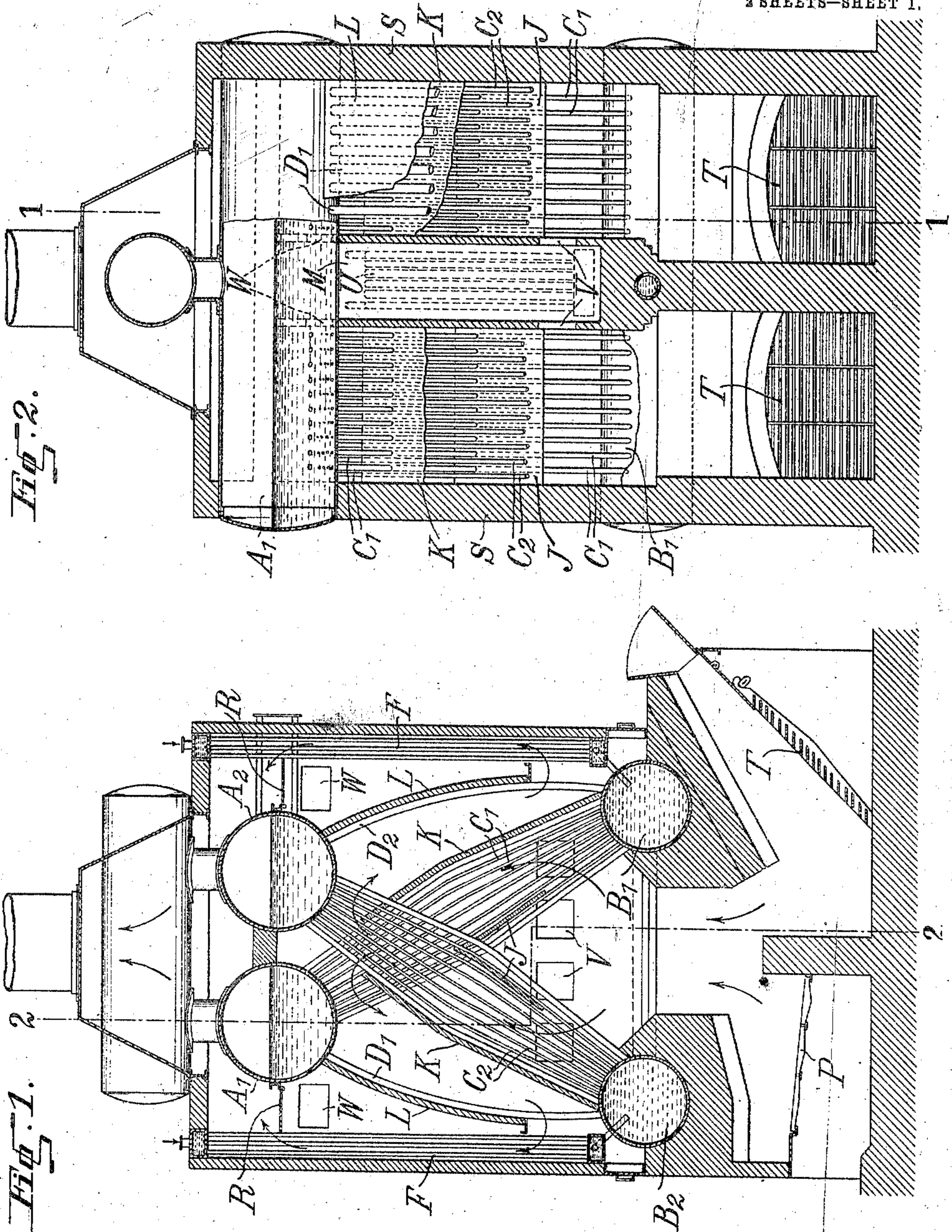


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WATER TUBE STEAM GENERATOR.
APPLICATION FILED JUNE 9, 1910.

967,718.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.



