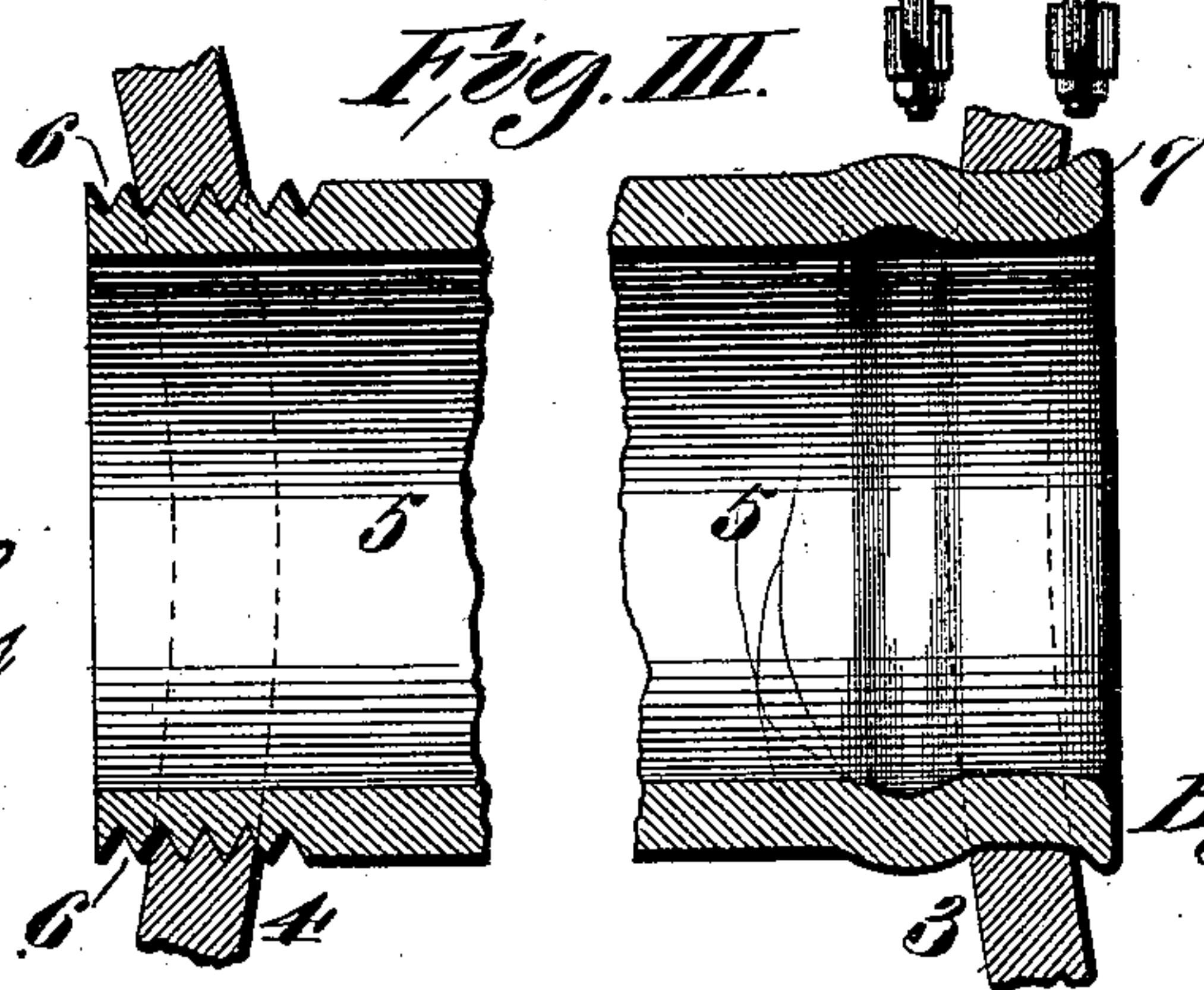
