

No. 682,313.

Patented Sept. 10, 1901.

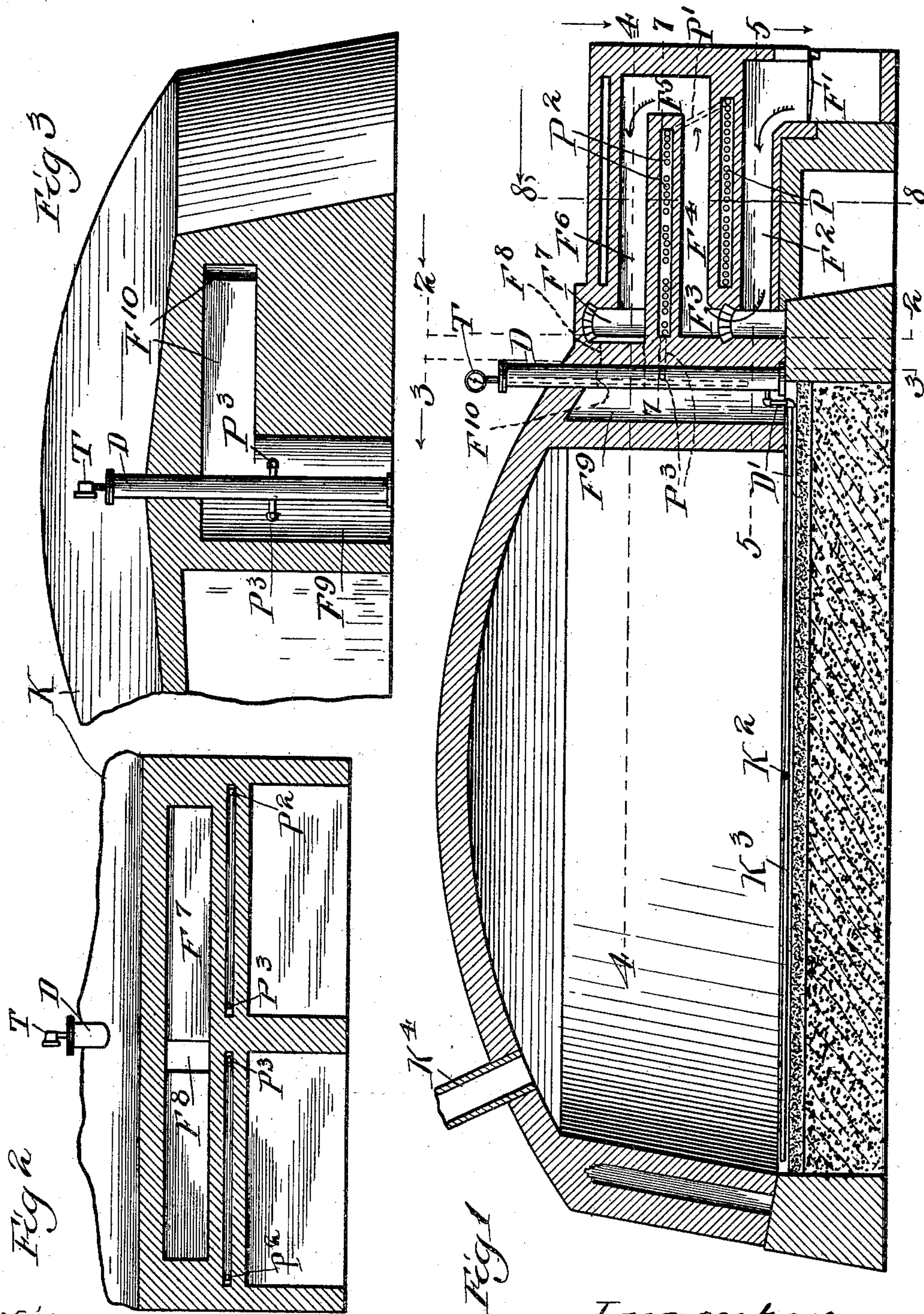
B. ZWILLINGER.

APPARATUS FOR CARBONIZING MATERIAL.