Witnesses: M. L. Brose
M. Schneider

Inventor
August G. Burkhardt
by John Lotka
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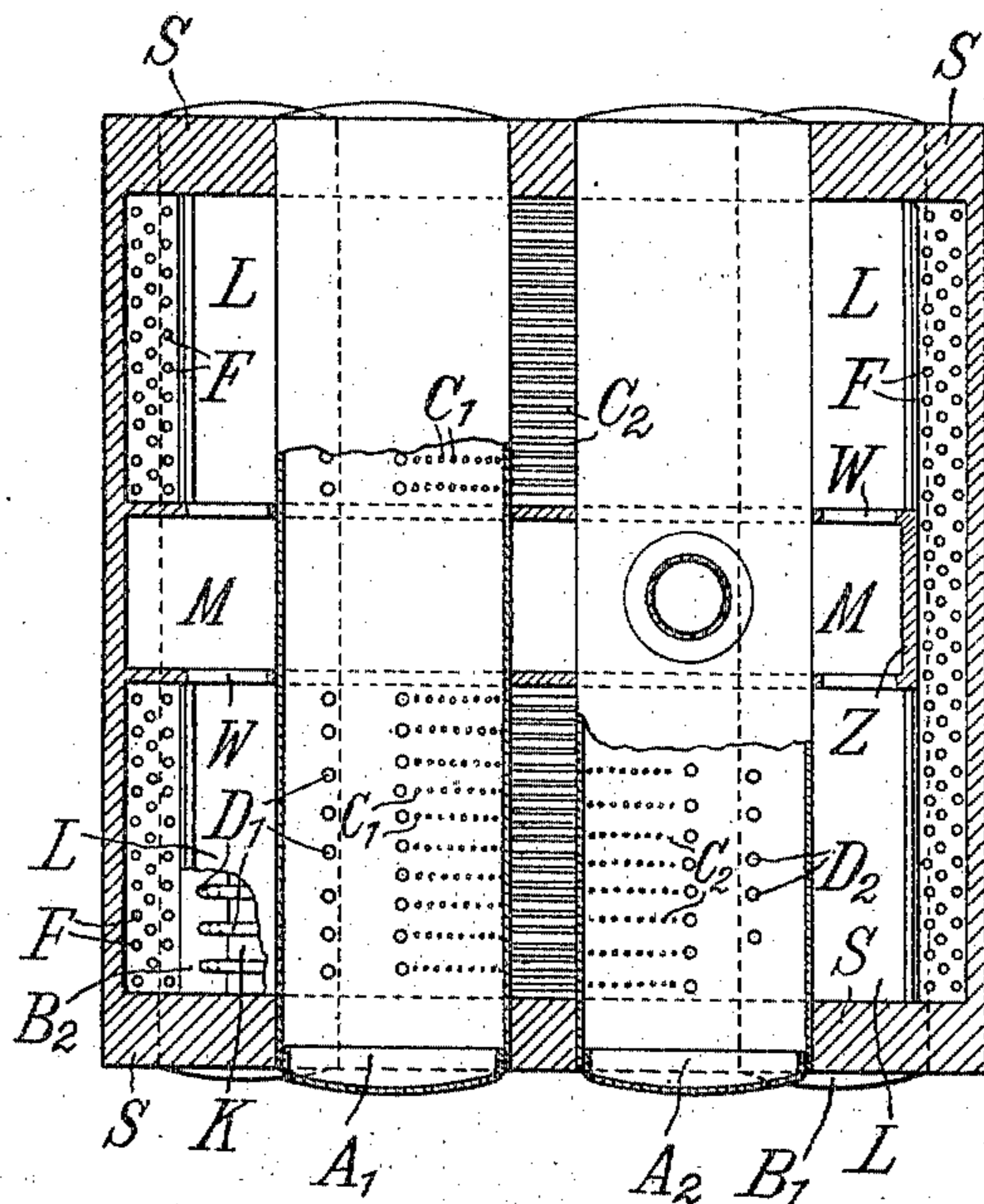
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Fig. 3.



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UNITED STATES PATENT OFFICE.

AUGUST GOTTLÖB BURKHARDT, OF DUSSELDORF, GERMANY.

WATER-TUBE STEAM-GENERATOR.

967,718.

Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed June 9, 1910. Serial No. 566,084.

To all whom it may concern:

Be it known that I, AUGUST GOTTLÖB BURKHARDT, engineer, a citizen of the Empire of Germany, residing at Dusseldorf, 108. Gartenstrasse, have invented certain new and useful Improvements in or Relating to Water-Tube Steam-Generators, of which the following is a full, clear, and exact description.

My invention relates to water-tube steam generators of the type wherein two horizontal water drums disposed in the lower part of the generator are cross-connected by diagonally arranged banks of generating tubes to upper steam and water drums, circulating tubes also connecting each steam drum with the water drum directly below it.

According to my invention the heating gases are divided by baffles into two currents which flow separately through each bank of generating tubes and rejoin at the point where the banks of tubes cross one another, being then separated again to flow through the two groups of descending circulating tubes. If desired, the heating gases then flow upward through tubular feed-water heaters which may also form the outer walls of the flue for the heating gases.

A construction of water-tube steam generator according to my invention is illustrated by way of example in the accompanying drawings, in which similar reference letters denote similar parts.

