACHINE FOR SCREW-THREADING SHEET-METAL PIPES.

SPECIFICATION forming part of Letters Patent No. 784,244, dated March 7, 1905.

Application filed June 13, 1904. Serial No. 212,311.

To all whom it may concern:

Be it known that I, EDMUND ZEH, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, (whose post-office address is Buffalo, New York,) have invented new and useful Improvements in Machines for Screw-Threading Sheet-Metal Pipes, of which the following is a specification.

This invention relates to machines for forming screw-thread or helical corrugations or grooves in sheet-metal pipes—such, for instance, as are employed for making corrugated stovepipe-elbows.

The objects of the invention are to produce an efficient pipe threading or corrugating machine of simple construction which can be rapidly operated with the minimum effort upon the part of the operator, to provide an automatic stop mechanism whereby the corrugating-rolls are stopped when a predetermined length of pipe has been threaded or corrugated, the provision of means for regulating the depth of the thread or corrugation to prevent injury to the pipe, to provide a feed-screw for the pipe which can be readily removed or replaced by other feed-screws for operation upon pipes of different diameters and producing threads of different pitch, to provide a hand-actuated holder and guide for the pipe which obviates the necessity for a skilled operator and lessens the danger of damage to the pipe in the operation of the machine, and to improve machines of this character in the respects hereinafter pointed out, and set forth in the claims.

In the accompanying drawings, consisting of two sheets, Figure 1 is a side elevation of a pipe threading or corrugating machine embodying the invention. Fig. 2 is a plan view thereof. Fig. 3 is a fragmentary longitudinal sectional elevation thereof on an enlarged scale. Fig. 4 is a transverse sectional elevation in line 4 4, Fig. 3, showing the hand-holder for the pipe. Fig. 5 is a transverse sectional elevation, partly broken away, in line 5 5, Fig. 3, showing the pipe-feed and stop devices. Fig. 6 is a detail sectional elevation, on an enlarged scale, of one of the corrugating-rolls.

Like letters of reference refer to like parts in the several figures.

A represents a supporting frame or stand, which may be of any suitable form and construction, B a hollow frame-arm, which has an upright inner portion secured to the stand and a forwardly-projecting horizontal portion, and C, Fig. 3, a hollow bearing-sleeve, which is fixed at its inner end in and projects forwardly from the upright portion of the frame-arm, beneath the horizontal portion thereof.

D D′ represent, respectively, lower and upper substantially parallel corrugating-roll shafts. The lower shaft passes through and is journaled in said bearing-sleeve C and in a suitable bearing-post *d*, rising from the stand. The upper roll-shaft is journaled in the hollow frame-arm in such manner that its outer end can be moved toward and from the lower shaft. As shown, it is journaled at its inner end in a rocking box *d′*, Fig. 3, pivoted at d^2 in the frame-arm, and at its outer end in a box d^3, which slides between guide-faces on the sides of the frame-arm and is yieldingly supported by a rod *e* passing through a hole in the top of the frame-arm and through a coil-spring *e′*, confined between adjusting-nuts on said rod and the top of the frame-arm.

F represents a hand-screw for forcing the outer end of the upper roll-shaft toward the lower shaft against the tendency of the spring *e′* to separate said shafts.

G G′ represent corrugating-rolls secured to the outer ends of the roll-shafts. One of the beading-rolls (preferably the lower one) has a single circumferential corrugating-bead, while the other roll (the upper one in this instance) consists of two separable sections or parts, Figs. 3 and 6, each having a circumferential bead *g*, which beads together form a groove into which the single bead of the lower roll projects. The lower roll and the two sections of the upper roll are detachably keyed or otherwise detachably secured on their shafts and caused to turn therewith.

