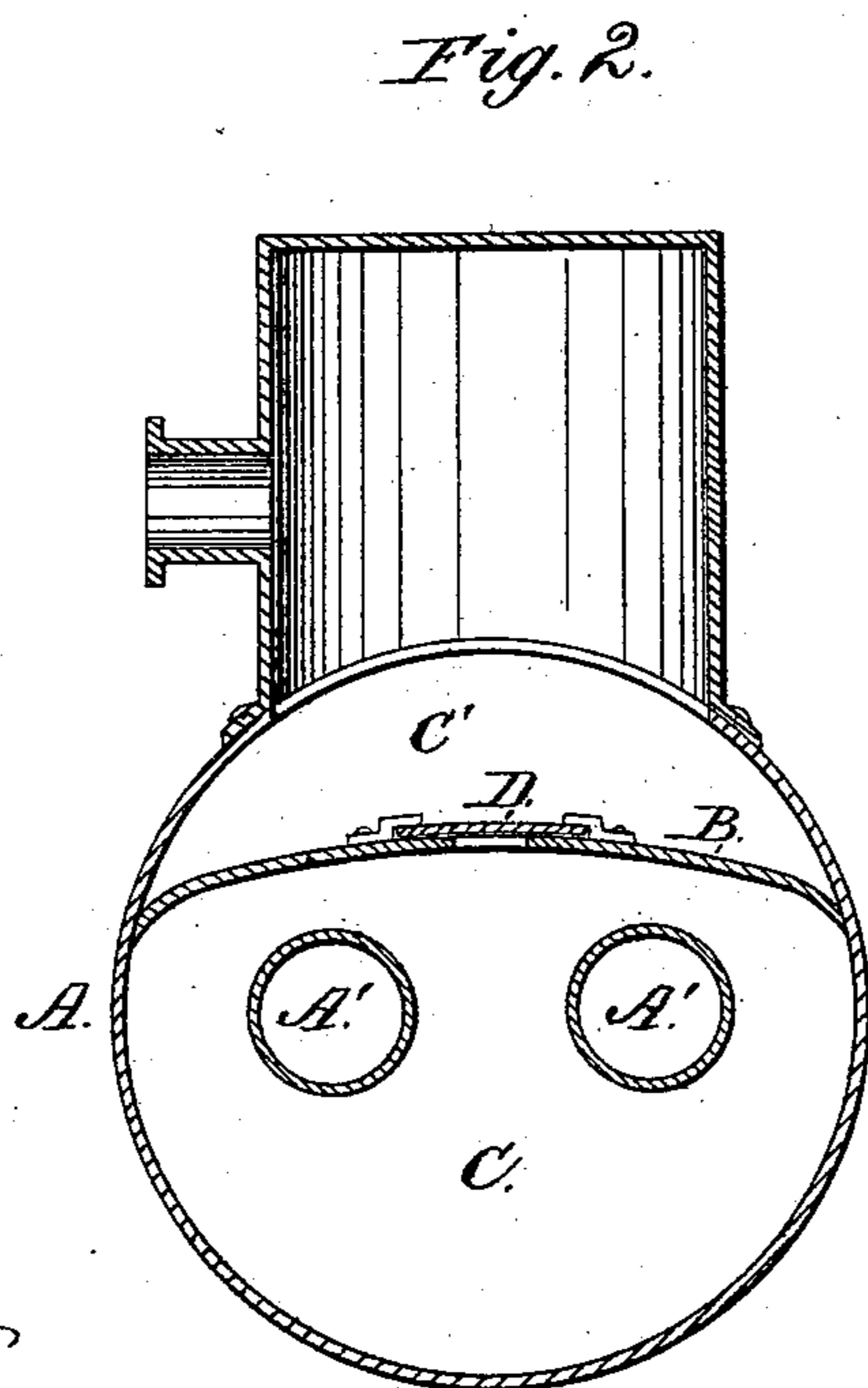