Figure 1 is a vertical section on the line 1—1 of Fig. 2, Fig. 2 is a vertical section on the line 2—2 of Fig. 1, and Fig. 3 is a plan showing two different forms of feed-water-heater.

The generator illustrated is provided with both a flat grate P of ordinary construction and also a stepped grate T so that the generator can be supplied with fuel simultaneously from both sides, steam coal being burned on the grate P and soft or brown coal on the stepped grate T.

The steam and water drums A^1 , A^2 arranged in the upper portion of the generator are cross-connected to the lower water drums B^1 , B^2 by banks of generating tubes C^1 , C^2 , the two banks of tubes crossing one another in the manner shown. Since the generating tubes are exposed to the hottest gases, generation of steam takes place for the most part within the tubes. To return any water which may rise in the generating tubes C^1 , C^2 in the shortest and easiest man-

ner to the water drums B^1 , B^2 from the steam and water drums A^1 , A^2 , the latter are directly connected to the water drum disposed immediately below them by means of a large number of descending circulating tubes D^1 , D^2 of comparatively large diameter. The descending tubes D^1 , D^2 are primarily intended to promote circulation and not for the generation of steam. Owing to the arrangement of descending circulating tubes, water from one bank of generating tubes C^1 is carried by the shortest route to the water drum B^2 and thence into the other group of generating tubes C^2 so that, if the banks of generating tubes are heated to an unequal extent, the circulation of water is equalized.

The heating gases are compelled to flow in two oblique paths by means of baffle plates J and K, the plates J extending downward from the point at which the banks of generating tubes cross one another parallel to these tubes thus forming a roof which forces the heating gases to flow between and parallel to the generating tubes, the outer ones of which carry the baffle plates K and extend downward to the water drums B^1 , B^2 , the distance between the baffles K and J being about equal to that of the width of each bank of tubes. The heating gases are thus divided into two currents which flow through the generating tubes and rejoin at the points where these tubes cross one another. Owing to the area of the passage through which the gases flow being considerably reduced by the crossing of the generating tubes, the heating gases make contact with the walls of the tubes in a very thorough manner resulting in an efficient generation of steam. After rejoining in the manner described, the two currents of heating gases again separate and flow downward between the outer surfaces of the baffle plates K and the inner surfaces of the other baffle plates L extending from the steam and water drums A^1 , A^2 parallel to, and terminating within a short distance of the lower ends of the circulating tubes D^1 , D^2 . Finally the heating gases flow upward through two groups of tubes F containing feed-water which flows downward in the opposite direction to the heating gases which pass upward between these tubes and escape into the main flue and chimney.

The feed-water-heater tubes extend from the end walls S of the generator to the su-

perheater chamber M, in this way covering the outer walls of the actual heating flues of the generator as shown on the left hand side of Fig. 3. Alternatively, the feed water device may be disposed so as to cover also the outer wall of the superheater chamber F in which case vertical partitions Z are disposed between the feed-water tubes and superheater chamber as shown on the right hand side of Fig. 3. Owing to the feed-water-heater tubes being arranged on the outer side of the brickwork of the generator, these tubes are easily accessible for cleaning purposes and at the same time readily take up heat radiating from the inner flues.

As shown in Fig. 2 of the drawings, if desired, a superheater U may be disposed in an intermediate chamber and also in the chambers bounded by the baffle plates K and L. The heating gases then enter through lateral openings V and escape at the top through openings W provided with regulating dampers R.

What I claim is:—

1. In a water-tube steam generator, the combination with steam and water drums arranged in the upper part of the generator, water-drums, arranged in the lower part of the generator, banks of generating tubes crossing one another, lateral circulating tubes, both set of tubes connecting the upper

and lower drums, and a furnace for generating heating gases, of baffles dividing the heating gases into two currents which rejoin at the crossing point of said generating tubes and then separate again so as to flow down between the said circulating tubes.

2. In a water-tube steam generator, the combination with steam and water drums arranged in the upper part of the generator, water-drums, arranged in the lower part of the generator, banks of generating tubes crossing one another, lateral circulating tubes, both set of tubes connecting the upper and lower drums, and a furnace for generating heating gases, of baffles dividing the heating gases into two currents which rejoin at the crossing point of said generating tubes and then separate again so as to flow down between the said circulating tubes, of baffles arranged near the outer surface of the circulating tubes and leading the heating gases, after having passed the circulating tubes, upward so as to sweep along feed-water-heater tubes forming the outer walls of the heating gas flues.

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

AUGUST GOTTLÖB BURKHARDT. [L. S.]

Witnesses:

CHAS. J. WRIGHT,
OTTO KÖNIG.