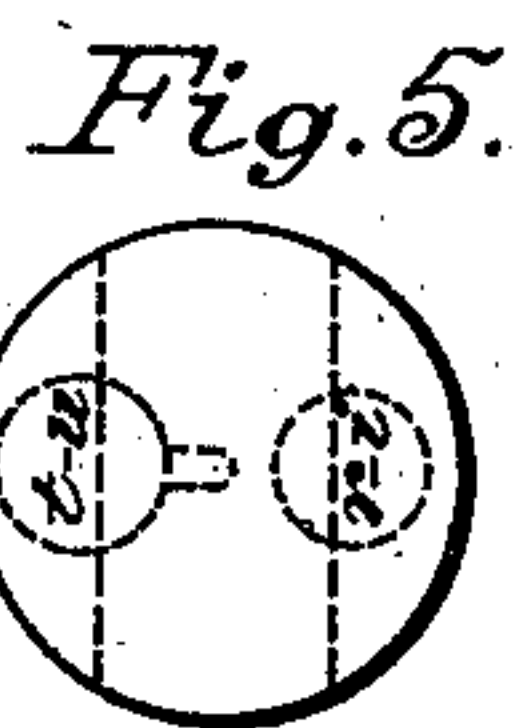
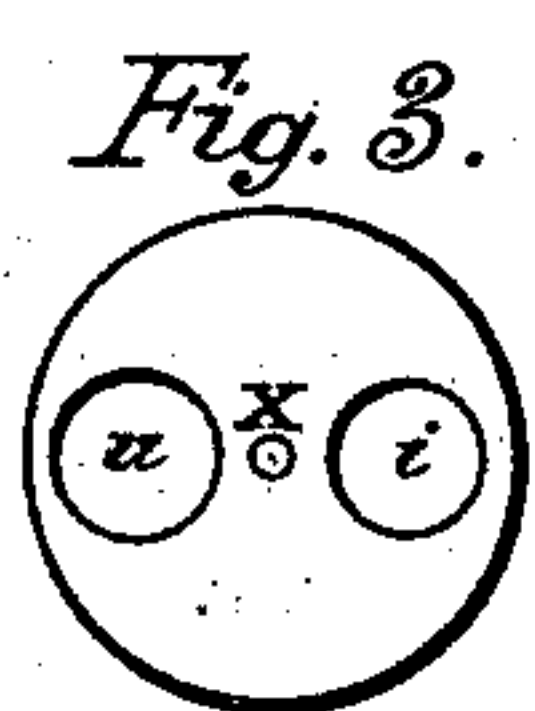
