(No Model.) 2 Sheets—Sheet 1.

J. P. KENNEDY.

MACHINE FOR SWAGING THE ENDS OF TUBES.

No. 457,955. Patented Aug. 18, 1891.

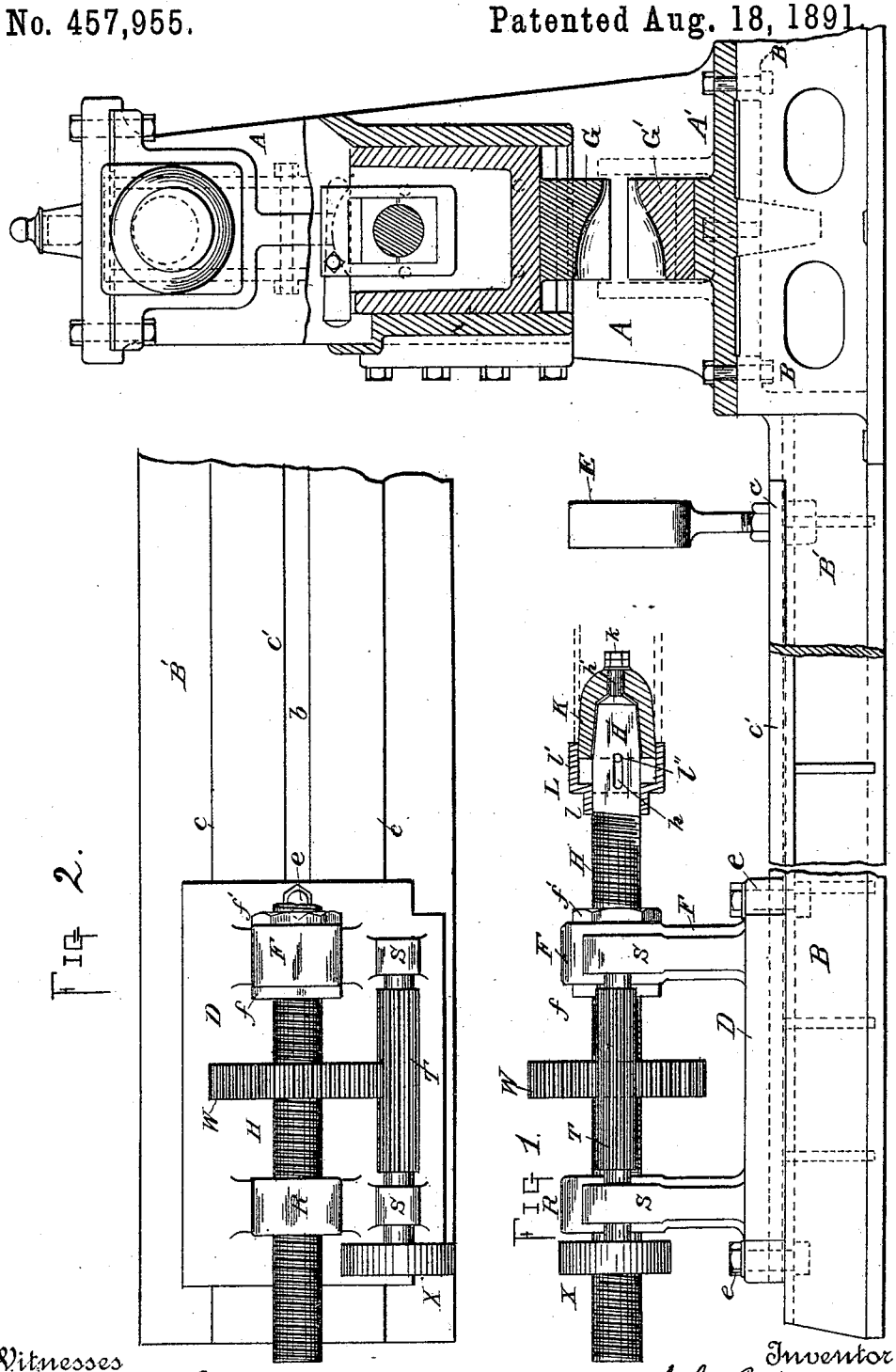


FIG 2.

