

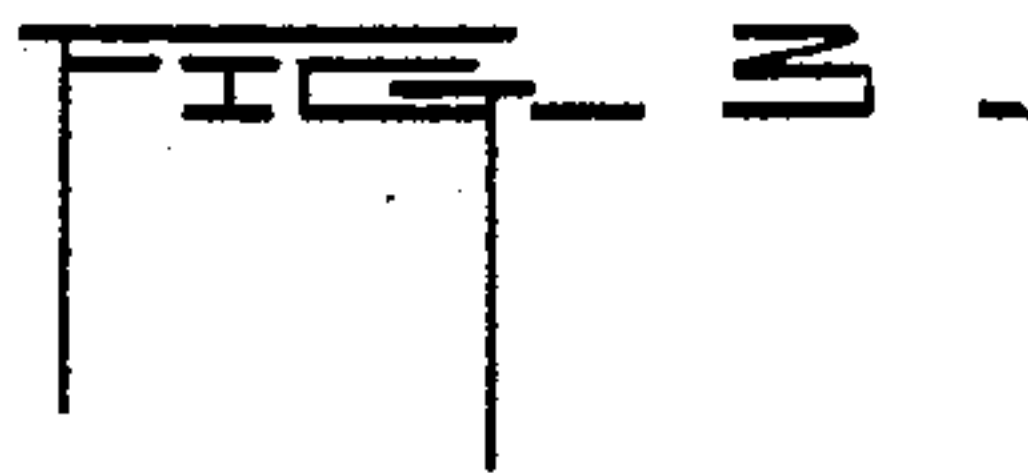
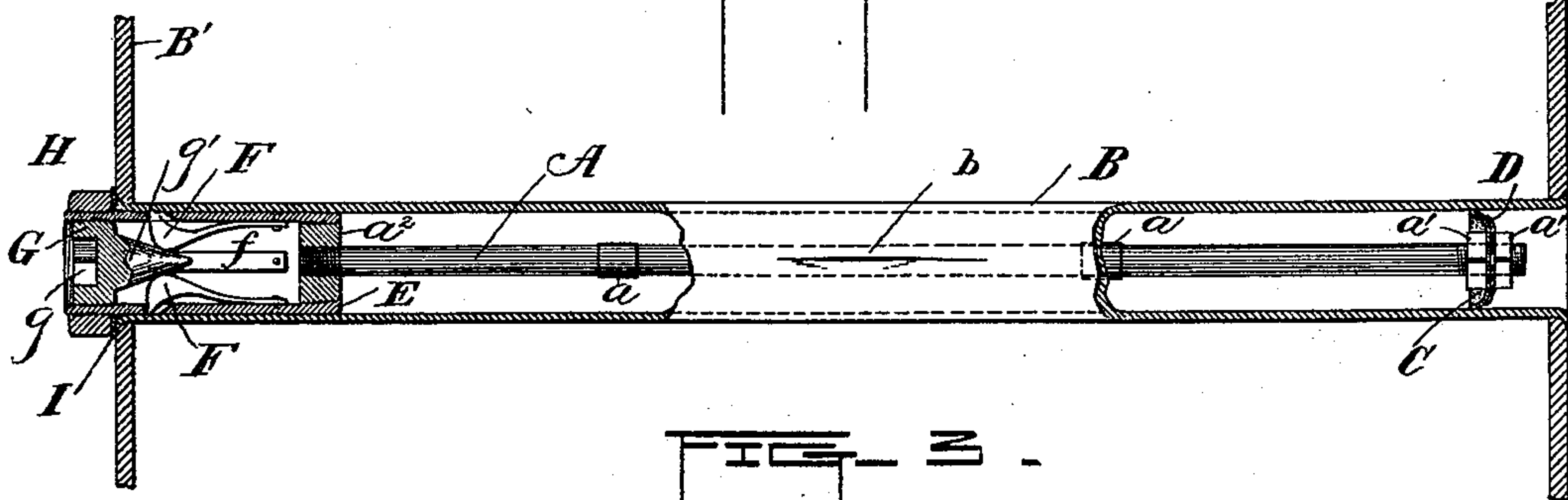