H represents a nut or hand-wheel screwed on the threaded end of the upper shaft between the outer roll-section and a detachable flange

h at the extremity of the shaft. By screwing this nut or wheel out the roll-sections can be moved apart to increase the space between their corrugating-ribs, while by screwing the nut or wheel in the roll-sections are forced toward each other to decrease the space between their ribs. The lower roll is preferably held on its shaft by a rod I, which is screwed on the threaded end of the shaft. This rod constitutes a guide for the hand-pipe holder hereinafter described. The roll-shafts are positively driven in opposite directions, and one shaft (preferably the lower one) constitutes a drive-shaft. In the machine illustrated the latter shaft is provided with two loose drive-wheels K K′, which are constantly driven in opposite directions by belts or other means (not shown) and are separately coupled to the shaft to rotate the latter in one direction or the other by a clutch L of any usual or suitable form. The clutch shown consists of a disk which is capable of sliding on the drive-shaft and is provided at opposite sides with projecting pins *l* to engage corresponding pins *l′*, projecting from the adjacent ends of the hubs of the drive-wheels. The clutch is caused to turn with the drive-shaft and is connected to an operating-stem l^2, movable longitudinally in a bore in the drive-shaft by a transverse pin l^3, passing through slots in the shaft. The operating-stem is similarly connected to a grooved collar l^4, Fig. 3, on the drive-shaft, and this collar is shifted to operate the clutch by a hand-lever M, Fig. 1, fulcrumed at *m* on the frame-arm and having an upwardly-projecting arm provided with a pin *m′*, entering the groove of the collar l^4. The other arm of the lever projects forwardly to a position within reach of the operator. When the lever stands in a neutral or intermediate position, in which it may be releasably held by known means, (not shown,) the clutch-pins will be out of engagement with the pins on both drive-wheels, so that the latter will turn freely without driving the machine, and by shifting the lever in one or the other direction one or the other of the drive-wheels can be coupled to the shaft to drive it in the desired direction. Any other suitable means may be employed to start and stop the drive-shaft and rotate it in opposite directions. The upper roll-shaft is driven from the lower or drive shaft by intermeshing gear-wheels *n n′* on said shafts.

O represents a hollow externally-threaded feed-screw which bears on and rotates about the hollow bearing-sleeve C for the drive-shaft. The feed-screw is fixed at its outer end to the lower corrugating-roll, whereby it is caused to turn with the lower roll-shaft, and it can be slipped off of the bearing-sleeve to be replaced by another feed-screw with a thread of different pitch by detaching the corrugating-roll.

P represents a feed device and support for the pipe. It preferably consists of a head or plate having a hollow boss *p*, which slides on the feed-screw, and a forwardly-projecting segmental circular flange *p′*, on which the inner end of the pipe is placed and loosely supported, so that it is free to turn about the flange. The feed device is held from turning on the feed-screw by parts p^2 thereon, which engage the longitudinal guide-faces p^3 on the frame-arm, Fig. 5. The feed device is connected by suitable means with the feed-screw to be moved thereby. A slide p^4 is shown for this purpose, movable toward and from the feed-screw in a guide p^5 on the feed device and having a threaded end for engagement with the feed-screw. p^6 is a holding-screw for the slide. By loosening the screw p^6 and retracting the slide the feed device can be disconnected from the feed-screw, and thus rendered inoperative. The outer end of the pipe is supported and guided while being corrugated by a hand-operated guide or holder Q, which slides on the guide-rod I, projecting from the front end of the lower roll-shaft. The holder has a handle *q′*, by which it is manipulated, and a circular flange *q*, which enters and supports the outer end of the pipe and on which the pipe is free to turn.

R represents a finger which is pivoted at *r* on the guide and the lower end of which enters and slides in a longitudinal slot *r′* in a stationary arm r^2, secured to and projecting from a suitable stationary part of the machine-frame below and parallel with the lower roll-shaft. The finger is capable of a swinging movement on the pipe-guide, which movement is limited by stop-screws or parts r^3 on the guide, between which the upper end of the finger extends.

S, Figs. 1 and 2, represents a stop-rod which is slidably held in guides *s* on the frame-arm parallel with the upper roll-shaft and is connected to the upwardly-projecting arm of the hand-lever M. The stop-rod is provided with adjustable stop-collars or parts *s′*. A nut s^2, having a screw-threaded hole through which the upper roll-shaft, which is threaded, passes, has an arm which projects out through a slot s^3 in the frame-arm between and is adapted to engage said stop-collars to shift the stop-rod. The stop-collars are set so that when the rolls have corrugated the desired length of pipe the nut will engage one of the collars and shift the stop-rod, which, through its connections with the clutch L, will shift the latter to a neutral position and stop the machine. The stop-nut travels in one direction and strikes one stop-collar when the corrugating-rolls are driven in one direction, and when the latter are driven in the opposite direction the stop also travels in the opposite direction and strikes the other stop-collar.

