

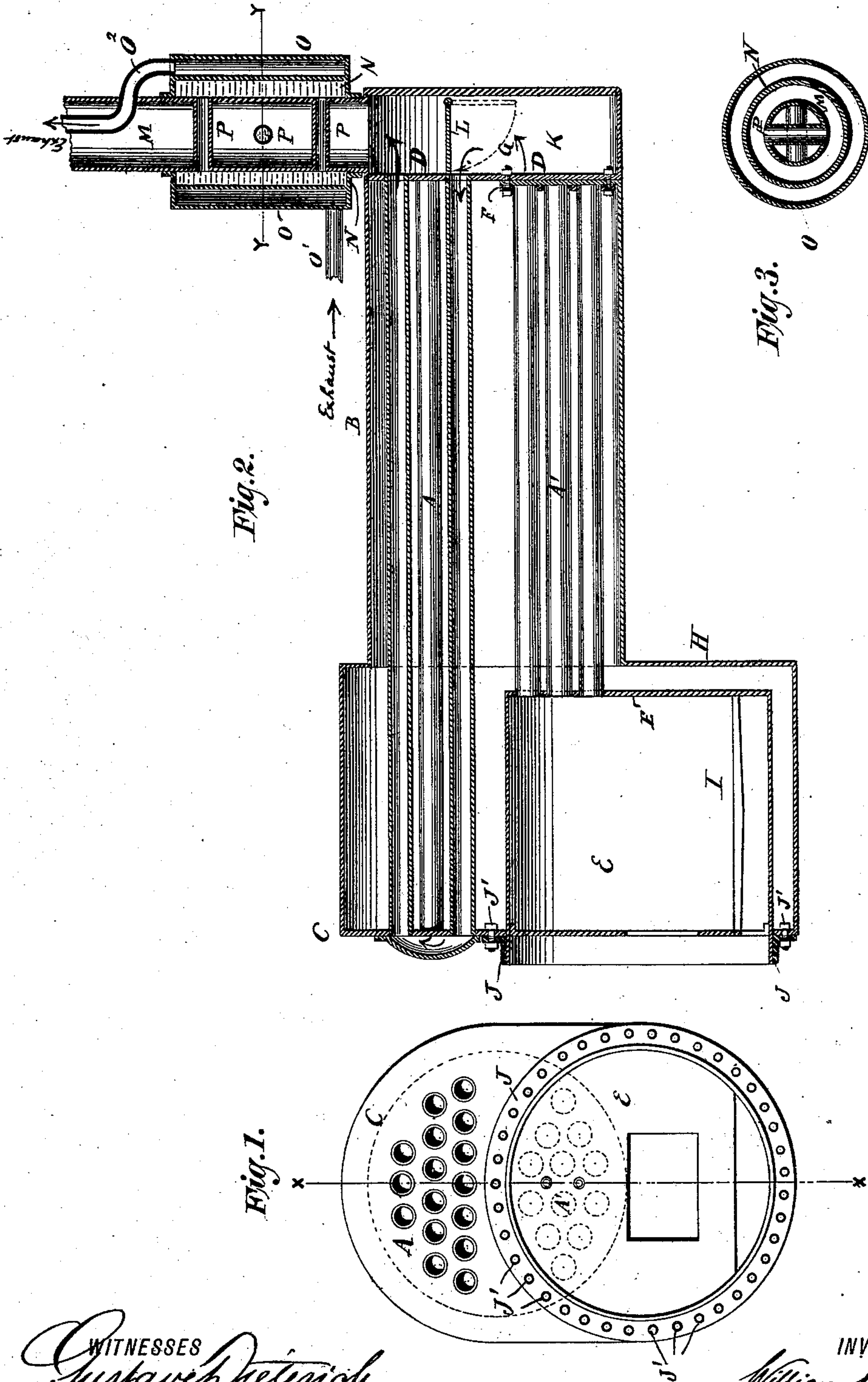
(No Model.)

2 Sheets—Sheet 1.

W. BERRENBURG.
PORTABLE BOILER.

No. 360,847.

Patented Apr. 12, 1887.



WITNESSES
Gustav Dietrich
Sam Goebel

INVENTOR
William Berrenberg
By his Attorneys
Gorrie & Raegen

(No Model.)