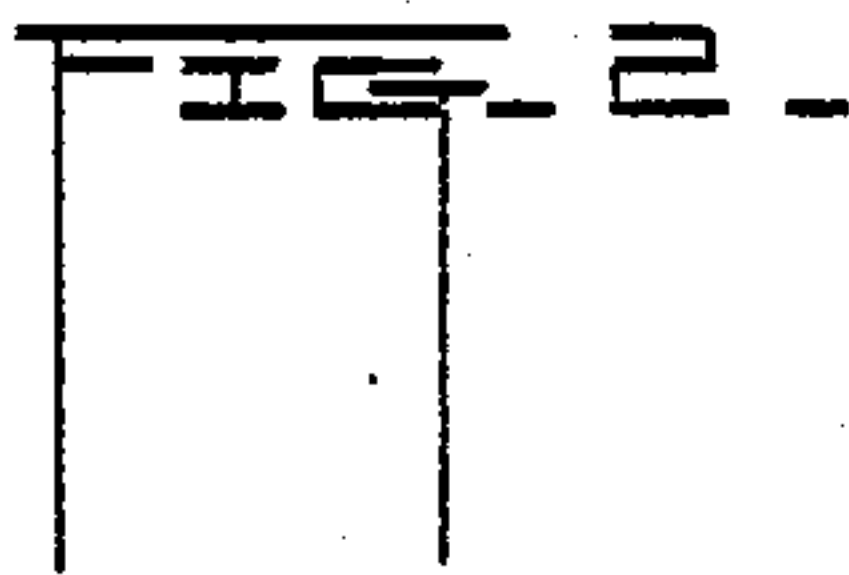
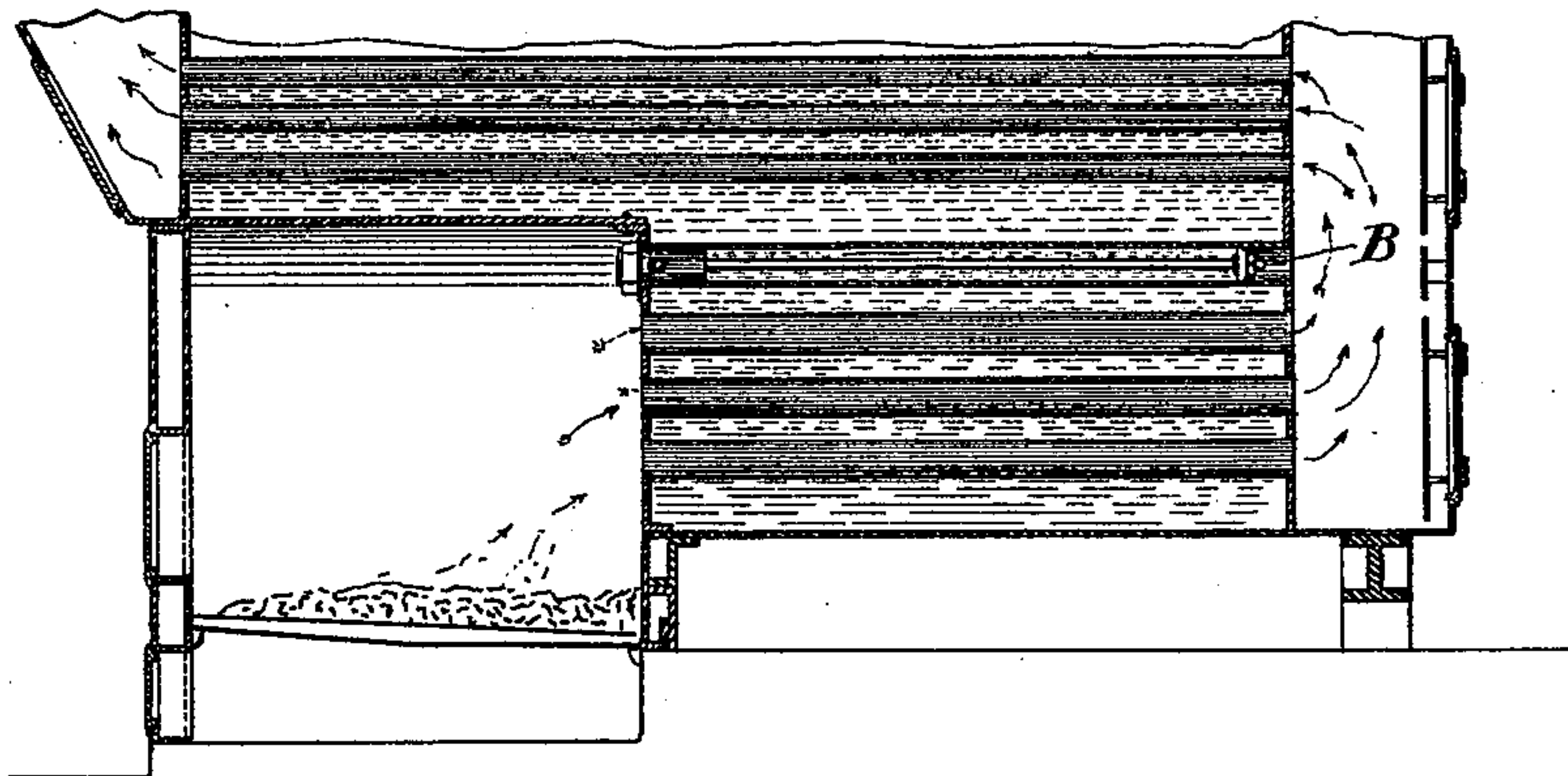
