

F. CLARK.
FLUE EXPANDER.
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1,047,498.

Fig. 1

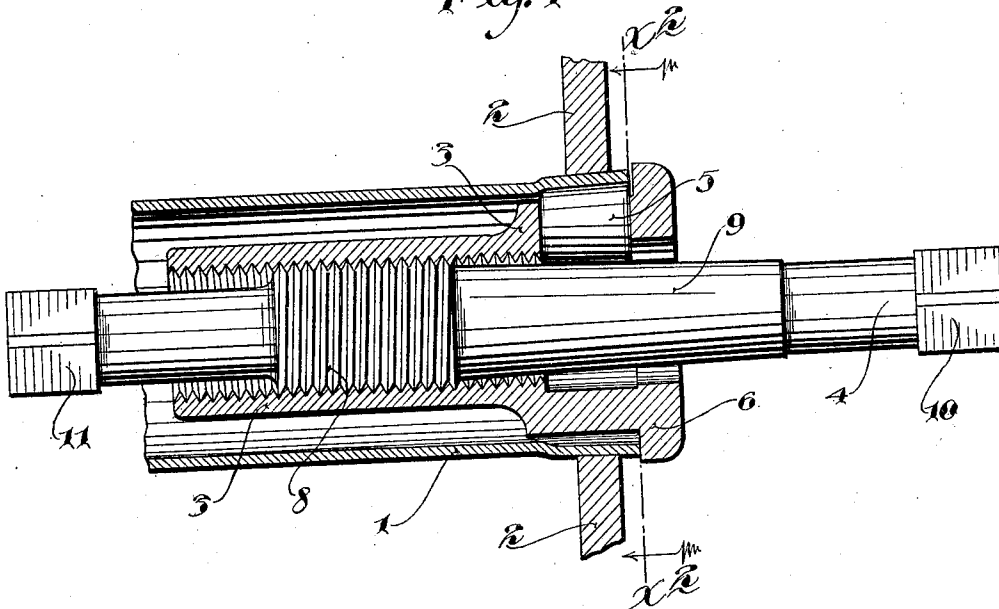
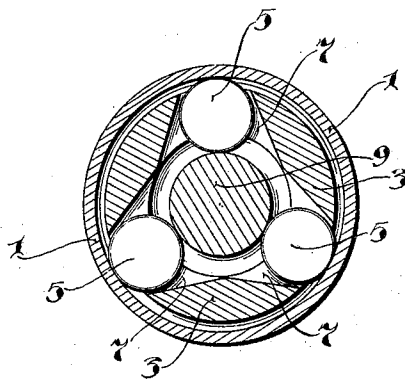


Fig. 2



Witnesses:
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UNITED STATES PATENT OFFICE.

FREDERICK CLARK, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO
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FLUE-EXPANDER.

1,047,498.

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To all whom it may concern:

Be it known that I, FREDERICK CLARK, a citizen of the United States, residing at the city of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Flue-Expanders; 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 has for its object to provide an extremely simple and highly efficient flue expander, and to such ends, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claim.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view chiefly in vertical section, but with some parts in full, showing the improved flue expander applied in working position; and Fig. 2 is a transverse section taken on the line $x^2 x^2$ of Fig. 1.

An ordinary boiler flue is indicated by the numeral 1, and a flue sheet is indicated by the numeral 2. The expander comprises a sleeve 3, a mandrel 4, and expanding rollers 5. The body of the sleeve is of such size that it is adapted to be inserted into the flue, and is internally screw-threaded. At its extreme outer end, it is provided with a stop flange 6 that is engageable with the outer end of the flue to limit the movement of the said sleeve into the flue. Just inward of the said stop flange 6, the sleeve 3 is enlarged in external diameter and is formed with radial roller seats 7, in which the rollers 5 are mounted with freedom for radial movements. These seats 7, at their outer extremities, are of less width than the diameters of the said rollers, so that they prevent the said rollers from being moved or from falling out of said seats.

At its intermediate portion, the mandrel 4 is provided with a threaded section 8 that works in the internal threaded section of the sleeve. Extending outward from the threaded section 8, the mandrel is formed with an outwardly tapered roller engaging expanding section, or portion 9. Also extending outward from the tapered portion

9, the mandrel 4 is reduced a distance sufficient to permit the rollers 5 to rest thereon when in idle position. The depth of this reduced portion is sufficient to permit the rollers 5 to clear the fin on the end of the tube 1, at the time the sleeve 3 is moved to and from working positions. The fin on the end of the tube 1 is formed at the time the flue is cut to its proper length. The reduced portion of the mandrel 4, at its extreme outer end, is provided with an angular head 10, to which a wrench, or other tool may be applied for the purpose of rotating the said mandrel. Extending inward from its threaded section 8, the mandrel is provided with a section of reduced diameter which terminates in an angular head 11, to which a wrench or other suitable tool may be applied for the purpose of rotating said mandrel.

All of the above noted parts of the mandrel are integrally formed, preferably from hardened tool steel. The rollers 5 are also preferably of hardened tool steel. When the expander is in working position, the entire body of the sleeve is within the flue and the rollers are positioned so as to expand the outer end of the flue against the seat in the flue sheet. The expanding mandrel may be rotated by application of a wrench, or other tool, either to the inner or outer end thereof. This is important because sometimes wrenches are located at both ends of the flue, and it is sometimes desirable to rotate the same from one point and sometimes from the other point. When the mandrel is to be rotated by application of a wrench to its inner head 11, the said wrench should be formed on the end of a long rod which is inserted into the farther end of the flue. The threaded section 8, it will be noted, has the largest diameter of any portion of the mandrel, so that the mandrel may be inserted into the sleeve endwise in either direction.

When the tool is positioned, as shown in the drawings, and the mandrel is screwed outward so as to press the rollers against the end of the flue, and the mandrel is then rotated in a direction which screws the same outward, and further expands the rollers, the action will be substantially as follows: Under the rolling action which takes place between the rollers and the flue, the rollers will travel in the same direction in which

the mandrel is rotated and they will cause the sleeve to rotate in the same direction, but at approximately one-half as fast as the said mandrel; and, as is evident, this differential rotary movement between the mandrel and spindle will gradually force the mandrel longitudinally outward and force the rollers radially outward. In this way, the flue will be gradually expanded under rotation of the mandrel, and travel of the rollers on the inner surface thereof. There is, however, a considerable friction between the threads of the spindle and the sleeve, and in practice, it is found that when the rollers are forced outward too rapidly, this friction between the said threads will become so great as to temporarily lock the sleeve and spindle together, and thus, for a time, lock the two in common rotation, thereby temporarily discontinuing the outward feeding movement of the rollers until the flue has been expanded sufficiently to relieve, to some extent, the pressure between the rollers and the flue. In this way, the feeding action is made perfectly automatic.

The double ended mandrel is especially adapted for use by boiler makers, but for many other classes of work the inwardly

projected operating head or shank may be omitted.

What I claim is:

In a flue expander, the combination with an internally threaded sleeve adapted to be inserted into a flue and having a stop flange at its outer end and roller seats just inward of said stop flange, of rollers in said roller seats, and a mandrel having an intermediate threaded section engaging the internal threads of said sleeve head provided with angular inner and outer heads at its extremities, and formed with a roller expanding section that tapers outward from its threaded section, and also formed with a reduced portion between the outer end of the said roller expanding section and the said outer head, the said threaded section of the mandrel being of greater diameter than any of the other portions thereof, and all parts of the said mandrel being integrally formed, substantially as described.

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

FREDERICK CLARK.

Witnesses:

CHARLES McMASTERS,
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."