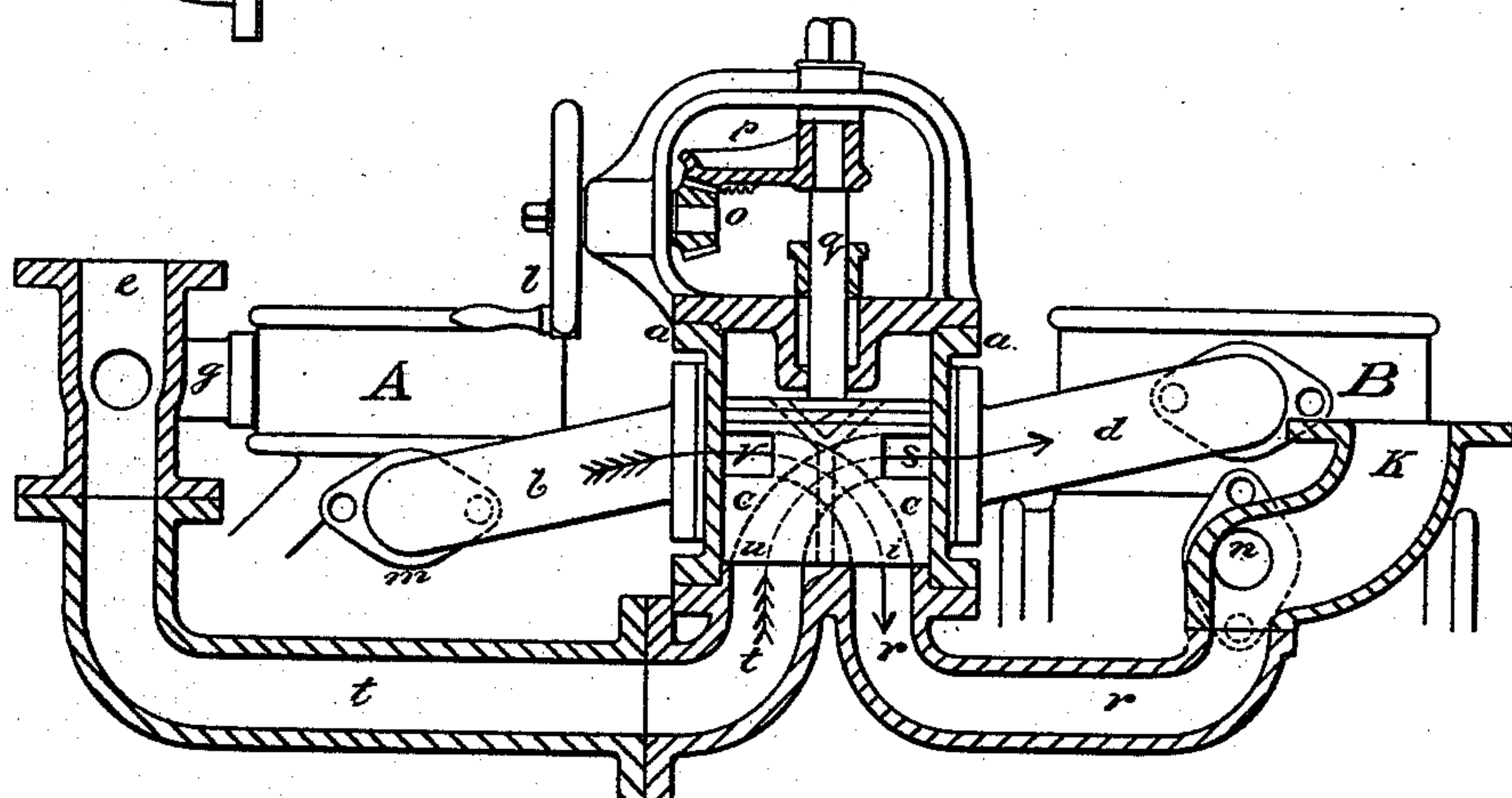
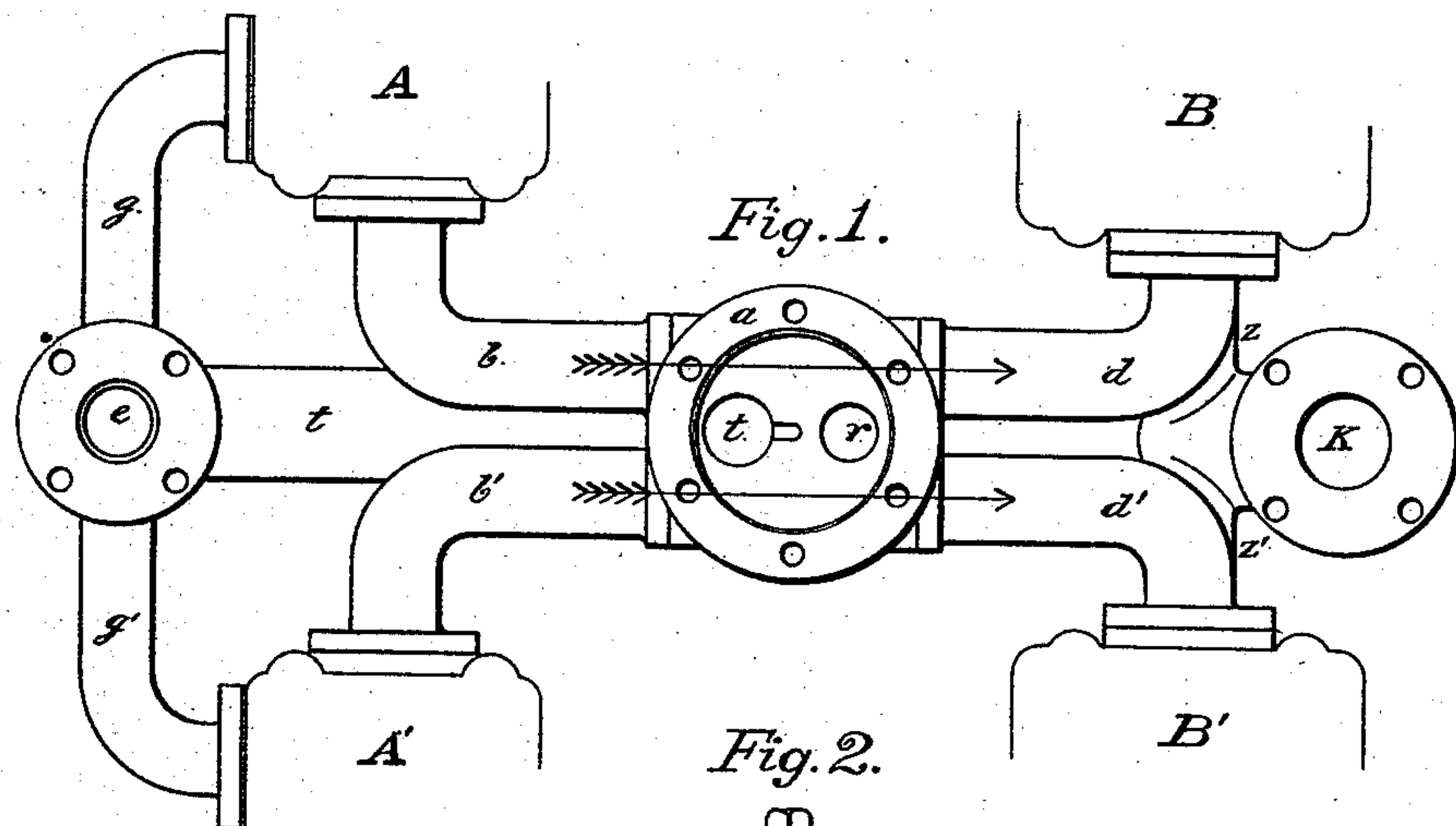


