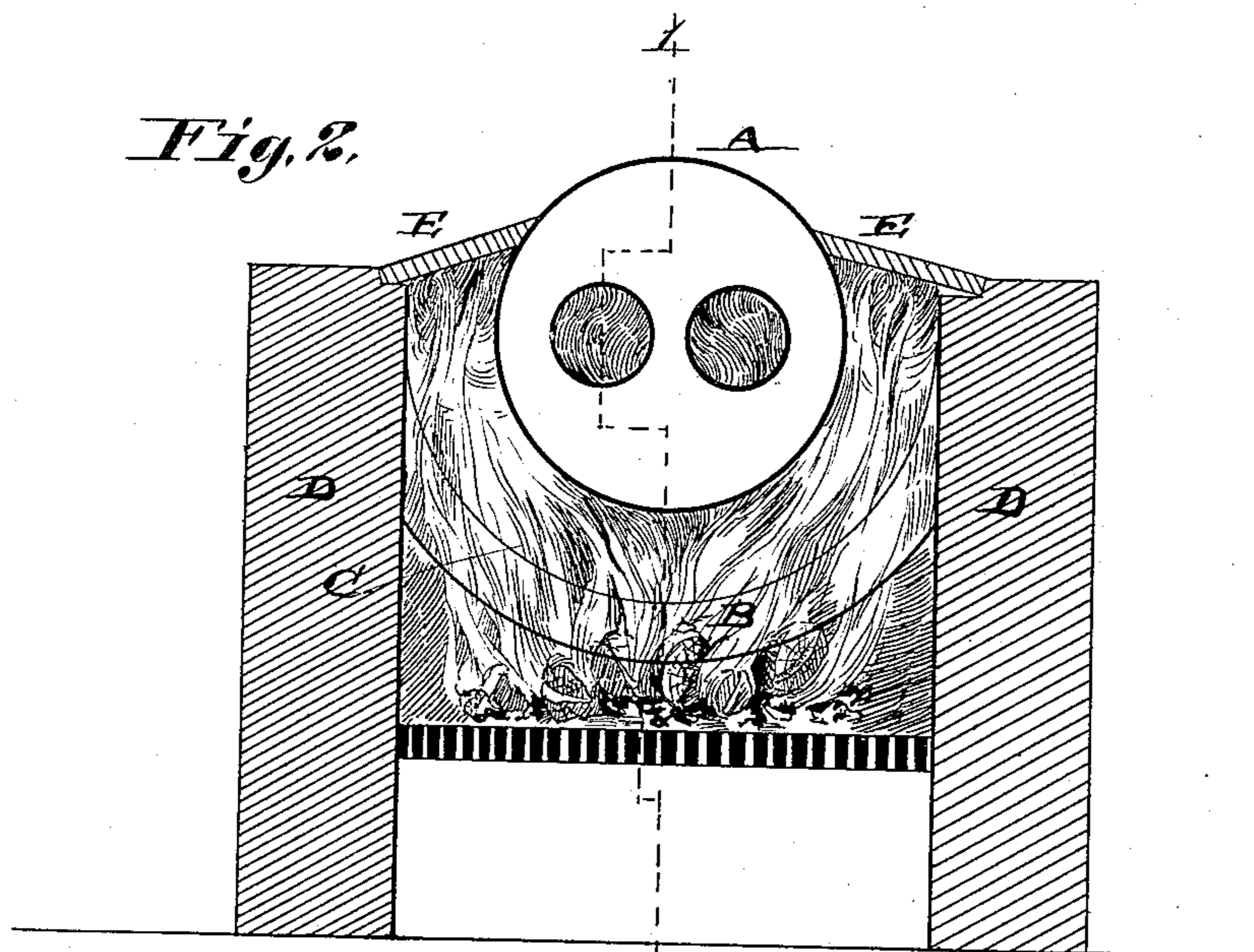
