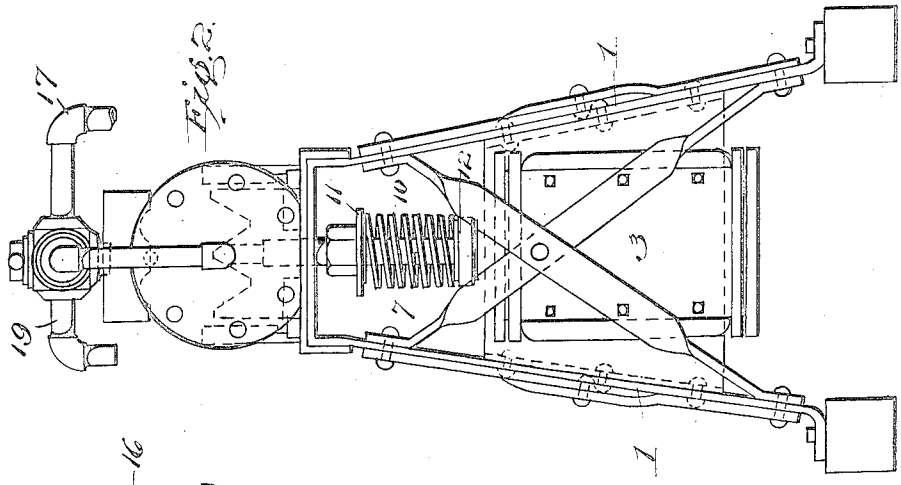
No. 818,337. PATENTED APR. 17, 1906.

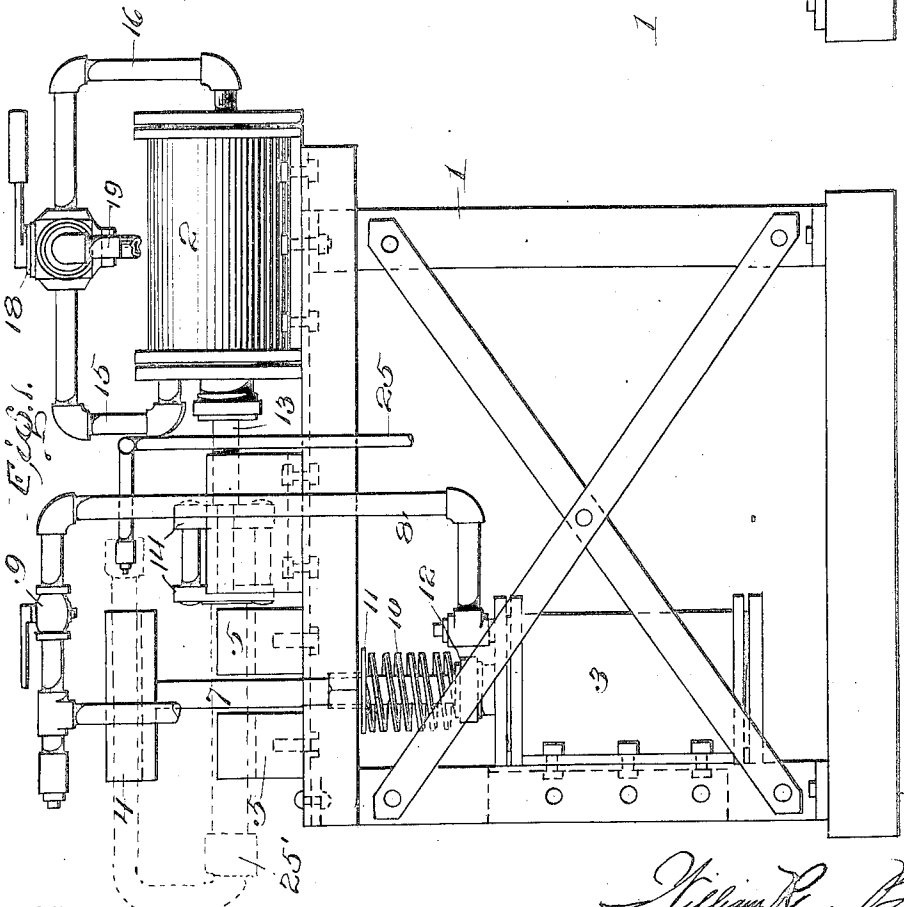
W. R. BARNES.

FLUE SWAGING AND PLUGGING MACHINE.

APPLICATION FILED MAY 10, 1905.

2 SHEETS—SHEET 1





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2 SHEETS—SHEET 2.

Fig. 3.