The operation of the machine is as follows: Assuming the machine to be at rest, with the feed device P at the inner end of the feed-

screw, the corrugating-rolls are separated by turning the hand-screw F, and the adjusting hand-wheel H for the upper corrugating-roll is turned out to separate the ribs of the roll to the maximum extent. A pipe is then placed between the corrugating-rolls with its inner end resting on the flange p' of the feed device. The upper roll is moved toward the lower one by the hand-screw, and the holder Q for the outer end of the pipe is then moved inwardly on its supporting guide-rod I to engage its flange q in the outer end of the pipe. The machine is then started by moving the hand-lever M to throw the clutch device into engagement with the driving-wheel, which turns the lower roll-shaft and feed-screw to the right. The corrugating-rolls are rapidly rotated and act to rotate the pipe, which is loosely supported on the flanges of the feed device P and the holder Q, and produce the thread or corrugation in the pipe, and the latter is fed forwardly by the guide device, which is in engagement with and moved forwardly by the feed-screw. The operator holds the outer end of the pipe steady by means of the hand-holder and moves the latter outwardly or forwardly as the pipe is fed forward. When the desired length of pipe has been corrugated or threaded, the stop-nut s^2, which is operated by the screw-thread on the upper roll-shaft, engages the forward stop-collar s' on the stop-rod S, shifting the latter and throwing the clutch to its neutral position out of engagement with the driving-wheel, and thus bringing the machine to rest. The adjusting-nut H is then turned to force the beads of the upper corrugating-roll nearer together, and the latter is forced toward the lower roll somewhat by turning the hand-screw F, and the hand-lever M is shifted to couple the other drive-wheel to the drive-shaft to rotate the corrugating-rolls and feed-screw in the opposite direction. The feed device is returned by the feed-screw, and the pipe is fed rearwardly by the action of the corrugating-rolls traveling in the partially-formed thread of the pipe. The operator steadies the pipe and causes the corrugating-rolls to properly follow the thread of the pipe by means of the hand-holder Q. As the pipe has been shortened by the formation of the thread, the feed device B does not determine the return movement of the pipe; but its flange simply acts to steady the inner end of the pipe. When the corrugating-rolls have traveled over the full length of the thread of the pipe, the machine is again stopped by the engagement of the stop-nut s^2 with the rear collar s' of the stop-rod S. The operator then sets the ribs of the upper roll still nearer together and also forces the upper roll nearer the lower one. The machine is then again started, and the corrugating-rolls following in the partially-formed thread feed the pipe forward again and still further deepen the thread. The feed device is inactive to feed the pipe after the first pass thereof between the rolls, and the latter cause the longitudinal feed or movement of the pipe, which is steadied or properly held to insure the travel of the rolls in the thread of the pipe by the hand-holder, which is under the control of the operator. This operation is repeated, the ribs of the upper corrugating-roll and the two rolls being adjusted toward each other after each pass of the pipe until the desired depth of the thread or corrugation is obtained, after which the corrugating-rolls are separated and the pipe removed from the machine. As the stop-nut s^2 is moved by a thread on the upper roll-shaft it moves a definite longitudinal distance for a definite circumferential travel of the corrugating-rolls on the pipe or for a definite length of the corrugation or thread of the pipe, thereby insuring the stopping of the machine at the proper point for each run of the pipe between the corrugating-rolls. This is important, because the pipe is shortened as the corrugation is deepened, and if the stop device were not thus operated the rolls would operate upon a different length of pipe at each pass, resulting in an imperfectly-formed thread or the spoiling of the pipe. When the machine is set in operation and the rolls started, they tend to swing the pipe laterally or twist the same relative to the corrugating-rolls in one direction or the other, according to the direction in which the rolls are driven. The guide-finger on the hand-holder Q permits this lateral swing of the pipe for a definite distance, and this movement insures the travel of the corrugating-beads in the partially-formed corrugation or thread after the pipe has been once passed between the corrugating-rolls.