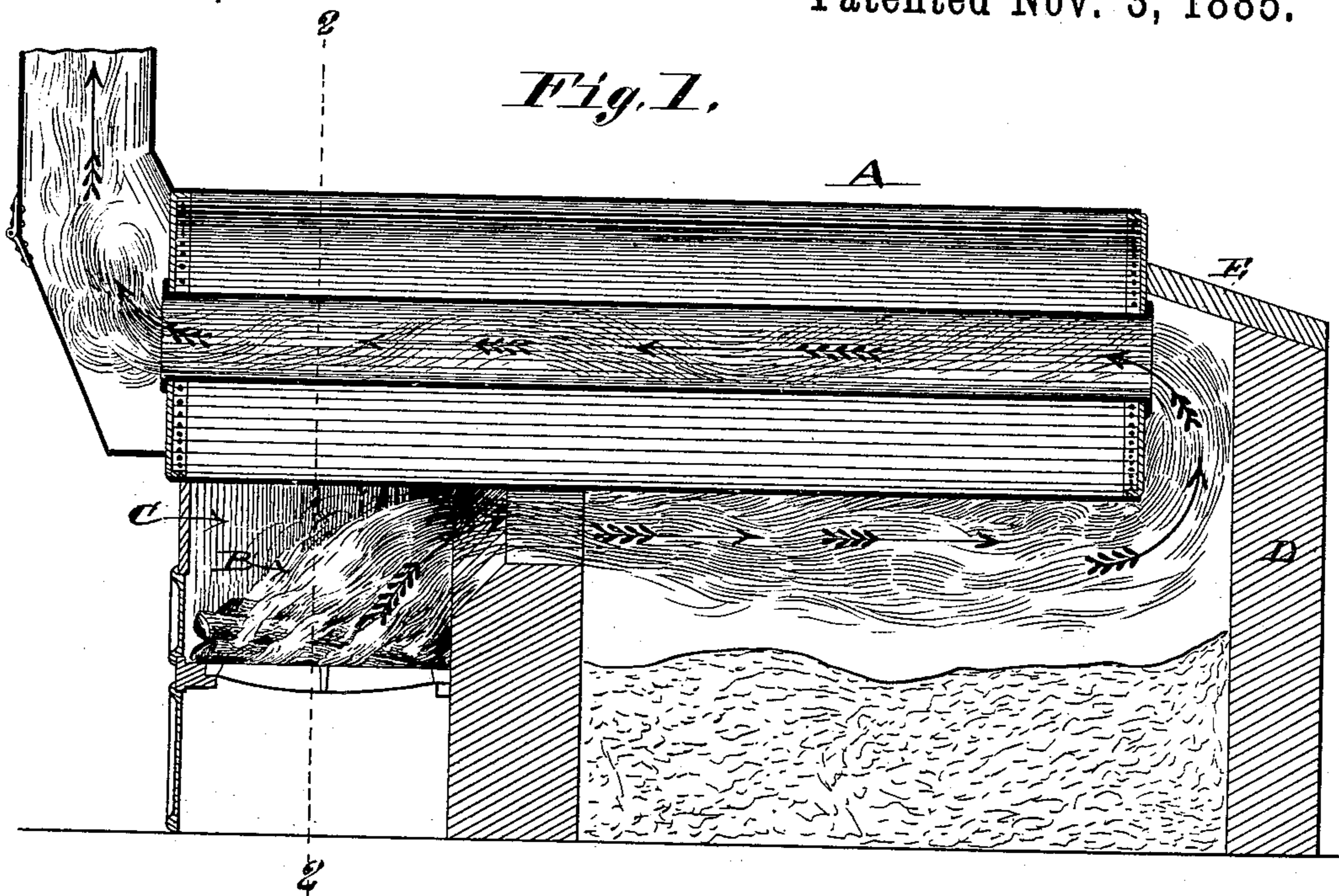