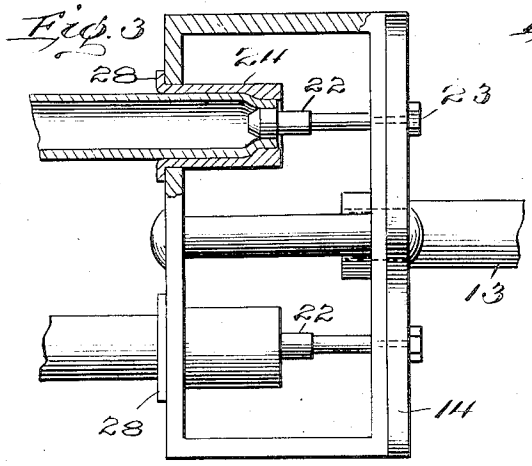


Fig. 4.

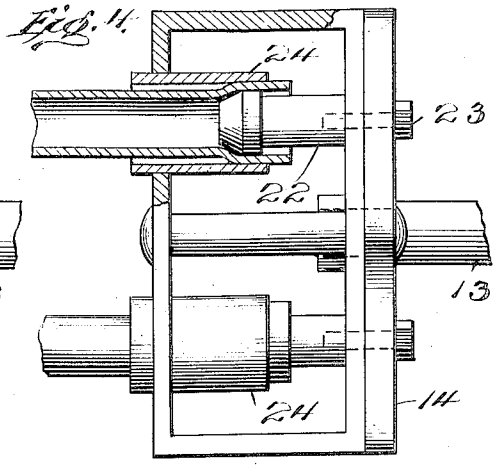


Fig. 5.

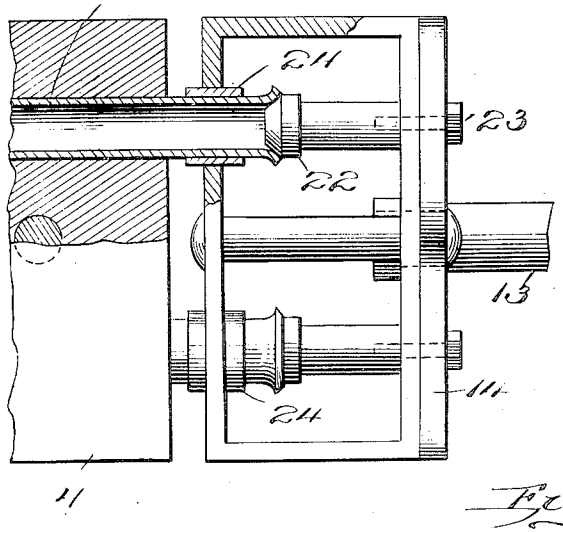


Fig. 6.

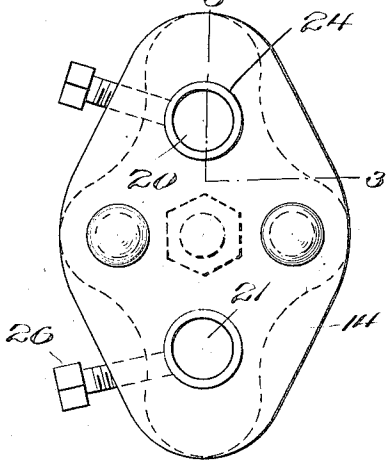
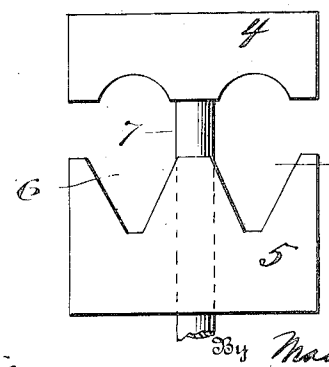


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM RILEY BARNES, OF ATLANTA, GEORGIA.

FLUE SWAGING AND PLUGGING MACHINE.

No. 818,337. Specification of Letters Patent. Patented April 17, 1906.

Application filed May 10, 1905. Serial No. 259,834.

To all whom it may concern:

Be it known that I, WILLIAM RILEY BARNES, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Flue Swaging and Plugging Machines; 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 improvements in flue swaging and plugging machines; and it has for its object the provision of a machine in which flues may be expanded to fit the holes in a flue-sheet, leaving the flues perfectly free from dirt and scale and obviating the necessity of using liners and the labor of applying the same.

The machine is also designed to move it possible to thoroughly test the flues before they are inserted in boilers for use.