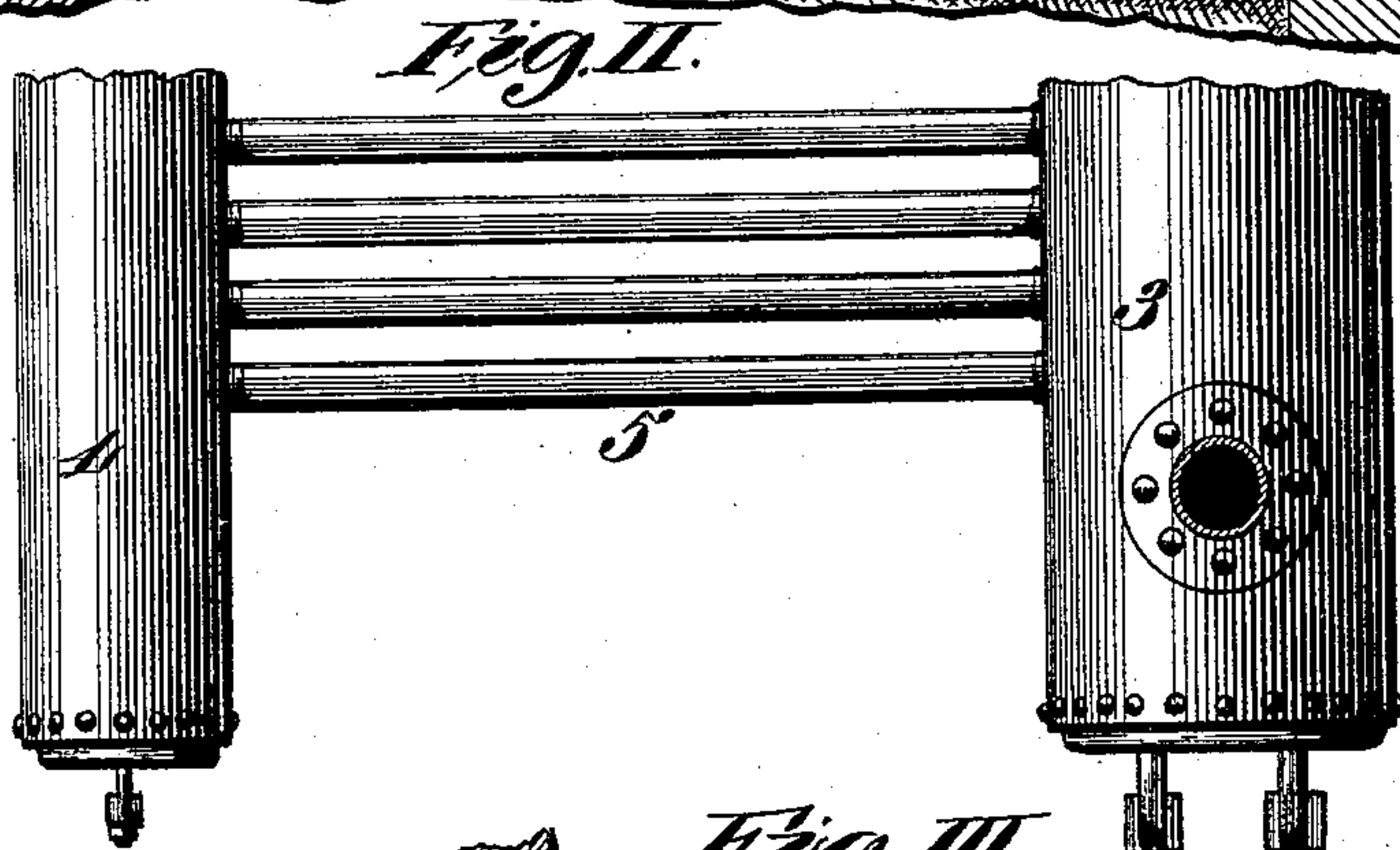
