

(No Model.)

2 Sheets—Sheet 1.

H. TILDEN & F. S. GUERBER.
Balanced Puppet Valve.

No. 229,341.

Patented June 29, 1880.

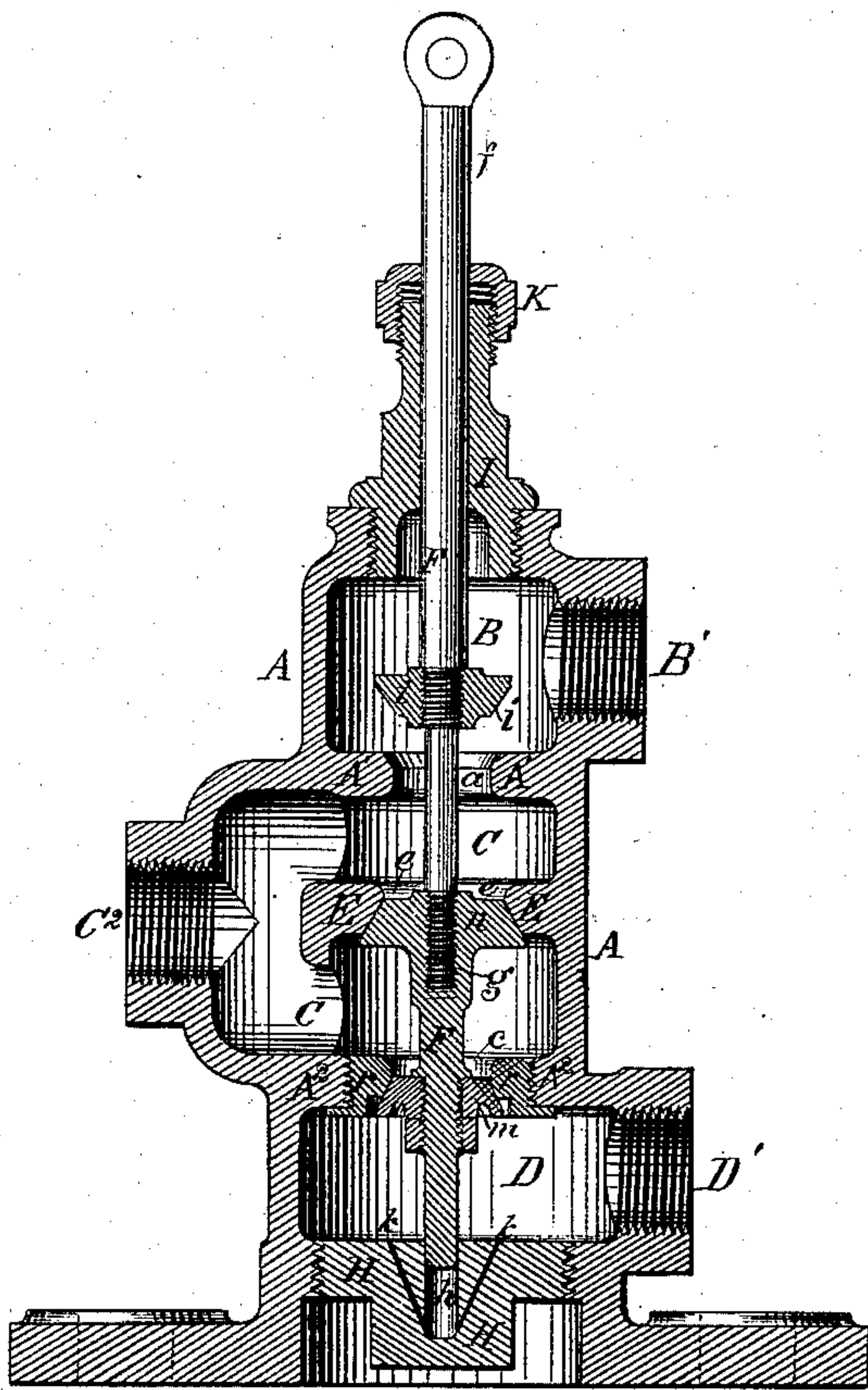


Fig. 1.

Witnesses:
C. L. Parker,
R. H. Whittlesy.

Inventors: Harvey Tilden,
Frederick S. Guerber,
By Attorney, George H. Christy.