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(No Model.) 2 Sheets—Sheet 2.

J. P. KENNEDY.

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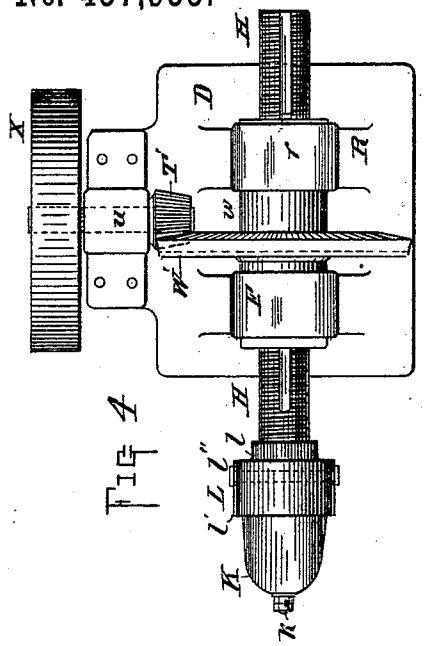


Fig. 4

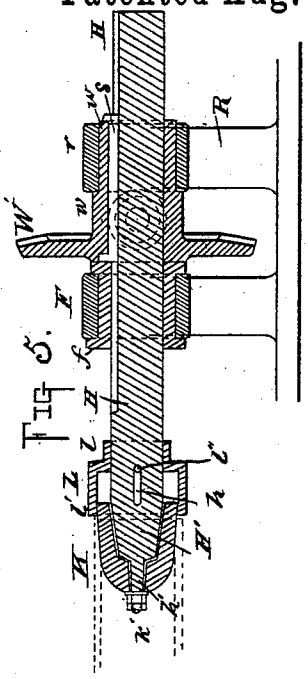


Fig. 5.

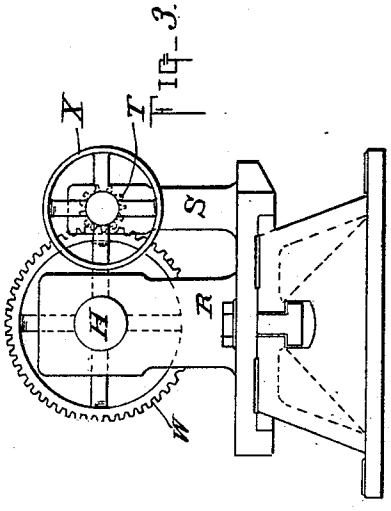


Fig. 3.

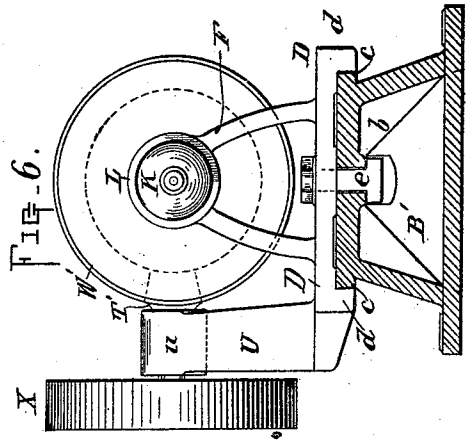


Fig. 6.

Witnesses
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M. Dargin

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UNITED STATES PATENT OFFICE.

JOHN P. KENNEDY, OF NEW YORK, N. Y.

MACHINE FOR SWAGING THE ENDS OF TUBES.

SPECIFICATION forming part of Letters Patent No. 457,955, dated August 18, 1891.

Application filed March 14, 1890. Serial No. 343,908. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. KENNEDY, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Power-Machines for Swaging the Ends of Metal Tubes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a power-machine for swaging the ends of wrought-metal tubes into a tapered or conical form preparatory to welding the metal directly upon itself and forming it into hemispherical ends of thickened homogeneous metal without seam or joint and constituting a perfect closure of great strength and durability, and embraces improvements upon the machine covered by my patent, No. 368,837, dated August 23, 1887, for method of and machine for closing the ends of tubes. Such improvements relate principally to the feed-screw, a tube-holder preferably in the form of a clutch plug or head for holding the tube while being swaged, devices for automatically releasing the tube from the clutch-plug, and power gearing mounted upon an adjustable carriage or head for operating the feed-screw. The tubes formed by my method and machine with hemispherical ends of thickened homogeneous metal are particularly adapted for use in the well-known radial tube or "porcupine boiler."