(No Model.)

C. S. EBAUGH.
PROCESS OF TREATING STEAM BOILERS FOR PREVENTING FRACTURES
AND EXPLOSIONS.

No. 329,446.

Patented Nov. 3, 1885.



Attest:
J. W. Hoke.

F. L. Stoddard

Inventor:
Charles S. Ebaugh
by C. D. Moody
atty

UNITED STATES PATENT OFFICE.

CHARLES S. EBAUGH, OF ST. LOUIS, ASSIGNOR OF ONE-TENTH TO CHARLES D. MOODY, OF WEBSTER GROVES, MISSOURI.

PROCESS OF TREATING STEAM-BOILERS FOR PREVENTING FRACTURES AND EXPLOSIONS.

SPECIFICATION forming part of Letters Patent No. 329,446, dated November 3, 1885.

Application filed September 8, 1885. Serial No. 176,477. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES S. EBAUGH, of St. Louis, Missouri, have made a new and useful Improvement in Processes of Treating Steam-Boilers for Preventing Fractures and Explosions, of which the following is a full, clear, and exact description.

The improvement is based upon the fact, ascertained by me after prolonged investigation, that the plates of steam-boilers, if not originally so, in use become, from various causes, crystallized, and therefore weakened and more liable to break, and that with the maximum authorized working pressure cracks occur only in plates whose metal is crystallized, and upon the further fact that by annealing crystallized iron or steel is reconverted into uniformly-tough ductile metal.

The improvement consists in taking a steam-boiler just as it is after its plates have from use or other cause become crystallized, and without in any manner changing its constitution, and preferably *in situ*, and without any water in it, subjecting it to an annealing-heat, and after thoroughly so heating allowing it to cool gradually, whereupon it will be found restored to its original condition and strength, and if the plates of the boiler when originally made were crystallized the boiler will be materially bettered by the treatment.

The most desirable mode of carrying out the improvement is illustrated in the annexed drawings, making part of this specification, in which—

Figure 1 is a vertical longitudinal section of an ordinary steam-boiler of the cylinder type having two flues and set in the ordinary manner. The section is on the line 1 1 of Fig. 2. Fig. 2 is a vertical cross-section on the line 2 2 of Fig. 1.

The same letters of reference denote the same parts.

The water being drawn out of the boiler A, a wood-fire, B, (as fuel containing sulphur should not be used,) is placed in the fire-place C and the boiler subjected to heat proceeding from the fire, just as when the boiler is filled with water and used as a steam-gener-

ator. The firing is continued until the entire boiler is subjected to an annealing-heat, and until it assumes the proper annealing color, following in this respect the most approved practice in annealing iron or steel, and according to the character of the metal of which the boiler is composed. (I have ascertained that if the plates are heated even to a white heat no injurious result ensues.) The fire is then withdrawn and the boiler allowed to gradually cool, as in annealing. It will then be seen that the seams and rivets are in no wise impaired, and that the metal in the plates is no longer crystallized, but tough and strong.

The customary inclosing-walls, D D, and covering E, constitute a suitable furnace or box, not only for enabling the heat to be applied to the boiler, but also for enabling it to be cooled gradually.

In presenting this application I beg to state that it is based upon a long series of tests with actual steam-boilers, both single ones and in batteries. At least one hundred boilers have been subjected, under my personal superintendence, to the above-described treatment. It was problematical whether the desired heat could be applied to a boiler as a unit without injuring its form or weakening it at the joints. It also involved a long period of time for a comparison to be instituted between boilers not thus treated and boilers which had been subjected to the treatment, and a reliable conclusion to be reached; but after these repeated and prolonged tests, made at first, and almost always afterward, at my own cost, risk, and responsibility, I am prepared to state that the treatment in question positively prevents fractures in boiler-plates, and with any working pressure equal to the test applied by the Government explosions will not occur.

The improvement is adaptable to any of the ordinary forms of steam-boilers, and to locomotives as well as to stationary boilers. I have further demonstrated that fractures occur in boiler-plates because of isolated strains due in turn to unequal contraction

and expansion, but only in plates whose metal is crystallized.

I claim—

The herein-described mode of treating
5 steam-boilers, for preventing fractures and explosions, with a working steam-pressure, which consists in subjecting the entire boiler,

without any water in it, to an annealing heat, and allowing it to cool gradually, substantially as described.

CHARLES S. EBAUGH.

Witnesses:

C. D. MOODY,
J. W. HOKE.