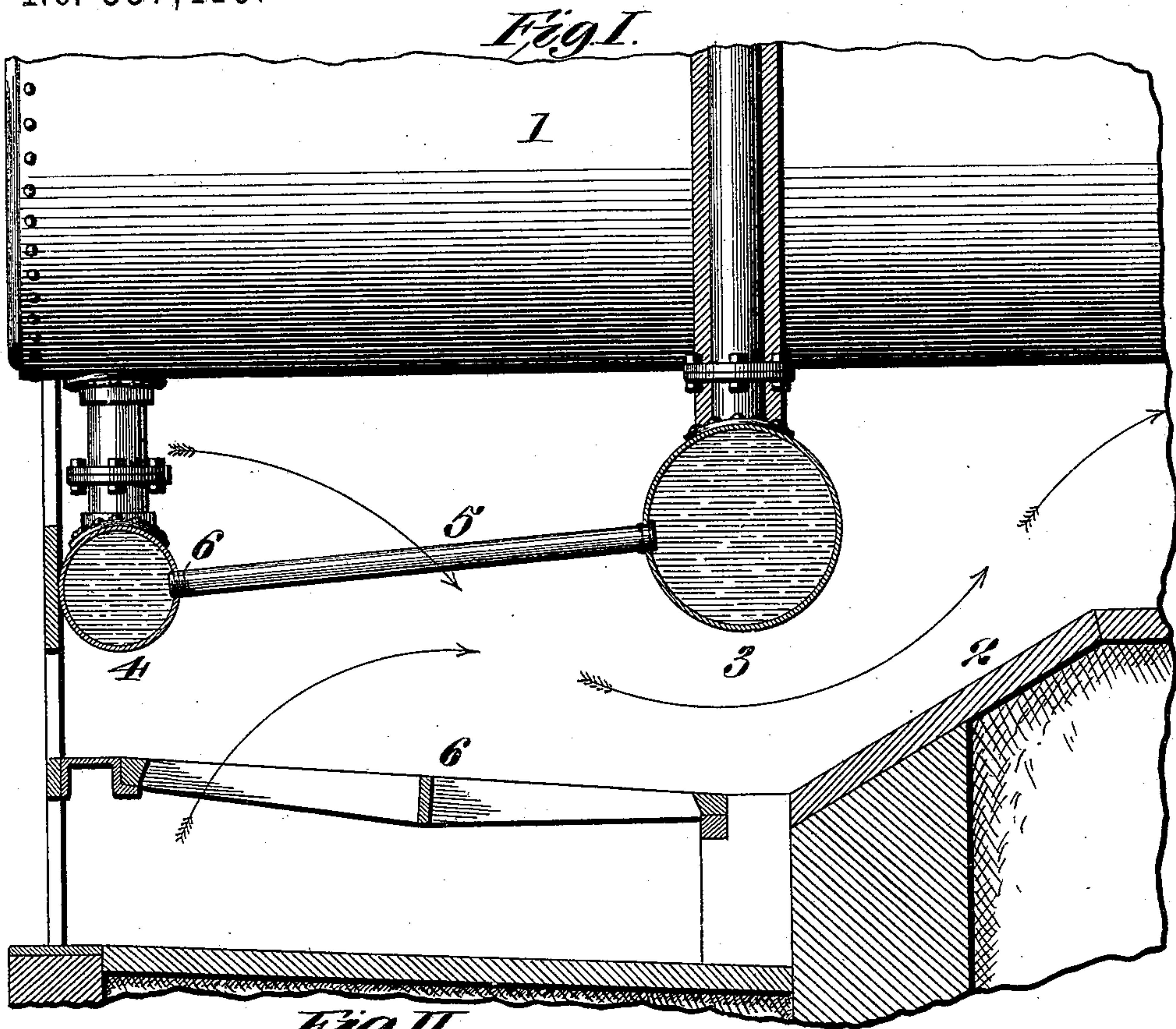