With these and other objects in view the invention comprises certain novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of my improved swaging and plugging machine. Fig. 2 is an end elevation of the same. Fig. 3 is a plan view of the swaging-head carrying a modified form of collar with certain parts broken away, the section of the broken-away parts being taken on lines 3 3 of Fig. 6. Fig. 4 is a top plan view of the swaging-head with portions of pipes in position, a portion of the head being broken away on the line 3 3 of Fig. 6. Fig. 5 is a top plan view of the swaging-head carrying a modified form of collar and part of the clamping-jaws with tubes in position, parts being broken away on line 3 3 of Fig. 6. Fig. 6 is a detail view in end elevation of the swaging-head for swaging the tubes. Fig. 7 is an end elevation of the clamping-jaws for holding the tubes in position for swaging.

A machine for swaging and testing flues embodying the features of the present invention is provided with a frame 1, upon which power-cylinders 2 and 3 are mounted and upon which also gripping means made up of upper and lower gripping-jaws 4 and 5 are supported. The gripping-jaws are so arranged that the pipes or tubes to be swaged or spread are capable of being firmly held in position by pressure delivered to the power-cylinder 3. To facilitate this gripping of the tubes, the lower gripping member is made in two parts, as indicated at 5, and each of said parts is formed with V-shaped grooves or seats 6, in which the tubes rest. The tubes are held in the V-shaped grooves by means of the upper gripping member 4, which is made broad enough to project over both of the lower gripping members 5. The upper gripping-jaw 4 is provided with grooves or recesses upon its under surface for fitting upon the said tubes. A piston-rod 7 is connected with the upper jaw 4 and extends downwardly to the cylinder 3, and within the said cylinder it is connected with any suitable piston-head. The cylinder 3 is provided with inlet-piping 8, connected with any suitable source of power, so that pressure may be admitted into the upper end of the said cylinder 3 for forcing the piston downwardly and tightly drawing the jaw 4 upon the tubes below. A controlling-valve 9 is located in the piping 8 at any suitable point for controlling the admission of pressure to the cylinder 3. When the pressure in the cylinder is released, the piston 4 will be carried upwardly again to the position indicated in Fig. 1 by a spring 10, which surrounds the piston-rod 7 and engages a head or washer 11, secured upon the piston-rod 7. The lower end of the spring 10 is shouldered against the packing-gland 12 of the cylinder. The cylinder 2 is also provided with a piston of any suitable type, and a piston-rod 13 projects from the cylinder and carries a swaging-head 14. The piston and piston-rod are so mounted that the swaging-head will be capable of movement longitudinally in the axis of the tubes. The movement of the piston in the cylinder 2 is preferably and positively controlled by power introduced into the opposite ends of the cylinder, and piping 15 and 16 is provided and connected with the opposite ends of the said cylinder, the said piping being coupled with a supply-pipe 17. A valve, as 18, is mounted at the juncture of the pipes, and an exhaust-pipe 19 leads from the casing of the valve. The valve is preferably a three or four way valve and is so constructed that pressure may be directed from the inlet-pipe 17 through either the pipe 15 or 16 to the ends of the cylinder. When pressure is entering the cylinder through the pipe 15, the opposite end of the cylinder is exhausting through the pipe 16, and when the pressure is turned into the pipe 16 it is cut off from

the pipe 15 and the exhaust from the opposite end of the cylinder is permitted to pass out through the pipe 15 and the exhaust-pipe 19. In this way the swaging-head may be positively forced in each direction.

The swaging-head 14 is preferably constructed so that one or more tubes may be operated upon simultaneously. As shown in the drawings, the swaging-head is formed with two pipe-receiving apertures 20 and 21, and opposite to the said apertures are plugs or swages 22, secured to the inner portion of the swaging-head. The plugs or swages 22 are removably secured to the swaging-head by means of screw-bolts 23, so that only one of said plugs may be used, or two may be inserted in the swaging-head and used simultaneously.

In order to facilitate the removal of the tubes after they have been swaged or upset at their ends, the apertures 20 are made of sufficient size to accommodate such spread or swaged ends and permit of their passing freely through them. In order to hold the tubes in position properly centered with relation to the plugs or swages 22, I insert removable collars or ferrules 24 in the said apertures 20, the ferrules being made to fit the size of the flue. Set-screws 26 are employed for holding the ferrules in place.