I claim as my invention—

1. The combination with corrugating-rolls between which the pipe is gripped, and drive mechanism for said rolls, of a feed device for moving the pipe longitudinally between the rolls, a holder for the pipe which holder is supported so as to be free and capable of a limited movement and is controlled by hand, and means for guiding said holder, substantially as set forth.

2. The combination with corrugating-rolls, shafts, and driving mechanism for said rolls, of a feed device for moving the pipe longitudinally between said rolls, a hand-controlled holder for the outer end of the pipe, and a guide-rod projecting from one of said roll-shafts and on which said holder is loosely supported and is free to slide and swing, substantially as set forth.

3. The combination with corrugating-rolls between which the pipe is gripped, and drive mechanism for said rolls, of a feed device for moving the pipe longitudinally, a hand-controlled holder for the pipe, a guide on which said holder is supported and is free to slide

and swing, a part connected to said holder and having a limited movement relative thereto, and a guide which is engaged by said part, substantially as set forth.

4. The combination with corrugating-rolls between which the pipe is gripped, and drive mechanism for said rolls, of a feed device for moving the pipe longitudinally, a hand-controlled holder for the pipe, a guide on which said holder is supported and is free to slide and swing, a finger pivoted on said holder and having a limited movement relative thereto, and a fixed guide which is engaged by said finger, substantially as set forth.

5. The combination with corrugating-rolls, and their drive mechanism, of a feed device for the pipe, a hand-controlled holder for the outer end of the pipe, a guide-rod for said holder, a finger pivoted on said holder and having a limited swinging movement thereon, and a fixed guide-arm which is engaged by said finger for guiding the latter, substantially as set forth.

6. The combination with corrugating-rolls between which the pipe is gripped, and drive mechanism for positively rotating one of said rolls, of a feed device for moving the pipe longitudinally, a stop mechanism including a part which is moved by said drive mechanism and operates to stop the corrugating-roll upon a definite number of revolutions thereof, substantially as set forth.

7. The combination with corrugating-rolls between which the pipe is gripped, and drive mechanism for positively rotating said rolls, of a feed device operated by said drive mechanism for moving the pipe longitudinally, a stop device which is moved by said drive mechanism, and stop mechanism actuated by said stop device to stop the corrugating-rolls upon a definite number of revolutions thereof, substantially as set forth.

8. The combination with corrugating-rolls between which the pipe is gripped, shafts, and driving mechanism for said rolls, of a feed device for moving the pipe longitudinally operated by said driving mechanism, a stop device, a screw driven by said driving mechanism for operating said stop device, and stop mechanism actuated by said stop device, substantially as set forth.

9. The combination with corrugating-rolls between which the pipe is gripped, and driving mechanism therefor, of a feed device for moving the pipe longitudinally, a screw operated by said drive mechanism, a stop-nut operated by said screw, and stop mechanism for said rolls operated by said nut, substantially as set forth.

10. The combination of corrugating-rolls between which the pipe is gripped, shafts, and driving mechanism for said rolls, of a feed-screw operated by one of said roll-shafts, a feed device for moving the pipe longitudinally operated by said feed-screw, said other roll-shaft being screw-threaded, a stop device which is operated by said threaded roll-shaft, and stop mechanism actuated by said stop device, substantially as set forth.

11. The combination of corrugating-rolls between which the pipe is gripped, shafts, and driving mechanism for said rolls, of a bearing-sleeve in which one of said shafts is journaled, and a feed-screw for the pipe bearing on said bearing-sleeve and detachably connected to the shaft journaled in said sleeve, substantially as set forth.

12. The combination of corrugating-rolls between which the pipe is gripped, shafts, and driving mechanism for said rolls, of a bearing-sleeve for one of said roll-shafts, a feed-screw surrounding said bearing-sleeve and connected to the corrugating-roll which is secured to said shaft, said feed-screw being detachable from said shaft and the bearing-sleeve, and a feed device for moving the pipe longitudinally operated by said feed-screw, substantially as set forth.

Witness my hand this 9th day of June, 1904.

EDMUND ZEH.

Witnesses:
CHAS. W. PARKER,
C. M. BENTLEY.