(No Model.)

J. O'BRIEN.  
DOWNDRAFT FURNACE.

No. 557,419.

Patented Mar. 31, 1896.



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# UNITED STATES PATENT OFFICE.

JOHN O'BRIEN, OF ST. LOUIS, MISSOURI.

## DOWNDRAFT-FURNACE.

SPECIFICATION forming part of Letters Patent No. 557,419, dated March 31, 1896.

Application filed November 14, 1895. Serial No. 568,904. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN O'BRIEN, of the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Downdraft-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improved manner of connecting the water-tubes of a down-draft-furnace to the manifolds; and my invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a detail vertical section of a downdraft-furnace illustrative of my invention. Fig. II is a detail top view of the inner and outer manifolds, showing part of the connecting water-tubes that form the upper grate. Fig. III is an enlarged detail view illustrating the manner of connecting the tubes to the manifolds.

Referring to the drawings, 1 represents a boiler, 2 the bridge-wall of the furnace, 3 the inner manifold, 4 the outer manifold, 5 the upper grate, and 6 the lower grate, of a down-draft-furnace. The manifolds have connections, as usual, with the boiler, and the upper grate 5 is composed of water-tubes forming communications between the manifolds. To the manner of securing these tubes in place my invention relates; and the object of my invention is to simplify, cheapen, and facilitate the ready and speedy connection of these tubes with the manifolds, and at the same time to guard against leaks and other objections.

My invention consists in tapping the water-tubes directly into the small manifold and expanding them into the large manifold. The small manifold is provided with a series of holes the proper distance apart to receive the tubes, and these holes are threaded. The outer ends of the tubes 5 are threaded at 6 and are screwed into the threaded openings made in the small manifold, their other ends being first inserted in holes made in the large manifold to receive them. After the tubes are screwed into the outer manifold their inner ends are expanded, as shown at 7, Fig. III, and a tight joint is thus made between

them and the inner manifold. The inner manifold is sufficiently large to permit a workman to enter to expand the tubes, and by tapping the tubes into the small manifold there is no necessity of a workman entering therein. This method of connecting the tubes to the manifolds is inexpensive, while the joints formed between the tubes and the manifolds are tight and not liable to leak and the work can be very quickly and conveniently done, as all that is necessary is to cut the tubes into proper lengths, then thread one end of each tube, then insert the unthreaded end into the large manifold, then screw the tubes into the small manifold, and then expand the other end of the tube in the large manifold.

Each tube is provided with a head just outside of the manifold 3, as shown in the drawings, which, when the tubes are expanded, as shown at 7, aids in forming a tight joint between the tube and the manifold, inasmuch as the manifold is confined between the head and the expansion of the tube, and the tube cannot move by expansion inwardly to cause the expanded end of the tube to be moved away from the inner wall of the manifold.

I am aware that it is old to secure a water-tube in place by employing a thimble that is inserted in one end of the tube and is expanded, the other end of the tube having a threaded connection with the tube-support, as such a construction is shown in English Patent No. 988 of 1867. Practical experience, however, has demonstrated that such a connection soon results in a leaky joint at the expanded end, owing to the additional amount of metal that is undergoing a constant expansion and contraction, which add to the expansion and contraction of the tube itself. This produces a leaky joint, which does not result where this excess of metal does not exist.

I claim as my invention—

1. In a downdraft-furnace, the combination of a small outer manifold having threaded holes, a large inner manifold having unthreaded holes, and water-tubes having threaded ends for connection with the outer manifold without the use of a thimble or nut, said tubes being connected to the large manifold by expanding them, substantially as and for the purpose set forth.

2. In a downdraft-furnace, the combination of a small outer manifold having threaded holes, a large inner manifold having unthreaded holes, the water-tubes having threaded ends screwed into the threaded openings in the outer manifold, said tubes being connected to the large manifold by beads formed thereon outside of the manifold and by their ends being expanded within the manifold, substantially as and for the purpose set forth. 10

JOHN O'BRIEN.

In presence of—  
E. S. KNIGHT,  
W. FINLEY.