The object of my invention is more particularly to provide an adjustable power feeding mechanism for holding and feeding forward and rotating the tube to be swaged at one end by a pair of semi-conical dies; also, to provide an improved clutch connected to the end of the feed-screw, and preferably consisting of a head or plug for holding the tube while being swaged, and a connected automatic releasing device for removing the tube from the clutch-plug after the swaging operation.

My power feeding mechanism is made adjustable upon its slotted bed-plate for the purpose of readily adapting it to swage tubes of different lengths.

By means of my power feeding devices I do away with the necessity of an attendant turning the feed-screw, which operation is very fatiguing and wearing upon such attendant, and thus provide for accomplishing a greatly-increased amount of work with my swaging-machine.

In carrying out my invention I provide the base of the swaging-machine heretofore used with a slotted extension having suitable guide-ways, and mount upon such base an adjustable head or carriage, which carries the power mechanism of my feed-screw and tube-holder. I also provide an automatic releasing-collar connected to the inner end of the feed-screw by a pin passing through a longitudinal slot in the shank of such screw for automatically forcing the tube, after it has been swaged, off from the conoidal clutch head or plug as the feed-screw is retracted.

I will first specifically describe the construction and operation of my improved machine with reference to the accompanying drawings, and then define the matter constituting my invention in the claims.

In the drawings, Figure 1 represents a side elevation, partly in vertical section, of my power swaging-machine. Fig. 2 represents a top plan view of the power gearing and a portion of the extended and slotted bed-plate. Fig. 3 represents an end view of the extended bed-plate, the adjustable carriage, and power gearing. Fig. 4 represents a top plan view of a modified form of power gearing. Fig. 5 represents a vertical longitudinal section thereof. Fig. 6 represents an elevation of the power gearing looking toward the end of the clutch-plug.

In this machine I cast with or otherwise connect to the base B of the swaging-machine a slotted extension or bed-plate B′, extending directly forward in line with the dies G G′. The side framing A, bed-plate A′, and the pair of semi-conical dies G G′ are substantially the same in construction as those heretofore used and described in my United States patent, No. 368,837. The extended base or bed-plate B′ is provided centrally with a longitudinal slot *b*, and the walls of this slot are so shaped as to form a guideway *c*′ for the movable bolts *e*, which hold the head or carriage D in position upon the bed-plate. In Fig. 1 a section of one side of the bed-

plate is broken away for showing one of the guideways c' of the longitudinal slot b. The bed-plate is also provided at the sides with longitudinal guideways c. The carriage D is provided on its sides with the downwardly-extending flanges d, which bear upon the guideways c and serve to hold the carriage in proper position upon its bed-plate and prevent lateral movement thereof. Two bolts $e\,e$ pass through the carriage D down through the slot b, and by means of their heads and nuts the carriage can be secured closer to or farther from the dies in any desired position.

Several varieties of power gearing may be mounted upon my adjustable carriage and adapted for operating my feed-screw, which carries a head or plug for holding the tube, and I have shown two kinds of gearing properly arranged for such work—viz., a spur-wheel fixed on the screw and meshing with an elongated pinion, and a beveled gear-wheel engaging the screw by means of a feather and meshing with a beveled pinion. The feed-screw may also be operated by a worm and worm-wheel.