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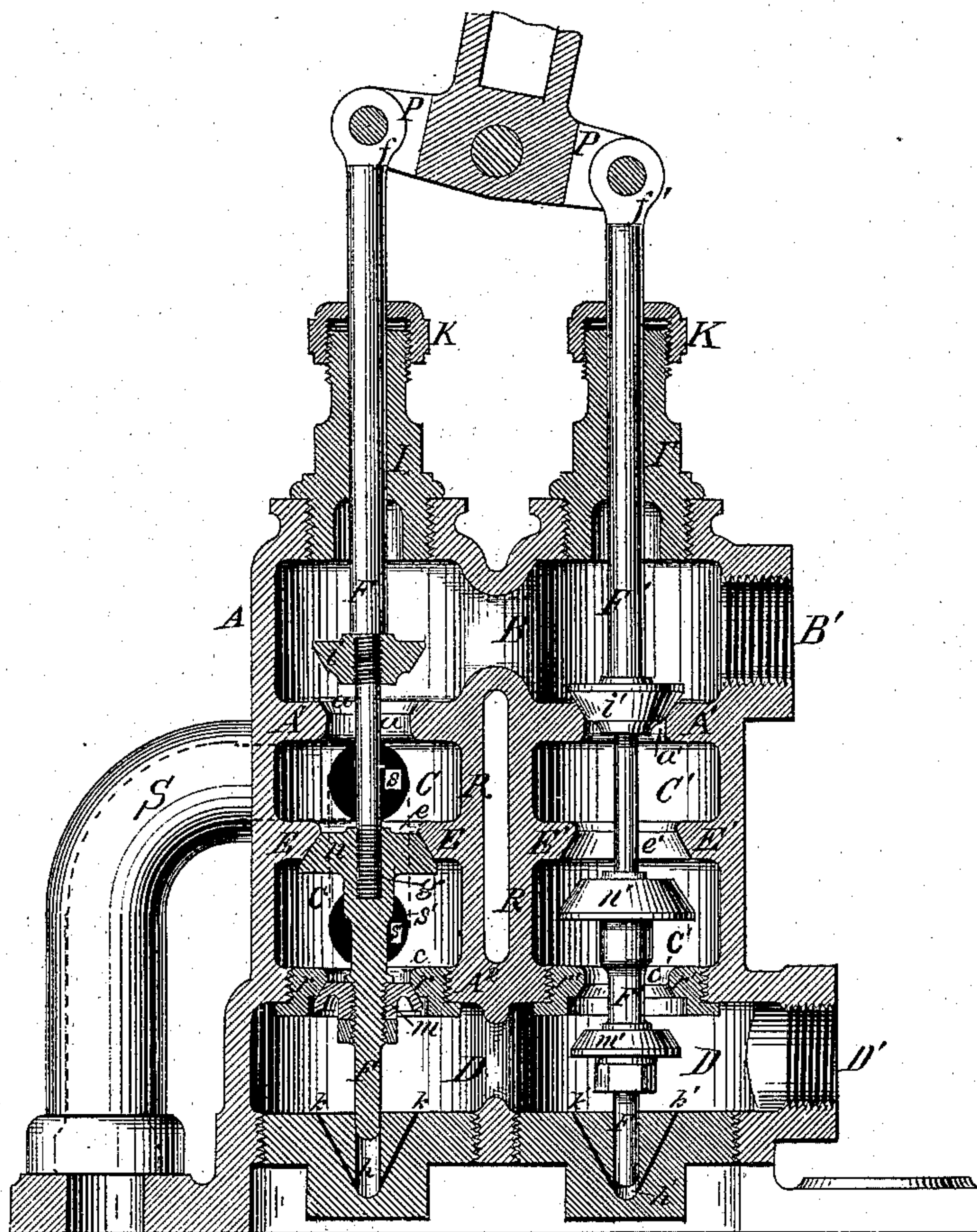


Fig. 2.