(Application filed Nov. 23, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses
W. C. Cochran
Wm. Geiger

By

Inventor
Bernhard Zwillinger
W. E. Williams
Atty

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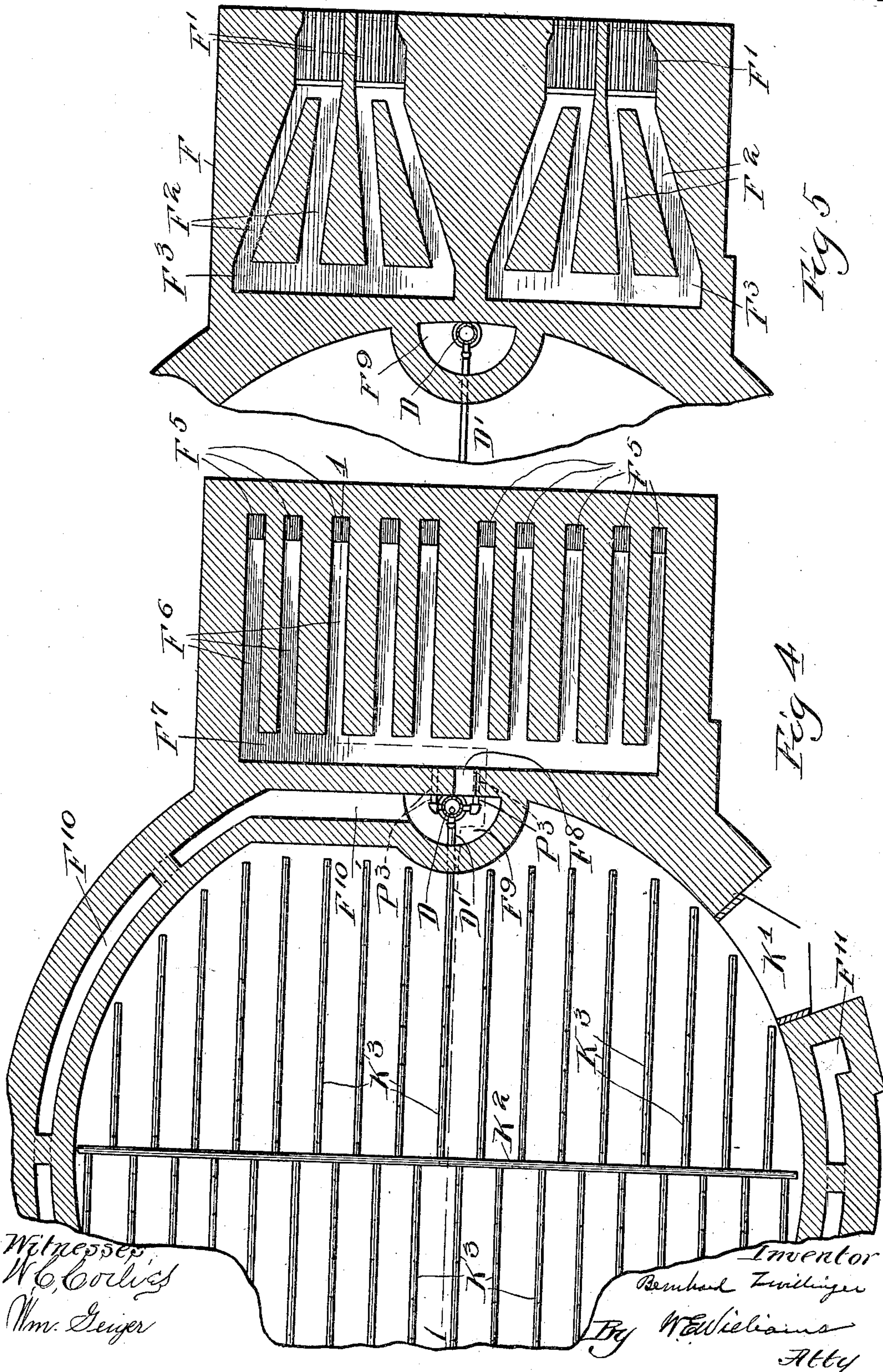
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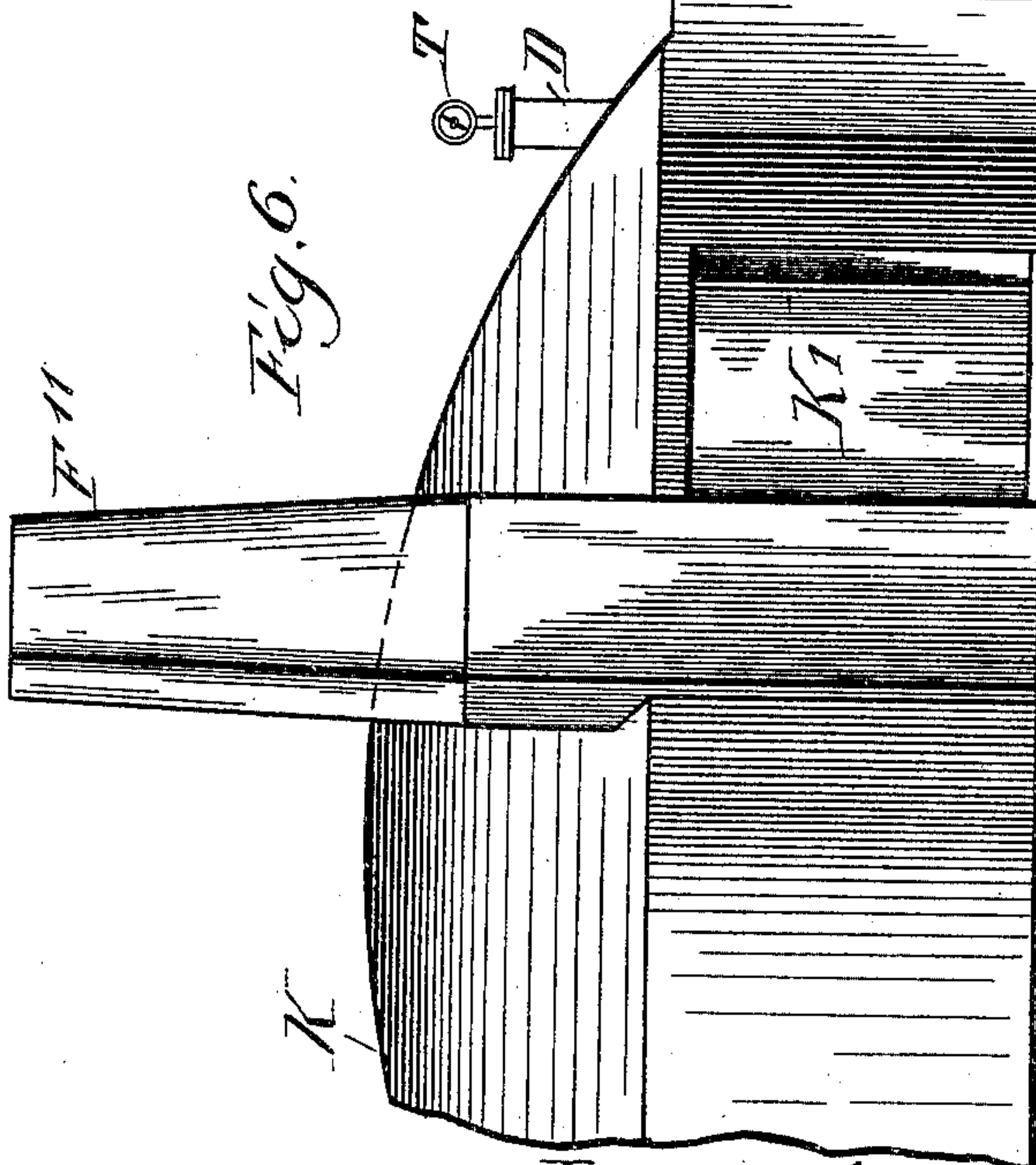