In using the machine for swaging flues the tubes to be operated upon are extended with their ends projecting between the jaws 4 and 5 of the gripping mechanism. The gripping-jaw is then brought down tightly upon the tubes by letting pressure into the upper end of the cylinder 3. Pressure is next introduced into the outer end of the cylinder 2 and the swaging-head is forced forward about the ends of the tubes, the ferrules or collars surrounding the said tubes and the plugs or swages 22 extending into the ends of the tubes which project beyond the said ferrules. In testing the tubes the plugs are only forced against the ends of the tubes with sufficient power to spread their ends. If there is any defect in the end of the tube, such as a split portion or imperfection of any kind, it will be disclosed by the spreading of the said end. While the tubes are thus gripped by the swaging-machine, liquid or other pressure may also be introduced into the other ends of the tubes and held there under pressure, so that if there are any leaks in the tubing the presence of the same will be readily detected. Any suitable piping for liquid or water pressure may be arranged adjacent to the swaging-machine, as at 25, for introducing water into the tubes, such flexible or other connection with the open ends of the tubes being also provided with nipple 25′ for securing it to the ends of the tubes temporarily. After the tubes have been thus swaged and tested they may be removed from the machine by reversing the operation of the cylinders 2 and 3. In this simple manner the machine may be manipulated for properly forming the ends of the flues to fit the flue-sheet of a boiler, and all defective ends of such flues are discovered before placing in a boiler. If the flue has seams, they are also discovered and the tubes discarded. The flues are preferably expanded while hot to fit the holes in the flue-sheet, and the said flues are thus perfectly free from dirt and scale when they are to be applied to the flue-sheet, and there is no necessity for the use of liners in fitting the same, and the labor of placing the liners is also saved.

In Fig. 3 I have illustrated a tube in position for swaging, with a tube surrounding collar 24 secured in the swaging-head, the said collar being reduced in internal diameter near one end, as at 27. A plug 22 is also shown within the reduced end of the tube, illustrating the manner in which the said plug coöperates with the collar in swaging the end of the tube. When a collar of the proper internal shape has been placed in one of the apertures, as 20, of the swaging-head and the said head is forced toward the tube, the end of the tube will be shaped between the inner face of the collar and the head of the plug 22. It will be evident that different-shaped collars may be employed in connection with the swaging-head and made to cooperate with the swaging plug or plugs 22. Of course it will be understood that the stem of the swaging-plug 22 may be varied in length, so that the said plug may properly enter the end of the tube and assume a proper position with relation to the collar or thimble, which is placed in the aperture of the swaging-head without departing from the spirit of the invention. As shown in said Fig. 3, the collars may be provided with retaining-flanges at one end, as shown at 28.

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

1. A tube-swaging machine, comprising gripping means for holding tubes or flues, a reciprocating swaging-head having spreading plugs and collars, and power-cylinder for forcing the plugs into the ends of the tubes and the collars over them and for withdrawing the same from the tubes.

2. A swaging-machine, comprising tube or flue gripping means, a reciprocating swaging-head arranged opposite the ends of the tubes and having apertures for receiving the ends of the tubes, and plugs carried by the said head opposite said apertures, and a power-cylinder for reciprocating the said swaging-head.

3. A flue swaging and plugging machine, comprising a frame, a gripping means mounted thereon, a reciprocating swaging-head formed with inner and outer walls, the outer wall having apertures formed therein, fer-

rules fitting in said apertures and also made of a size to fit upon the said tubes, and plugs or swages carried by the inner wall of the head opposite said apertures, a piston carrying the said swaging-head, and extending into a power-cylinder, and means for introducing pressure into either end of said power-cylinder for reciprocating the swaging-head.

4. A swaging-machine, comprising tube-gripping jaws, a reciprocating swaging-head having apertures formed therein, shaping collars or ferrules removably mounted in the said apertures and coöperating swaging-plugs carried by the said swaging-head.

5. A swaging-machine, comprising means for holding a tube, a swaging-head movable with relation thereto, shaping collars or ferrules movably mounted in the swaging-head, plugs coöperating with the collars for swaging or shaping the ends of tubes, and a power-driven piston carrying the said swaging-head.

6. A swaging apparatus, comprising a tube-gripping device, a reciprocating collar-carrying head mounted opposite the gripping device and provided with apertures, flanged collars or ferrules fitting in said apertures, swaging-plugs also carried by said swaging-head, and means for reciprocating the swaging-head for causing the plugs and collars to act upon tubes held by the gripping means.

7. A swaging-machine for flues or tubes comprising gripping means for holding the ends of the tubes and a swaging-head carrying collars mounted opposite the ends of the tubes, and power mechanism for forcing the swaging-head and collars over and in the ends of the tubes to swage the same.

8. A swaging-machine comprising tube or flue gripping means, a reciprocating swaging-head arranged opposite the ends of the tubes, a power-cylinder for reciprocating the said swaging-head and means for introducing water under pressure into the tubes for testing the same while the said swaging-head is in one end of said tubes.

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

WILLIAM RILEY BARNES.

Witnesses:
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C. A. HARRIS.