Referring now to Figs. 1, 2, and 3, the carriage is provided with a strong standard F, having at its top a large opening containing a screw-threaded nut or bushing f, held in place by nut f'. The rear end of the screw may pass through a plain opening in standard R, though such standard will not ordinarily be required, and the screw may end just back of spur-wheel W. This wheel W is rigidly secured to the screw and meshes with an elongated pinion T, supported by standards S. Pinion T is longer than the distance traveled by the screw and spur-wheel. A belt-pulley X is applied to the extended shaft of pinion T. The feed-screw H is preferably made solid, and can therefore be made of a smaller diameter than the screw-threaded feed-cylinder described in my former patent, and as a consequence the screw can be more rapidly worked forward for forcing the tube into the die and again retracted after the tube has been swaged.

Instead of the power gearing above described, I may use the form shown in Figs. 4, 5, and 6. In this form the strong standard or bridge F, containing a screw-threaded bushing or nut f, is used, as before described. The bevel-wheel W′ is mounted upon the feed-screw H by means of its elongated hub w and the longitudinal key or feather s inserted in the groove in such feed-screw. By means of the connecting key or feather the bevel-wheel engages the feed-screw H, so that the two turn together, but permits longitudinal motion of the feed-screw through its hub as it is turned back or forth through its screw-threaded nut f. The hub w of wheel W is mounted in a journal box or bearing r at the top of standard R. The pinion T, which meshes with wheel W′, is mounted by its shaft in the bearing u at the top of standard U, and such shaft is provided at its outer end with belt-wheel X.

Instead of the sliding gripper-jaws described in my former patent for holding the tube in the feed-cylinder, I preferably use a clutch-plug, over which one end of the tube is slipped for holding it while its other end is being swaged.

In order to apply my clutch-plug and releasing-collar, the outer end of the screw H is left plain back a short distance from slot h for receiving the collar L, and beyond such plain cylindrical portion the shank H′ is made square in cross-section or of other angular form, and is tapered longitudinally in the form of a prismoid, and such prismoid is provided at its end with a projecting bolt h' for the application of a nut k. The clutch-plug K is provided with a tapering socket, made square or of angular shape in cross-section to correspond with the tapering shank, and with a hole through its end for passage of the projecting bolt h'. The plug is of conoidal form externally for readily receiving and engaging the tube to be swaged as it is forced backward thereon. The resistance offered by the dies as the tube is fed forward by the feed-screw firmly forces the tube onto the clutch-plug, which securely holds it and causes it to rotate with the turning feed-screw. The angular socket fitting over the angular and tapered shank H′ prevents the plug from turning on the feed-screw.

Other forms of tube-holders may be used—such as the well-known conical chuck—and other forms of clutch-plugs without departing from my invention.

An automatic releasing-collar L is slipped upon the round plain surface of the feed-screw just back of plug K, and is provided with a neck l, just large enough to turn readily upon the smooth portion of the feed-screw, and with an enlarged portion l' of sufficient diameter to slide over plug K and abut against the rear end of the tube which it is desired to release. This collar is connected to the shank H′ by a transverse bolt l'', passing through a slot h in the shank, as shown in Figs. 1 and 5. By this construction it is seen that the collar is prevented from turning, but is free to move back and forth on shank H′ the distance of its slot h. It is evident when feed-screw H is turned backward through its nut f' the collar L will strike such feed-nut and be driven forward, so as to force the tube off from the clutch-plug K. Clutch-plugs of different sizes may be used for holding tubes of different diameters.

The semi-conical dies G G′ are secured, respectively, in the cross-head and bed-plate in the usual well-known manner. The cross-head which carries the upper movable die is properly fitted in a four-sided guideway, which is provided with adjustable gibs at the sides and with an adjustable front plate. The front, rear, and side guideways or plates are

provided with flaring extensions at the top to form an oil-cup for lubricating the cross-head.