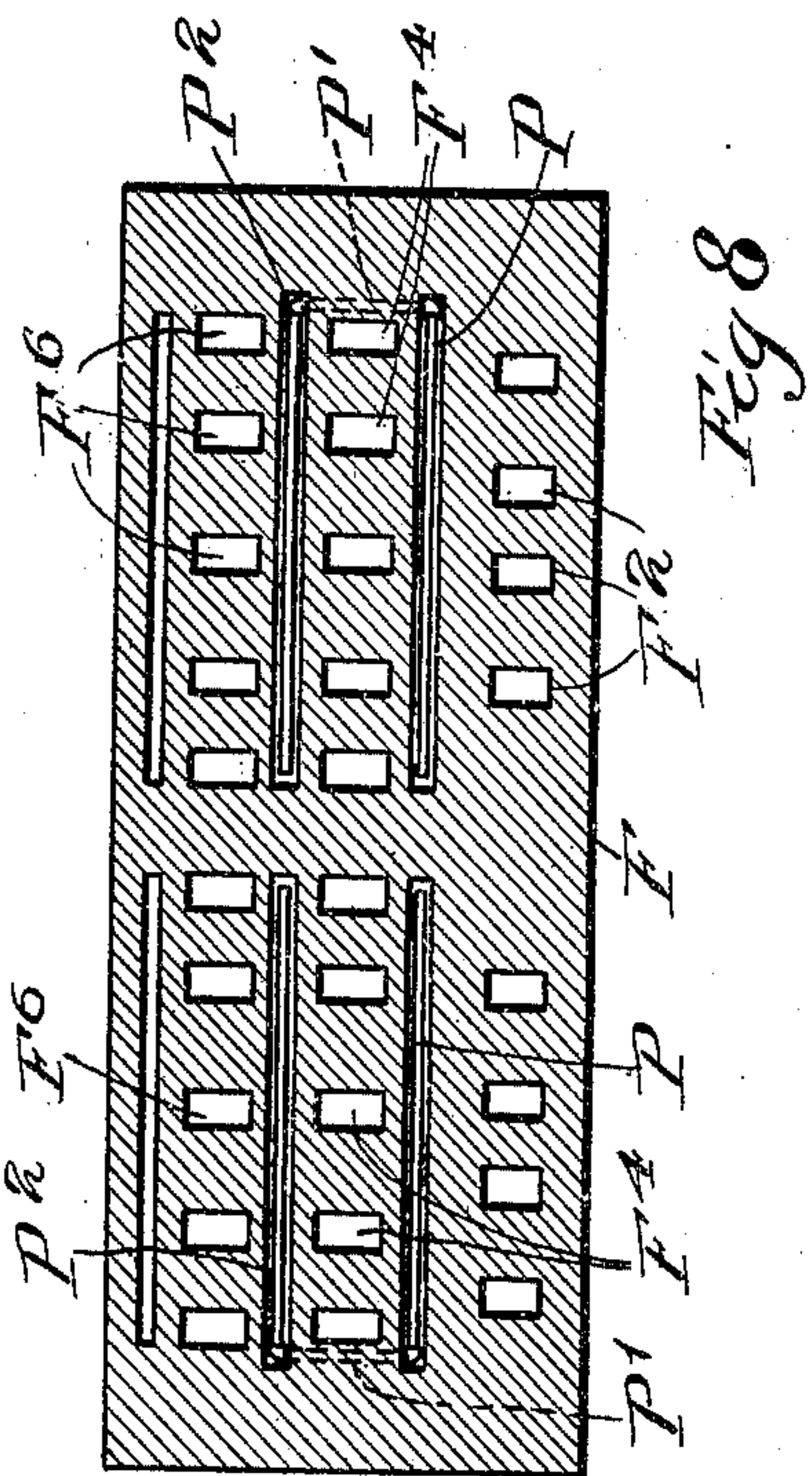
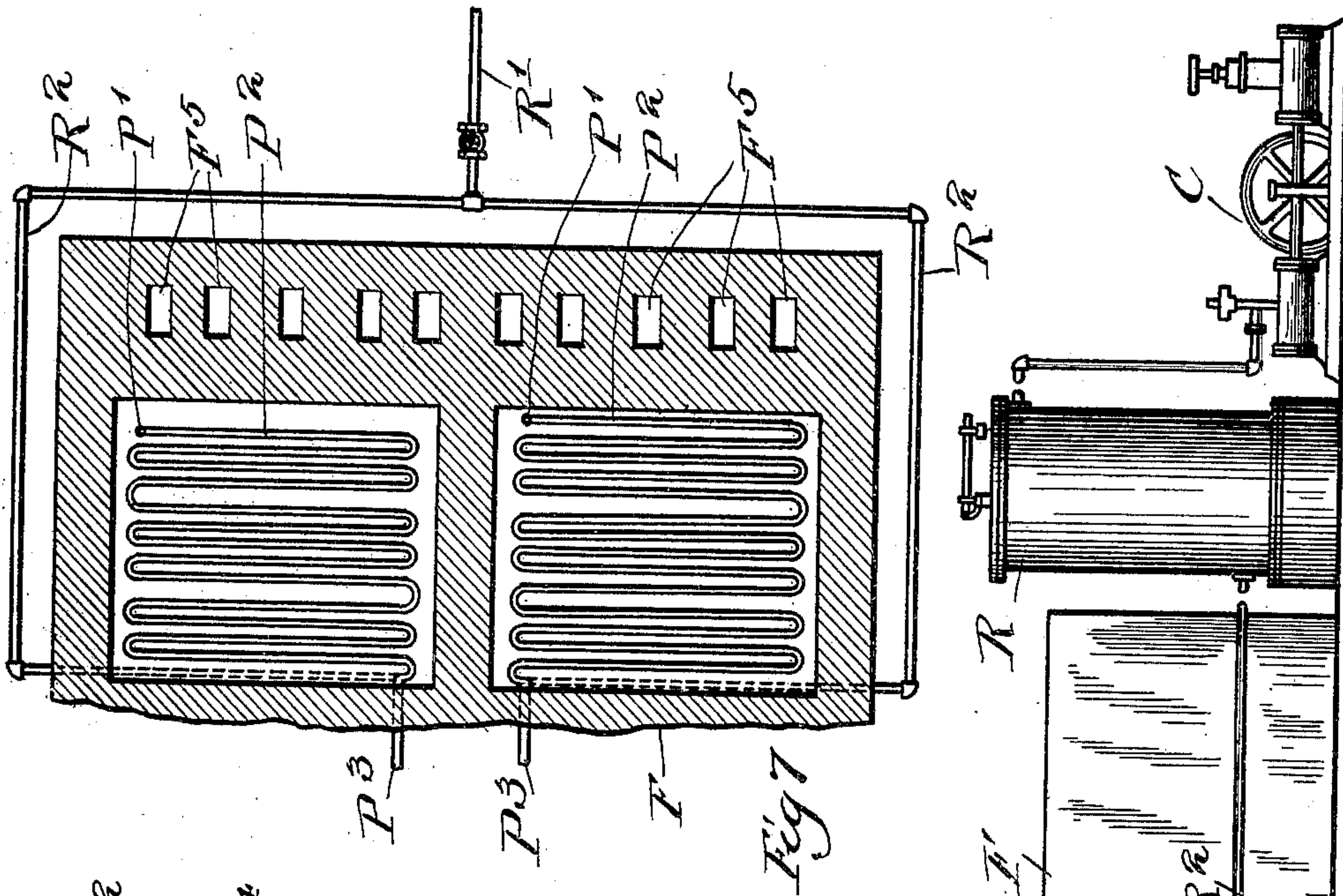
B. ZWILLINGER.