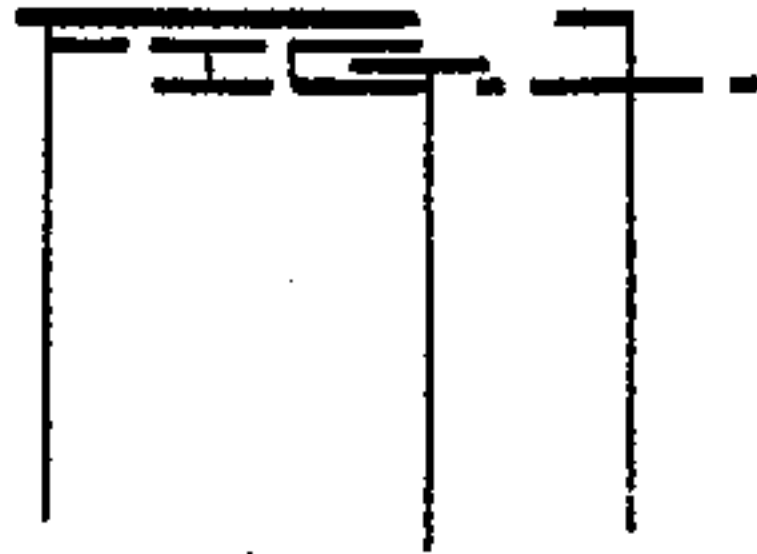
(No Model.)