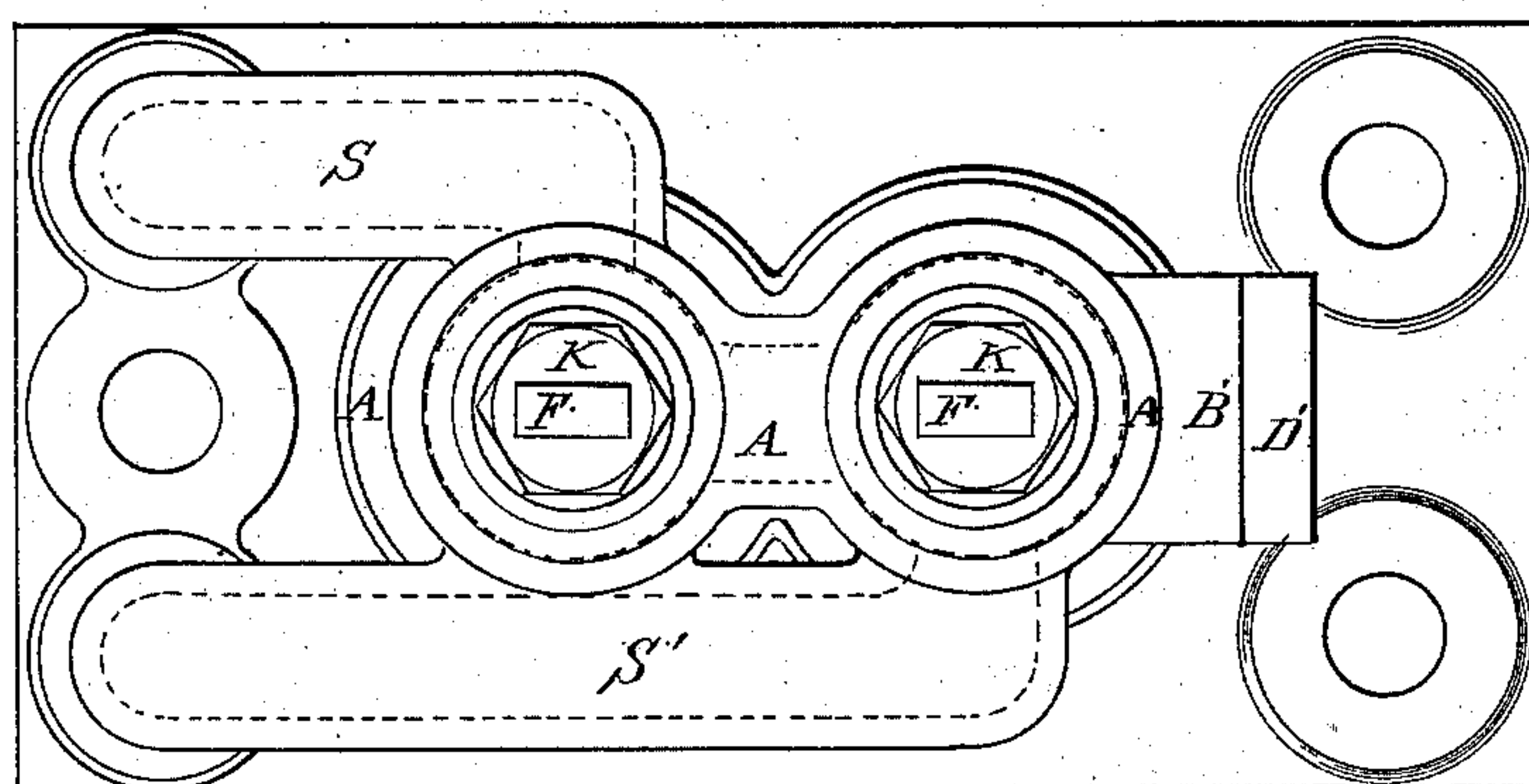


Fig. 3.

Witnesses:
C. L. Parker,
R. A. Whittlesey.

Inventors: Harvey Tilden,
By Attorney, Frederick S. Guerber,
George W. Christy.

UNITED STATES PATENT OFFICE.

HARVEY TILDEN AND FREDERICK S. GUERBER, OF HARRISBURG, PA.

BALANCED PUPPET-VALVE.

SPECIFICATION forming part of Letters Patent No. 229,341, dated June 29, 1880.

Application filed April 14, 1880. (No model.)