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(Application filed Nov. 23, 1899.)

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3 Sheets—Sheet 3.



Witnesses
W. C. Corlies
Wm. Geiger.

Inventor
Bernhard Zwillinger
By W. E. Williams
Atty

UNITED STATES PATENT OFFICE.

BERNHARD ZWILLINGER, OF ASHLAND, WISCONSIN, ASSIGNOR TO FRED-
ERICK GUILLERMO VOSS, TRUSTEE, OF NEW YORK, N. Y.

APPARATUS FOR CARBONIZING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 682,313, dated September 10, 1901.

Application filed November 23, 1899. Serial No. 738,016. (No model.)

To all whom it may concern:

Be it known that I, BERNHARD ZWILLINGER, a citizen of the United States of America, and a resident of Ashland, Ashland county, Wisconsin, have invented certain new and useful Improvements in Apparatus for Carbonizing Material, of which the following is a specification.

My invention relates to devices for making charcoal, but adapted for carbonizing materials other than wood. The apparatus is intended for quickly and economically carbonizing large quantities of wood and at the same time saving practically all the valuable products separated from the wood during the operation. Rapidity in itself saves directly fuel, labor, and deterioration of the plant, and indirectly affects equally important gains in that it avoids destructive changes in the valuable by-products of carbonization. In the practical use of my invention a large masonry chamber is filled with wood, the doors are closed, and intensely-hot gas, not adapted to support combustion to any material extent, is discharged into the chamber at a great number of points, the chamber being also heated meantime by what may be termed a "lateral wall of hot gas" within the lateral wall of the chamber and practically encircling the interior carbonizing-space. To secure such arrangement and results gas is compressed and forced into a reservoir, whence it passes through heating apparatus into perforated pipes in the floor of the carbonizing-chamber and is discharged into all parts of the latter at the same time. Being at a very high temperature it sets free the more volatile constituents of the wood and with them passes out through a suitable discharge-passage to apparatus for collecting the volatile portions. That the carbonizing-gas and the chamber in which it acts may be kept economically at the desired high temperature the necessarily-hot furnace-gases or waste products of the heating apparatus are discharged into the hollow lateral wall of the chamber, around which they pass to a chimney-flue near the point of their entrance within the wall. None of these gases can reach the chimney without passing around the chamber, and hence the draft of the chimney advances this constantly-re-

newed hot envelop, which in moving around the chamber gives up to every part below its own temperature a portion of its heat. In apparatus constructed as set forth and now in practical use thirty cords of wood may be very economically carbonized in a few hours or in nearly the time which would be required for carbonizing a comparatively small quantity.

In the accompanying drawings, Figure 1 is a sectional elevation of the apparatus on the line 1 1, Fig. 4. Fig. 2 is a sectional elevation on the line 2 2, Fig. 1. Fig. 3 is a vertical sectional view on the line 3 3, Fig. 1. Fig. 4 is a plan sectional view on the line 4 4, Fig. 1. Fig. 5 is a plan sectional view on the line 5 5, Fig. 1. Fig. 6 is an external diagrammatic elevation of the entire apparatus. Fig. 7 is a plan sectional view on the line 7 7, Fig. 1. Fig. 8 is a sectional elevation on the line 8 8, Fig. 1.

In the views, K designates a preferably circular kiln or carbonizing-chamber provided with doors K' and a chimney-flue F¹¹, Fig. 4, near the doors and having its lateral walls made hollow to form a passage or flue F¹⁰, extending nearly around the chamber and opening into the chimney-flue. Upon that side of the doors opposite the chimney heating apparatus is inclosed within walls F' integral with the walls of the kiln. In this apparatus heat is generated upon grates F', Figs. 1 to 5, at the side most distant from the kiln. The furnace-gases pass from this point back and forth through horizontal and vertical flues F² F³ F⁴ F⁵ F⁶ F⁷ F⁸ into a small chamber F⁹, opening directly into the kiln-encircling flue F¹⁰, before mentioned, and thence into the chimney. Alongside the heating apparatus is a reservoir R, into which gas is forced by a compressor C and from which leads a valved pipe R', having branches R², each connected with one end of one of two coils P, located in the partition between the flues F² F⁴, Fig. 1. At the other end of each coil P a pipe P' leads to a similar coil P², embedded in like manner in the partition between the flues F⁴ F⁶. From the latter coil a pipe P³ leads to a vertical drum D in the chamber F⁹, and from the drum a pipe D' leads along the bottom of the kiln to a dia-

metrical pipe K^2 , having numerous parallel perforated branches K^3 , arranged to discharge gas in every part of the lower portion of the chamber. In the drum D is placed a pyrometer T, by means of which the temperature of the gas entering the kiln may at all times be known. This being known, the flow of gas may be regulated by the valve in the pipe R' , so that there may be no uncertainty about the progress of the work nor any waste arising from admitting gas at improper temperature. The gas admitted to the chamber and the gaseous products resulting from decomposition of the wood are taken from the chamber through a pipe K^4 , Fig. 1, which leads to apparatus not concerned in this invention, and therefore not shown.