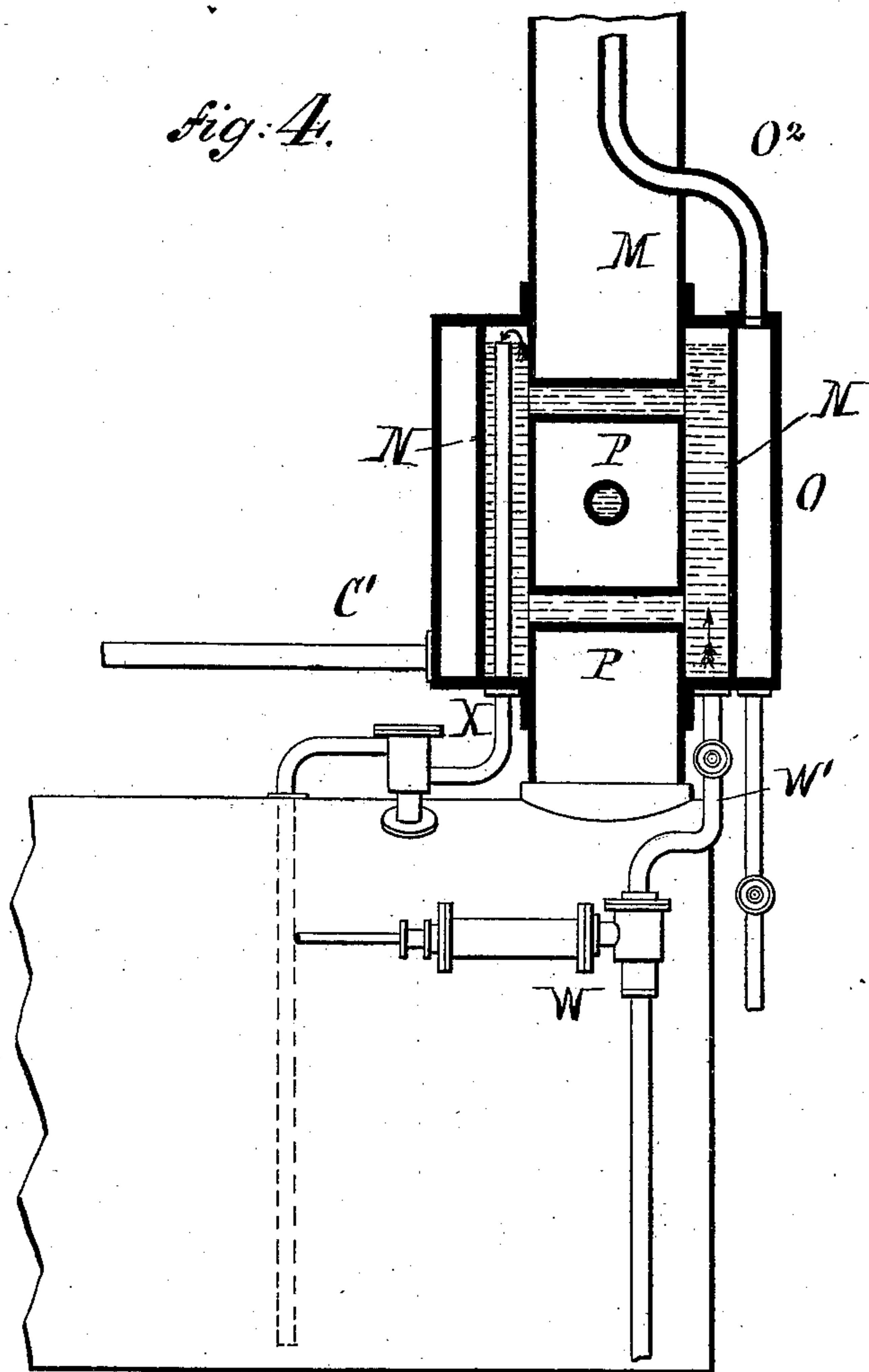
2 Sheets—Sheet 2.

W. BERRENBURG.

PORTABLE BOILER.

No. 360,847.

Patented Apr. 12, 1887.



WITNESSES:

A. Schehl.

Carl Karp

INVENTOR

William Berrenberg

BY

Goepel & Macgovern

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM BERRENBURG, OF BOSTON, MASSACHUSETTS.

PORTABLE BOILER.

SPECIFICATION forming part of Letters Patent No. 360,847, dated April 12, 1887.

Application filed March 24, 1886. Serial No. 196,317. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BERRENBURG, of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Boilers for Portable Steam-Engines, of which the following is a specification.

The removing of scales from the flues of the boilers of portable engines is connected with some difficulty, and numerous attempts have been made to construct the boilers of portable engines in such a manner that the scales can be readily removed from the flues; but in all such cases the size of the fire-box was reduced and the products of combustion passed but once through the boiler.