To all whom it may concern:

Be it known that we, HARVEY TILDEN and FREDERICK S. GUERBER, both of Harrisburg, county of Dauphin, State of Pennsylvania, have invented or discovered a new and useful Improvement in Balanced Puppet-Valves; and we do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a vertical sectional view of our improved valve and its case. Fig. 2 is a similar view, showing an arrangement of two of our balanced valves in a compound or duplex case; and Fig. 3 is a top-plan view of such double case.

Our invention relates to balanced puppet-valves; and it consists, in general terms, in an arrangement of three such valves upon a common stem, the extreme ones being the inlet and exhaust valves, while the intermediate valve is so arranged, in connection with its chamber or case, that it will operate to balance or counteract the pressure upon the exhaust-valve when seated, and thus prevent the valve from being unseated by such pressure.

Another part of our invention relates to a duplex or double arrangement of our balanced valves in a two-part or compound case, as hereinafter more fully described.

In Fig. 1 of the drawings, A represents a valve-case, the interior of which is divided by diaphragms A' A² into three chambers—an inlet, B, balancing-chamber C, and exhaust D. From chamber B a port, B', leads, by suitable pipe-connections, to the source of fluid-supply, either steam, water, or other fluid. From C a port, C², leads to the engine or other place of use, and from exhaust D a port, D', affords discharge. Also, ports *a* and *c* in the partition-diaphragms A' A² afford communication between chambers B C and C D. We also make in chamber C a false diaphragm or valve-seat, E, through which is an opening, *e*, in line with ports *a* and *c*. A common valve-stem, F, extends through the length of the case A, passing through ports *a c e*, the lower end being guided in a recess, *h*, made in the inner face of the end nut or plug, H, while the other end of the stem protrudes from the case,

as at *f*, by passing through the end nut, I, and a stuffing-box, K, which latter may be of any suitable construction.

Vents *k*, leading from the base of recess *h* to the inner surface of nut H, prevent confinement of fluid in the base of the recess, which, unless allowed to escape, might interfere with the proper working of the valve-stem. On this stem, within the chamber B, is secured a puppet-valve, *i*, which is adapted to seat upon the port *a* and close the same, and so cut off the inlet-supply from chamber C, or, by unseating, to open such communication. Also, a similar valve, *m*, is secured on this common stem at such distance from valve *i* that it may operate or move within exhaust-chamber D and be seated upon and close port *c* from the exhaust side when valve *i* is open or unseated, and when inlet-valve *i* is in turn seated this exhaust-valve will be open. Between these valves *i* and *m* we arrange on the common stem, and within chamber C, a puppet-valve, *n*, the function of which is to balance or counteract the fluid-pressure upon the exhaust-valve *m* when it is seated, and thereby prevent the premature opening of the exhaust. This we accomplish by arranging valves *m* and *n* at such distance apart that when valve *m* is seated *n* will also be seated against the under side of E or its opening *e*. By thus seating valve *n* a part of its upper face or surface will be covered and relieved from fluid-pressure by the seat, and by properly proportioning the sizes of opening *e* and of valve *n* the fluid-pressure upon the under side of *n* (its fully-exposed side) will be equal to the fluid-pressure on its upper side (its partially-covered side) plus the pressure upon the inner face of valve *m*. There will then be no tendency to unseat valve *m* by fluid-pressure, and to that extent the valves may be said to be balanced. This being the case, outside pressure or force must be employed to unseat the exhaust-valve. Also, when inlet-valve *i* is seated the inflow pressure will hold it to its seat until outside impulse removes or unseats it.

For convenience in construction we have shown the stem F made in two parts, with a screw-socket connection, as at *g*; but it may be made in one piece if preferred. When the valve *i* is open a continuous passage is afforded

from ports B' to C², the escape *c* being closed; and when valve *i* is seated a continuous escape from C² to D' is afforded.

We have shown the seat of valve *m* made on a rim or bushing, *r*, which is screwed into the threaded opening in diaphragm A². By this means the seat, as well as its valve, may be accurately turned and fitted, and then put in place, and also a large opening is thereby obtained through diaphragm A² for fitting the seat E of the balancing-valve. The same construction may be followed in the seat for valve *i*, if desired.