As has already been suggested, the products of combustion pass from the grates F' , Figs. 1, 5, and 8, rearward through horizontal flues F^2 , upward through vertical flues F^3 , forward through flues F^4 , upward through flues F^5 , Figs. 1, 4, and 7, again rearward through flues F^6 , Figs. 1, 4, and 8, into a cross-flue F^7 , Figs. 1, 2, and 4, thence through passages F^8 , Figs. 1, 2, and 4, into the chamber F^9 , Figs. 1, 3, 4, and 5, which opens into a flue F^{10} , Figs. 1, 3, and 4, passing nearly around the kiln to the chimney-flue F^{11} , Fig. 4, and the carbonizing-gas forced into the reservoir R by the pump C, Fig. 6, passes through the pipe R' , Figs. 6 and 7, and pipes R^2 to coils P, Figs. 1 and 8, lying between the flues F^2 F^4 , thence by pipes P' , Figs. 1, 7, and 8, to coils P^2 , Figs. 1, 2, 7, and 8, lying between the flues F^4 F^6 , thence by pipes P^3 , Figs. 1, 2, 3, 4, and 7, to a drum D in the chamber F^9 , Figs. 1, 2, 3, 4, 5, and 6, thence by a pipe D' , Figs. 1, 4, and 5, to a cross-pipe K^2 , Figs. 1 and 4, communicating with the perforated pipes K^3 , Figs. 1 and 4, in the floor of the kiln, and from the kiln out through a pipe K^4 , Fig. 1. The kiln being filled with material to be carbonized and the door being closed, as above suggested, heat being disengaged or generated at the grate F' , gas containing little or no oxygen being forced into the reservoir R, and the various valves being properly adjusted, it is obvious that gas will be forced through the pipes into the kiln, heated on the way by the gases in the flues, heated in the kiln by the gas in the kiln-walls, and expelled with products of carbonization through the pipe K^4 , Fig. 1.

From this construction it appears that the hot furnace-gases can reach the chimney only by passing nearly around the kiln in the hol-

low wall, and hence that the carbonizing-gas forced into the kiln can lose practically no heat by transmission in a lateral direction, but, on the contrary, during parts of the operation at least may receive some heat from the hollow wall.

What I claim is—

1. The combination with a carbonizing-chamber having its lateral walls made hollow to form a flue extending nearly around the chamber, of a chimney leading from one end of said flue, and a superheating-furnace discharging its waste gases into the opposite end of said flue; whereby the chamber is practically surrounded by a constantly-renewed layer of heated gas, and means for passing gas through said superheating-furnace and into the carbonizing-chamber.

2. The combination with the carbonizing-chamber and the small contiguous chamber, of the furnace discharging its waste gases into said small chamber, a drum within the latter, a pyrometer extending into said drum, and means for forcing carbonizing-gas through said furnace into said drum and thence into the carbonizing-chamber.

3. The combination with a carbonizing-chamber and a superheating-furnace alongside the same, of a gas-reservoir, an air-compressor for compressing gas and forcing it into said reservoir, heating-coils within the superheating-furnace, a valved pipe leading from the reservoir to the coils, and perforated pipes connected to said coils and extending to all parts of the floor of the carbonizing-chamber.

4. The combination with a carbonizing-chamber having its lateral walls made hollow to form a flue extending nearly around the chamber and opening at one end into a chimney, of a small chamber opening into the other end of said flue, a furnace discharging its waste gases into the small chamber, a drum in the latter, a pyrometer extending into the drum, a compressor, a reservoir receiving gas from the compressor, a valved pipe leading from the reservoir, heating-coils within the furnace, receiving gas from the pipe and delivering it in the drum, and perforated pipes receiving gas from the drum and delivering it in all parts of the lower portion of the carbonizing-chamber, substantially as set forth.

BERNHARD ZWILLINGER.

Witnesses:

M. E. DILLON,
GRACE MERRILL.