The object of my invention is to provide a new and improved boiler for portable engines, which is so constructed that the fire-box can be removed with some of the tubes for the purpose of cleaning them.

A further object is to provide means for utilizing the exhaust-steam for the purpose of heating the feed-water.

The invention consists in a boiler having a series of upper flues or tubes secured to the heads of the boiler and the lower tubes secured to the inner wall of a removable fire-box, and to a plate which is bolted to the front head of the boiler.

The invention also consists in the combination, with the smoke-stack, of a water-jacket surrounding the same, a steam-jacket surrounding the water-jacket, and diametrical water-pipes passing through the smoke-stack, all as will be fully described and set forth hereinafter, and pointed out in the claims.

In the accompanying drawings, Figure 1 is an end view of my improved boiler for portable engines, parts being removed. Fig. 2 is a vertical longitudinal section of the same on the line *xx*, Fig. 1; and Fig. 3 is a sectional plan view of the same on the line *yy*, Fig. 2. Fig. 4 is an enlarged detail view of the sectional feed-water pipe.

Similar letters of reference indicate corresponding parts.

The upper tubes, A, of the boiler B have their ends secured in the heads C and D, in the usual manner. The lower tubes, A', which are shorter than the upper tubes, have their

ends secured in the inner wall, E', of the removable fire-box E, and in the plate F, which is attached by bolts G on the inner surface of the front head, D. The fire-box E is located within the enlarged box H, formed on the rear end of the boiler in the usual manner, said fire-box E projecting beyond the outer surface of the rear head, C, and being supported by an angle-iron, J, which is attached by bolts J' to the head C, as shown in Fig. 1. A grate, I, is provided in the movable fire-box E. At the opposite or front end of the boiler is arranged a smoke-box, K, in which the damper-valve L is located. The smoke passes from the fire-box, through the lower set of tubes, A', into the smoke-box K, and then either directly to the smoke-stack M or through a portion of the upper tubes, A, to the rear part of the boiler, and another portion of the tubes A to the smoke-stack, according to the position of the damper-valve L. The smoke-stack M projects upward from the smoke-box, and is surrounded by a water-jacket, N, which in turn is surrounded by a steam-jacket, O, into which the exhaust-steam from the engine (which is supported on the boiler, but not shown in the drawings) is conducted by the pipe O', the steam being then conducted from the jacket O, by the pipe O², into the smoke-stack M. Diametrical pipes P, located at right angles to each other, extend through the smoke-stack and connect the opposite sides of the water-jacket at different elevations.

The feed-water is fed by means of a suitable pump or injector, W, through the pipe W', into the water-jacket N, and from the same into the boiler. The water is heated while in the water-jacket by the exhaust-steam in the jacket O and the smoke and hot products of combustion acting on the inner surface of the water-jacket N and the pipes P. When the boiler is to be cleaned, the bolts J and G are detached, and then the removable fire-box E and the tubes A', connected with the same, withdrawn in longitudinal direction from the boiler-shell, thus facilitating the cleaning of the tubes A' and of the tubes A, supported by the heads of the boiler-shell. The removable fire-box E and the tubes A are replaced easily and quickly after cleaning by reattaching the fire-box E and plate F to the boiler-shell.

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

1. A steam-boiler having some of its tubes fixed permanently in the heads of the boiler-shell and the remaining tubes fixed in the inner wall of a removable fire-box, and in a plate which is bolted to the front head of a boiler, substantially as herein shown and described.
2. In a steam-boiler, the combination, with a shell and tubes fixed in the same, of a removable fire-box provided at its outer end with an angle-iron which is bolted to the rear head of the boiler, and of tubes having their ends secured to the inner wall of said removable fire-box, and in a plate which is bolted to the front head of the boiler, substantially as shown and described.
3. In a steam-boiler, the combination, with a shell and tubes fixed in the upper part of the same, of a removable fire-box, one end of which projects beyond the rear head of the boiler, an angle-iron extending around the pro-

jecting end of the fire-box, bolts for attaching said angle-iron to the rear head, and tubes attached to the inner wall of the removable fire-box, and to a plate bolted to the front head of the boiler-shell, substantially as shown and described.

4. The combination, with a portable steam-boiler and its smoke-stack, of a water-jacket surrounding the smoke-stack and having transverse connecting-pipes which pass through the smoke-stack, and of a steam-jacket surrounding the water-jacket and provided with inlet and outlet pipes for the exhaust-steam, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

WILLIAM BERRENBURG.

Witnesses:

PAUL GOEPEL,
SIDNEY MAHN.