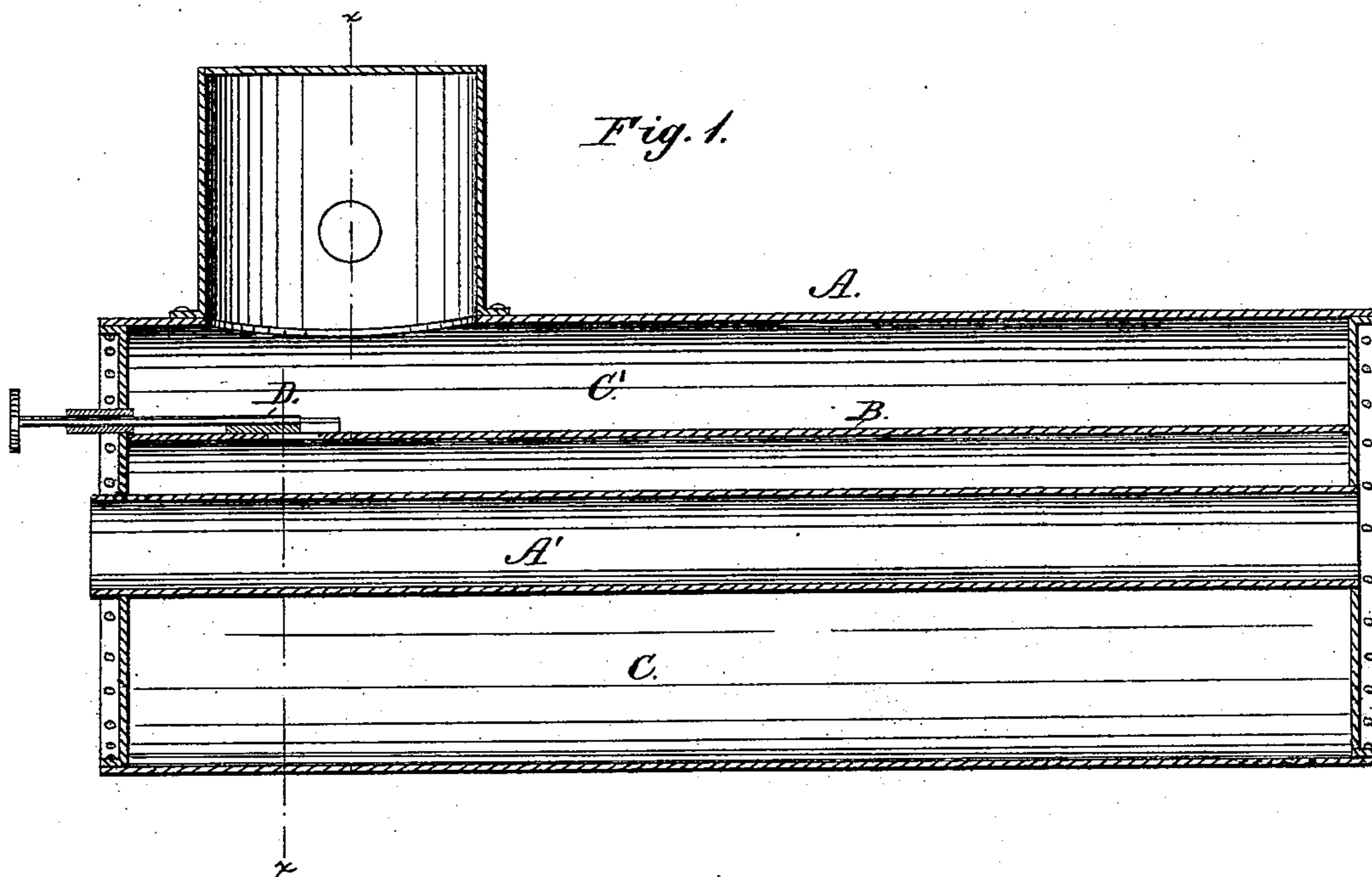