2 Sheets—Sheet 1.

E. W. CRAINE.  
TUBE STOPPER.

No. 518,226.

Patented Apr. 17, 1894.



Witnesses  
L. A. Commey  
P. L. Clark.

Inventor  
Edwin W. Craine  
By Geo. Whitney  
Attorney

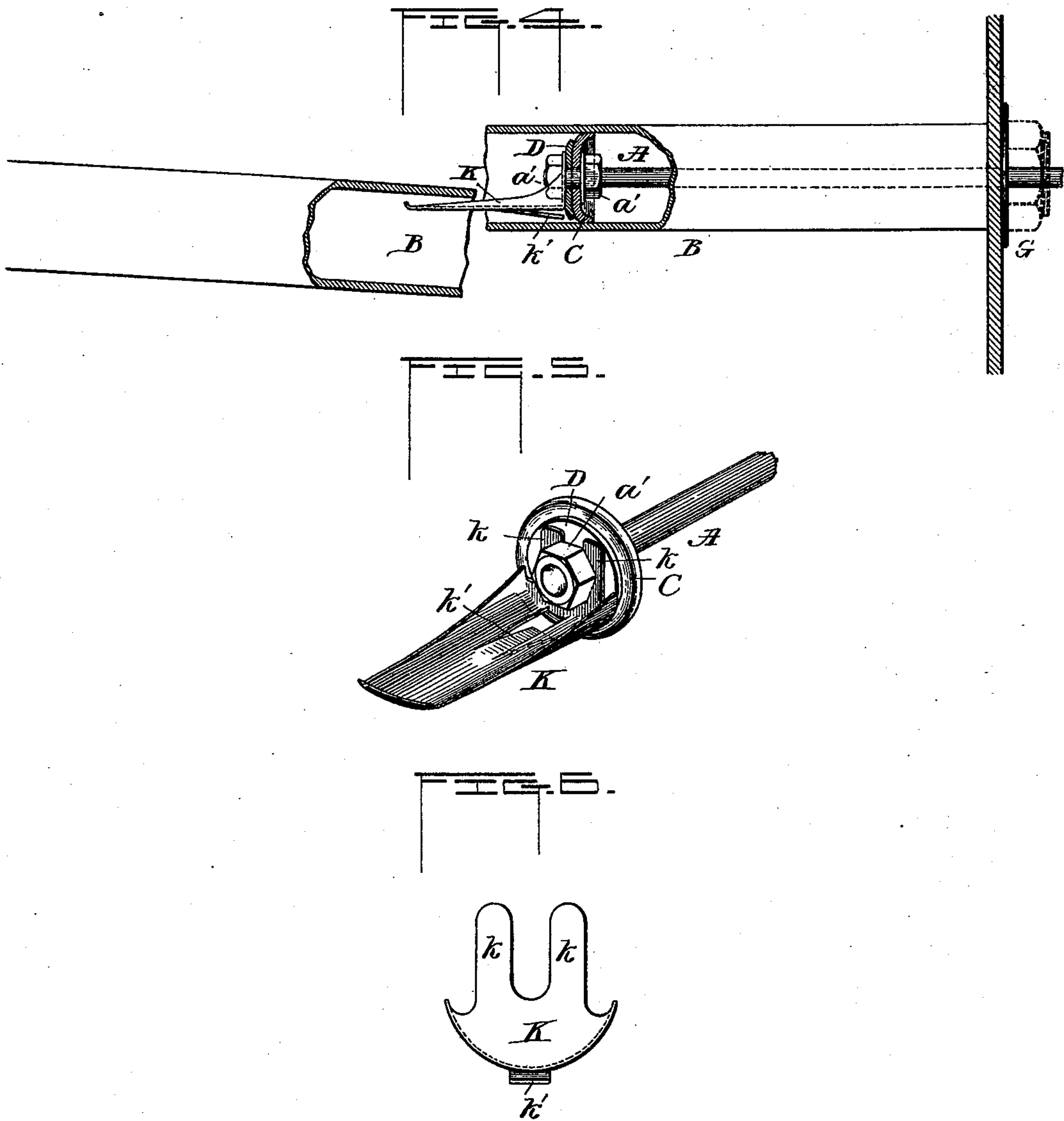
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2 Sheets—Sheet 2.

E. W. CRAINE.  
TUBE STOPPER.

No. 518,226.

Patented Apr. 17, 1894.



Witnesses  
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P. L. Clark.

Inventor  
Edwin W. Craine,  
By *Geo. W. Whitney*  
Attorney



# UNITED STATES PATENT OFFICE.

EDWIN W. CRAINE, OF MISSOURI VALLEY, IOWA.

## TUBE-STOPPER.

SPECIFICATION forming part of Letters Patent No. 518,226, dated April 17, 1894.

Application filed March 1, 1893. Serial No. 464,269. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN W. CRAINE, a citizen of the United States, residing at Missouri Valley, in the county of Harrison and State of Iowa, have invented certain new and useful Improvements in Tube-Stoppers; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to steam boilers, and its object is to effectually stop up a leaky tube to prevent the water and steam from escaping into the fire box and smoke box.

The invention consists in a rod having at one end a flexible washer to tightly fit the tube, and at the other end a shell containing a set of teeth to bite into the tube, and hold the shell fast, so that a nut on its outer end may be screwed up against a gasket to make a tight joint.