In Figs. 2 and 3 we have illustrated two of our improved balanced valves arranged in one case and connected in such way that when one opens its inlet and closes its exhaust the other shall close its inlet and open its exhaust, and thus passage is alternately opened from a common inlet-chamber to either one of two pipes leading to the place of use, while the other pipe is opened to the exhaust, and also so that any excess of pressure which may hold one inlet-valve to its seat will also be operative to hold to its seat the exhaust-valve on the other stem, and thereby the operation of the valves be made more uniform. In this arrangement we make a case, A, having a common inlet-port and chamber, B B', a common exhaust-port and chamber, D D', and two separate intermediate chambers, C C', which are divided from each other by the partition R.

Ports *a* and *a'* give passage from chamber B to the respective chambers C C', while *c* *c'* give passage from C C' to D.

Valve-stems F F', carrying inlet-valves *i* *i'*, exhaust-valves *m* *m'*, and balancing-valves *n* *n'*, are arranged in the respective chambers, substantially as before described, though instead of leaving a passage at one side of the diaphragms E E' within the chambers C C' we extend the same across the chambers and provide openings or passages *s* *s'* above and below, which give intercommunication between the upper and lower parts of the chambers outside of the diaphragms or valve-seats.

Two separate outflow-pipes, S S', are provided, (see Fig. 3,) one, S, leading from the chamber C, or from one or both of its openings *s* *s'*, while the other, S', leads in like manner from the chamber C'. These separate pipes may discharge in a cylinder on opposite sides of a piston, or may lead to other place of use.

The protruding ends *f* *f'* of the two valve-stems are coupled together by a pivoted lever, P, or by equivalent link-connection, so that a movement of either stem in one direction will necessitate a movement of the other stem in the opposite direction, and the operation of one set of valves will assist in the reverse operation of the other; also, as the inlet-port *a* of chamber C is opened and its exhaust-port *e* is closed the inlet-port *a'* of chamber C' will be closed and its exhaust-port *e'* opened, and vice versa. Thus the outlet-pipes S S' will each, in turn, become pressure and exhaust pipes alternately.

Individually considered the pressure on the exhaust-valves, when seated, is balanced by their respective balancing-valves *n* *n'*, as before described; but by means of the coupling P between the valve-stems the excess of fluid-pressure which holds either inlet-valve, as the case may be, to its seat will also be operative in holding the exhaust-valve on the other stem to its seat until both are removed by a common impulse, which may be communicated by hand or by gearing from an engine. Thus substantially a uniform power will be required to open both the inlet and exhaust ports, and uniformity of action be thereby secured.

Our improved valve, either in its single or double arrangement, may be used in an apparatus where steam, gas, or liquids are employed for imparting motive power.

We claim herein as our invention—

1. In combination with a valve-case the interior of which is divided into three separate chambers, with communicating ports between the chambers, and an inlet or outlet port for each chamber, a common valve-stem, F, extending through such chambers and carrying thereon a puppet-valve, *i*, arranged to operate in the inlet-chamber and open and close the port *a*, a similar valve, *m*, arranged to operate in the exhaust-chamber, and by taking its seat to close port *c* when the inlet is opened, and a balancing-valve, *n*, arranged to seat upon a ported diaphragm, E, within the chamber C when valve *m* is seated, and by an excess of exposed surface on one of its faces counterbalance the fluid-pressure on valve *m*, substantially as set forth.

2. The combination of case A, having valve-chambers B, C, and D therein, valve-stem F, passing through such chambers, puppet-valves *i* and *m*, carried on such stem, and adapted to open and close communication between the chambers, as described, valve-seat E within chamber C, with communication outside the seat between its sides, and balancing puppet-valve *n*, carried on stem F, arranged to take its seat E when valve *m* is seated, and adapted, by lessening its exposed surface on its seating-face, to counterbalance the fluid-pressure tending to unseat valve *m*, substantially as set forth.

3. A valve-case having therein an inlet-valve chamber, an exhaust-valve chamber, and two separate balancing-valve chambers between the inlet and exhaust, in combination with valve-stems F F', having inlet, exhaust, and balancing valves arranged on each stem, and adapted to operate as described, and pivoted lever-connection P between such stems, substantially as and for the purposes set forth.

In testimony whereof we have hereunto set our hands.

HARVEY TILDEN.

FREDERICK S. GUERBER.

Witnesses:

F. K. BOA,

EUGENE SNYDER.