The operation of swaging tubes with my machine is very simple and is conducted as follows: The tube to be swaged is first heated at one end to the proper working temperature, and then its opposite end is slipped over the plug K, supposing it to be properly drawn back to or near the standard F. The upper swaging-die being in operation, the feed-screw H is now turned to the right by means of the power gearing, thus rotating the tube and feeding it forward into the semi-conical dies. As the tube is forced into the dies it is jammed upon the conoidal head or plug K, so as to be securely held and rotated therewith. The heated end of the tube will now be quickly swaged into a tapered or conical form, and with this improved machine such operation can be performed with a single heat. After the end of the tube has been properly swaged the feed-screw H is turned to the left, thus withdrawing the tube from the dies, and the feed-tube is run backward until the releasing-collar L strikes against the projecting bushing *f* of the cross-bar F, which pushes it forward on the shank of the feeding-screw and over the conoidal plug K in contact with the end of the tube, thereby forcing it off from the plug. As soon as the tube is released it may be removed from the machine. A tube-rest E of Y shape, properly secured to the extended bed-plate, serves to support the tube while being swaged, and also after it has been released from the plug till removed by the attendant. After the end of the tube has been swaged into a tapered or conical form in this machine it is reheated and placed upon a mandrel having a rounded or hemispherical end in a separate machine, and there by means of a coupling-die is quickly given a thickened hemispherical form by welding the metal directly upon itself.

By the above-described operation the tubes are formed with perfect closures, and it has been found that the metal where welded was seamless and homogeneous in structure. Such tubes have proved very durable and satisfactory in use in the well-known porcupine boiler.

By means of the adjustable bolts *e*, passing through the bottom plate of the carriage D, and thence down through the longitudinal slot *d* in the bed-plate, the carriage can be quickly and accurately secured in suitable position for adapting the machine for swaging tubes of different lengths. This feature of adjustability has been found advantageous in practice.

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

1. In a machine for swaging the ends of metal tubes, the feed-screw provided at one end with a work or tube holder and mounted in a screw-threaded opening in a fixed standard or bridge, in combination with suitable power gearing for operating such feed-screw, substantially as described.

2. In a machine for swaging the ends of metal tubes, the feed-screw provided with a clutch head or plug and mounted in the screw-threaded opening in a fixed standard or bridge, in combination with a spur-wheel connected by a key or feather with the feed-screw, a pinion meshing with such wheel, and a belt-pulley secured to the shaft of the pinion, as and for the purpose described.

3. In a machine for swaging the ends of metal tubes, an adjustable head or carriage provided with means for supporting the feeding mechanism, in combination with such mechanism composed of the feed-screw, a clutch head or plug, and operating-gearing, substantially as described.

4. In a machine for swaging the ends of metal tubes, the extended bed-plate having guideways, in combination with an adjustable carriage or head having flanges fitted to the guideways, bolts for securing said carriage in any desired position to the bed-plate, and the feeding mechanism supported on such carriage, as described.

5. In a machine for swaging the ends of metal tubes, the extended base or bed-plate having a longitudinal slot with guideways, in combination with an adjustable head or carriage supporting the feeding mechanism and power gearing, and headed bolts passing through the bottom plate of said carriage and through the slot in the bed-plate for securing said carriage in any desired position, and the feeding mechanism supported on the carriage, as described.

6. In a machine for swaging the ends of metal tubes, the feed-screw mounted in a screw-threaded opening in a fixed support and having a tapered end of square or other angular cross-section, in combination with a clutch-plug of tapered or conoidal form externally and having a socket adapted to loosely fit on the tapered end of the feed-screw, as and for the purpose described.

7. In a machine for swaging the ends of metal tubes, the feed-screw mounted in a screw-threaded opening in a fixed support and having secured to its inner end a work or tube holder, in combination with a tube-releasing device suitably connecting with the feed-screw, substantially as described.

8. In a machine for swaging the ends of metal tubes, the feed-screw mounted in a screw-threaded opening in a fixed support and having secured to its inner end a tapered or conoidal plug, in combination with a sliding collar loosely connected to the feed-screw and having an enlarged portion overlapping the rear end of the plug and adapted to automatically release the tube from the plug, as described.

9. The feed-screw mounted in a screw-threaded opening in a fixed support and having a longitudinal slot near its inner end and carrying a tapered or conoidal plug adapted

to receive and hold a tube to be swaged, in combination with the sliding collar having an enlarged portion overlapping the plug and loosely connected to the shank of the feed-screw by a belt passing through the slot for automatically releasing the tube from the plug, as described.

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

JOHN P. KENNEDY.

Witnesses:
B. WILLIAM HOYT,
J. FREDK. LARKY.