D. T. LAWSON.  
Means for Preventing Explosions of Steam-Boilers.  
No. 227,024.                      Patented April 27, 1880.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

DANIEL T. LAWSON, OF WELLSVILLE, OHIO.

## MEANS FOR PREVENTING EXPLOSIONS OF STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 227,024, dated April 27, 1880.

Application filed November 4, 1879.

*To all whom it may concern:*

Be it known that I, DANIEL T. LAWSON, of Wellsville, in the county of Columbiana and State of Ohio, have invented a new and Improved Means for Preventing Explosions of Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical longitudinal section. Fig. 2 is a transverse section.

Water boils under the normal pressure of the atmosphere at 212° Fahrenheit. Under a pressure of ten pounds to the square inch a heat of 239° is required to make it boil; under fifty pounds to the square inch, 298° is required, and under one hundred pounds pressure to the square inch, 338° of heat is required in all the water in the boiler to keep the steam-pressure to that point—i. e., to one hundred pounds to the square inch—and just as the steam-pressure is increased so the heat in the water must be proportionately increased, or else the steam-pressure required cannot be had.

When water is thus superheated it becomes as explosive as gunpowder; but it does not explode in the same manner, as powder explodes by chemical union upon ignition, while superheated water explodes by bursting into steam from a reduction of pressure. Thus the engineer opens the throttle-valve and the cylinder is instantly filled with steam, which creates a vacuum to that extent in the boiler. The superheated water then immediately jumps to fill the vacuum, and is met by the valve, instantly cutting off the escape into the cylinder, which causes a concussion on every square inch in the boiler much greater than the regular pressure of the steam. I have abundant reason to believe that it is this concussive action which causes the numerous and mysterious boiler-explosions, and which cause is wholly independent of the amount of water in the boiler—in fact, the greater the amount of water in the boiler the more terrific the explosion.

Another cause of boiler-explosions which occur when the pumps begin to act is as follows: When the water gets low in the boiler, or the boiler careens, the cold feed-water is injected directly into the steam-space. It thus

acts to condense the steam, and for an instant suddenly reduces the pressure. Immediately after the momentary condensation the superheated water again bursts into steam, and by a concussive action involves a strain of the same general character as that which is constantly going on during the escape of steam through the cylinder-ports, but of a more intense character.

My invention, which is based upon this theory, consists in reducing the concussive strain produced by the impulsive and intermittent escape of steam to the cylinders to an approximately uniform pressure by rendering the evolution or passage of steam from the water to the steam space approximately constant and independent of the intermittent discharges from the steam-space to the cylinder; and the means for accomplishing the same consist in a boiler constructed with a partition intervening between the water-space and the space whence the steam is taken to supply the cylinder, and feeding the steam as it is generated through a valve or orifice in said partition of a smaller size than the port or opening through which the steam passes into the cylinder. By this means the normal steam-pressure or steam-supply, when thus intermittently or alternately reduced, is restored gradually by reducing the flow from the water-space to the steam-space, so that the transformation of water into steam is made approximately uniform in spite of the intermittent escape of steam through the cylinders, and the boiler is thus relieved of the constant wear and strain of the concussion.

In the drawings I show one example of my invention, in which A represents a steam-boiler, which may be of any approved shape and be provided with fire-flues A' A'. B is a partition in the same, separating the boiler into two compartments, one of which, C, contains the water and a small steam-room, and the other of which, C', is occupied entirely by steam, and into which is tapped the pipe leading to the cylinder.

Through the partition B is formed an opening, which is preferably controlled by a valve, D, operated from the outside of the boiler, so as to enlarge or reduce the size of the orifice leading from the water-compartment to the steam-compartment. This orifice, to reach the

result of my invention, should be smaller than the orifice through which steam is fed to the cylinder. For practical purposes it should be about one-fourth as large as said outlet, and  
5 when so relatively proportioned it will be found that although a considerable body of steam may be suddenly taken out of the steam-space proper by the opening of the cylinder-valve the protracted flow from the lower com-  
10 partment to the upper compartment, caused by the smaller size of the orifice, retards the transformation of superheated water into steam through a period of time sufficiently long, as compared with the strokes of the piston, to  
15 make the liberation of steam practically uniform. In other words, the superheated water cannot jump in a body to supply the place of the discharged steam and meet with a check by the sudden closing of the induction-port,  
20 which produces a concussive strain on the boiler; but the reduction of the size of the orifice through which the steam liberated from the water passes is such as to prolong the passage of steam through said orifice over the  
25 period when the induction-port valve is closed. To avoid the concussion produced by condensation, I propose to introduce the water at a point so low that no cold water can ever come in direct contact with the steam, and  
30 with a downward instead of an upward injection. If, perchance, any cold water should thus come in contact with the steam, my invention of the partition and opening therethrough still acts beneficially, for the reason that the  
35 steam-space over the water in the lower compartment is limited in my invention and the condensation of the steam in this space is limited in its effect.

In making use of my invention I do not limit myself to any construction of boiler, any  
40 arrangement of partition, or to any form of opening in the partition, as a plain orifice of smaller size than the induction-port may be used without a valve to control its size and still give good results.

In fitting up old boilers with my improve-  
45 ment I may build a supplemental steam-space above the old boiler and connect their chambers by an orifice of the relative size described, or I may interpose the partition between the  
50 boiler and the steam-dome.

Having thus described my invention, what I claim as new is—

1. The method of preventing concussive strains in boilers due to the intermittent es-  
55 cape of steam into the cylinder, which consists in retarding or prolonging the flow of the steam from the water to the steam space through a greater length of time than is allowed for the escape of the same quantity of  
60 steam from the steam-space, as described.

2. A steam-boiler adapted to carry a permanent bulk of water, having a partition dividing the main steam-space from the water-space,  
65 with an opening in said partition of less area than the opening through which the steam is led from the steam-space to the cylinder.

The above specification of my invention signed by me this 30th day of October, 1879.

D. T. LAWSON.

Witnesses:

EDWD. W. BYRN,  
CHAS. A. PETTIT.