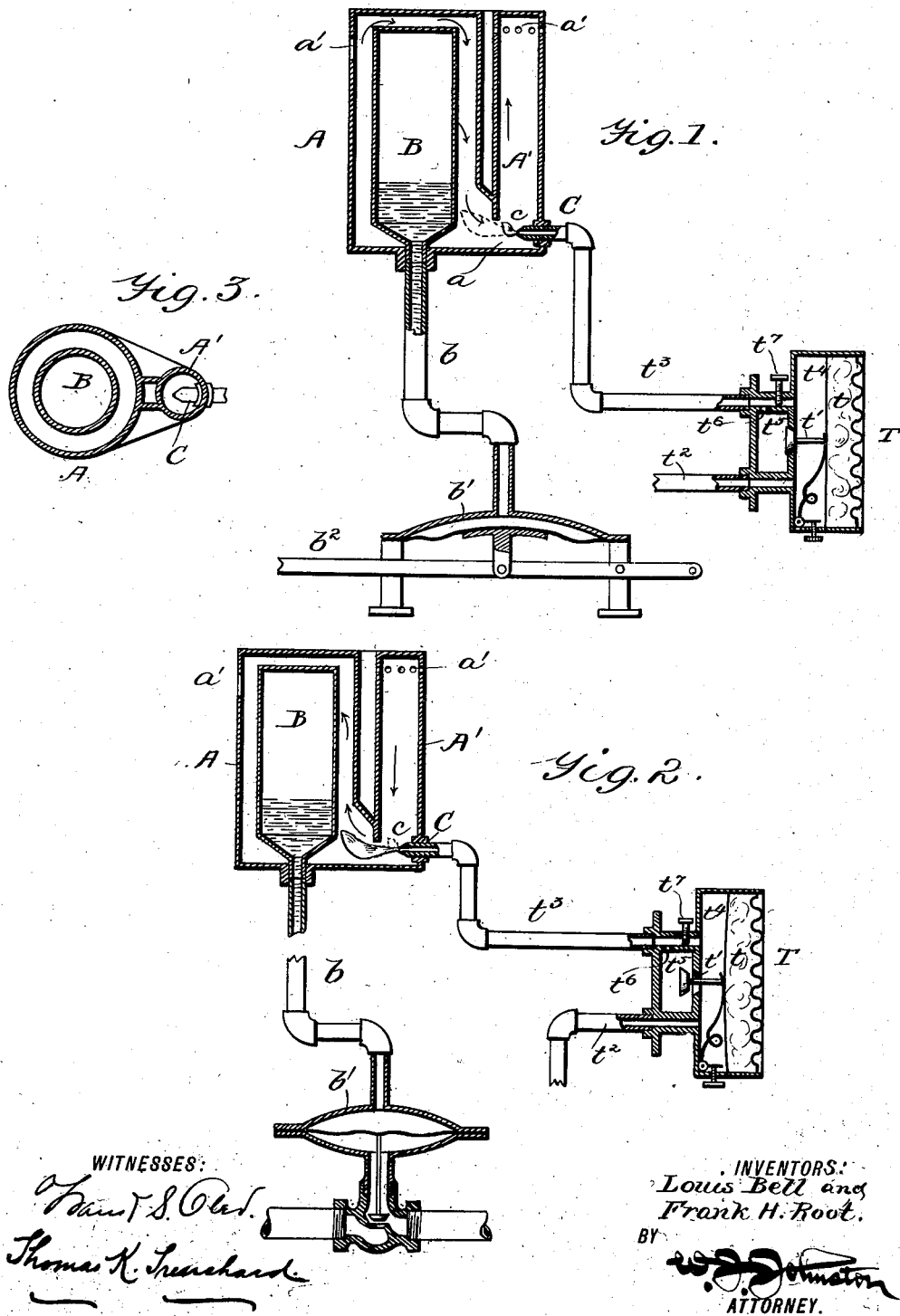


(No Model.)

L. BELL & F. H. ROOT.
VAPOR TENSION CONTROLLER.

No. 455,382.

Patented July 7, 1891.



UNITED STATES PATENT OFFICE.

LOUIS BELL AND FRANK H. ROOT, OF CHICAGO, ILLINOIS.

VAPOR-TENSION CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 455,382, dated July 7, 1891.

Application filed September 5, 1890. Serial No. 364,064. (No model.)

To all whom it may concern:

Be it known that we, LOUIS BELL and FRANK H. ROOT, citizens of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vapor-Tension Controllers, of which the following is a specification.