In the drawings, Figure 1 is a longitudinal section of a fire tube boiler, with one of my tube stoppers in place. Fig. 2 is a section of a tube stopper on a larger scale, and Fig. 3 is a view of the shell and its adjuncts on a still larger scale. Figs. 4, 5, and 6 show an attachment.

The rod A is composed of short lengths united by couplings  $a$ , so that it can be made longer or shorter, according to the location of the break  $b$  in the tube B. At the inner end of the tube is a flexible cupped washer C, preferably of leather, backed by a metallic support D, the two being confined between nuts  $a'$  screwed upon the threaded end of the terminal section of the rod. The outer end of the rod carries a screw threaded collar  $a^2$ , on which is screwed the inner end of a tube or shell E, of such diameter externally as to fit snugly into the tube B. Near the outer end of the shell, are two or more holes  $e$ , through which project sharp-edged dogs F attached to the inside of the shell, preferably by means of spring tails  $f$  riveted to the shell at  $f'$ . The outer end of the shell is screw threaded

both internally and externally. A screw plug G is screwed into it having in its outer face a wrench socket  $g$  and provided on its inner face with a conical stud  $g'$  whose axis lies substantially in the axis of the tube B. When the plug is screwed into the shell, the cone enters between the dogs and forces them outward through the holes  $e$ . A nut H screws upon the outside of the tube.

The operation of my device is illustrated in Figs. 1 and 2, in which it is shown inserted into a leaky tube. The cupped washer C closes the inner end of the tube. The plug G is then turned in, forcing out the dogs and causing them to bite firmly into the tube B. A gasket I of any suitable material, is then slipped over the projecting end of the shell, and the nut H is screwed up, clamping the washer against the tube sheet B', and making a tight joint at that end of the tube. The dogs prevent the nut H from drawing the shell out of the tube. In some cases, the rod A may be dispensed with, the shell E being made long enough to close the leak, and, if desired, being suitably packed at its inner end.

Figs. 4, 5 and 6 show an attachment for lifting a section of a broken tube which has dropped out of line. The attachment consists of a tapering point or finger K curved in cross section, and having at its wider end, an upright yoke  $k$  which enables it to be clamped by the outer nut  $a'$  to the end of the rod A, in front of the washer C. The tip of the finger is preferably curved slightly inward, as shown, to guide it over any obstruction in the tube. A flexible tongue  $k'$  is cut in the rear portion of the finger and is sprung downward to guide the end of the broken tube section over the washer C.

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

1. A tube stopper comprising a rod carrying at one end a flexible washer, and at the other end a set of dogs, means for forcing them into the tubes to hold the rod in place, and a nut and gasket for closing the outer end of the tube, substantially as described.

2. A tube stopper comprising a shell fitting the tube, a set of dogs carried by the shell,



means for forcing them outwardly, a nut screwing upon the outer end of the shell, a rod extending from the inner end of the shell, and a washer on the end of the rod.

5 3. The combination with the shell E having the nut H and the holes *e* of the dogs F having spring tails *f*, fastened to the inside of the shell, and means for forcing the dogs outwardly through the holes, substantially as described.

10 4. The combination with the shell E having the holes *e*, of the dogs F having spring tails *f* attached to the shell, the conical screw plug G, and the external nut H, substantially as described.

15 5. The combination with a tube stopper, of a finger projecting from the end thereof at its periphery to lift a broken tube section, substantially as described.

20 6. The combination with a tube stopper, of a detachable finger projecting from the end

thereof, at its periphery to lift a broken tube section, substantially as described.

7. The combination with a tube stopper, of a tapering finger having its wider end secured 25 to the end of the tube stopper, at its periphery to lift a broken tube section substantially as described.

8. An attachment for a tube stopper, comprising a tapering finger curved in its cross 30 section, and having a yoke at its wider end, substantially as described.

9. An attachment for a tube stopper, comprising a tapering finger curved in cross section, and having a yoke and a flexible tongue 35 at its wider end, substantially as described.

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

EDWIN W. CRAINE.

Witnesses:

J. S. DEWELL,

WINDSOR J. LLOYD.