Our invention relates to mechanism for controlling the tension of a confined fluid similar to those shown and described in our applications, Serial No. 336,945, filed January 14, 1890, and Serial No. 368,420, filed October 17, 1890. As here shown and described it is made a part of an automatic apparatus for controlling a fluid-passage.

In general terms the invention consists of two chambers communicating with each other at one point and both having openings into the atmosphere, in combination with a flame located at or near the opening between the chambers in such a manner that when the flame is small it is entirely within one of the chambers, but when large it extends into the other chamber. As the heated air from the flame rises the chamber which the flame is in determines the direction of a draft of air through the two chambers, and accordingly which one of the two chambers the heated air from the flame will pass through. In one of the chambers a sealed cylinder containing a volatile fluid is placed, and the tension of this fluid is controlled by varying the size of the flame, as will appear hereinafter. This tension or pressure of the fluid may be utilized for doing any kind of work. It is here to be described as the means for opening and closing a valve.

In the accompanying drawings, Figure 1 represents an apparatus embodying our invention, shown partly in section and partly in elevation. Fig. 2 represents the same apparatus, showing a different method of applying power; and Fig. 3 is a horizontal section of the draft-chambers.

A and A' represent two chambers communicating with each other through a passage *a*, which is located at the ends of the chambers. The chamber A contains a sealed cylinder B, in which is placed a certain quantity of highly-volatile liquid, such as ether.

At C is placed a gas-jet *c*, which enters

through the wall of chamber A', and extends to within a short distance and directly in front of the opening *a*, so that the end of the jet will be wholly within the chamber A'.

At the upper ends of both chambers A A' or, rather, at the end opposite the opening *a*, perforations *a'* are made to admit the external atmosphere.

T represents a thermostat comprising a chamber *t*, in which is confined a highly volatile fluid. The inner wall of the chamber is movable under the pressure of the vapor. It is connected with a valve *t'*, which controls a passage between a gas-supply *t²* and a pipe *t³*, leading to the gas-jet *c*. The gas from supply-pipe *t²* passes first into a chamber *t⁴*, thence through the valve opening into a chamber *t⁵*, thence through an opening *t⁶* into the pipe *t³*. There is also a passage into the pipe *t³* directly from chamber *t⁴*, as shown. This passage is throttled by a valve *t⁷*, so that the quantity of gas flowing into the pipe *t³* from the chamber *t⁴* direct will be just sufficient to maintain a small flame at the jet *c*.

The chamber B may communicate by a passage *b* with a chamber *b'*, one wall of which has a flexible diaphragm, which is connected with a lever *b²* for doing any kind of work; or the said diaphragm may connect with a valve, as shown in Fig. 2.

The operation of the apparatus is as follows: Let us suppose for the sake of illustration that the lever *b²* or the valve in Fig. 2 controls a passage through which fuel in the form of gas or liquid flows to a heating apparatus and that the thermostat T is located in the apartment heated by the said heating apparatus. Now when the temperature of that apartment rises above the normal the tension of the vapor in chamber *t* of the thermostat increases and opens the valve *t'*, thus allowing an increased supply of gas to flow from supply-pipe *t²* into the pipe *t³* and thence to the flame at *c*. This increases the size of the flame and the pressure of the gas drives it through the opening *a* between the chambers A and A', so that the heat from the flame will rise into the chamber A and have the tendency to establish a vacuum in the chamber A', thus setting up a draft in the direction of the arrows, Fig. 2, heating the chamber B, increasing the pressure therein,

and cutting off the supply of fuel to the heating apparatus. When the temperature in the apartment lowers to the normal again, the valve *v*' closes and cuts off the supply of gas, thus reducing the size of the flame until it is so small that it is fully within the chamber A'. The heated air from the flame then rises into the chamber A' and draws cold air through the chamber A in the direction of the arrow shown in Fig. 1. This cools the chamber B, and the consequent reduction of pressure therein allows the valve to open and supply more fuel to the heating apparatus. Thus it is that the draft of air through the chambers is first in one direction and then the other, depending upon the size of the flame at the jet *c*.

Having thus described our invention, we claim—

The combination, with two chambers communicating with each other at their lower ends and opening into the atmosphere at their upper ends, of a burner located adjacent to the opening between the chambers, and means for forcing the flame into one or the other of the chambers, for the purpose set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

LOUIS BELL.
FRANK H. ROOT.

Witnesses as to Louis Bell's signature:

THOMAS K. TRENCHARD,
FRANK S. OBER.

Witnesses as to Frank H. Root's signature:

E. G. LANGFORD,
HENRY C. HANSEN.