(No Model.)

C. P. DEANE.  
STEAM ENGINE.

No. 413,711.

Patented Oct. 29, 1889.



Witnesses:

Lewis E. Bellows  
Arthur G. Hoffman

Inventor:

Charles P. Deane



# UNITED STATES PATENT OFFICE.

CHARLES P. DEANE, OF SPRINGFIELD, MASSACHUSETTS.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 413,711, dated October 29, 1889.

Application filed February 18, 1889. Serial No. 300,218. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES P. DEANE, of Springfield, in the State of Massachusetts, have invented a new and useful Improvement in Steam-Engines, of the kind known as "compound direct-acting;" and the following is an exact description of the same, reference being had to the accompanying drawings, and to letters of reference thereon, forming a part of this specification.

My invention consists in a new and improved construction and arrangement, hereinafter described, of what I call a "switching-valve," with the connecting and main steam and exhaust pipes and the cylinders of a compound direct-acting engine, whereby such engine (in which, as is well known, the exhaust-steam from the smaller or high-pressure cylinder, instead of passing directly to the open air is carried to and actuates the larger or low-pressure cylinder) may be instantly converted into two simple engines, which, though operating in conjunction, are independent, in that each receives its steam directly from the boiler and each exhausts freely to the atmosphere or to a condenser; and the object of my invention is to provide a more simple, direct, and convenient means than hitherto attained of thus largely and immediately increasing, when desirable, the power of such engines, whether single or duplex, the improvement being applicable to either.

Figure 1 is a plan view of the cylindrical shell (shown uncovered) of the switching-valve and the pipes which connect it with the several steam-cylinders and with the main steam and exhaust pipes of a duplex compound direct-acting engine in which my invention is embodied. Fig. 2 is a vertical section of the same. Fig. 3 shows in plan the lower end of the switching-valve with its openings to interior passages for steam. Figs. 4 and 5 indicate the situations in different positions of the valve of the openings therein (shown in Figs. 2 and 3,) relatively to the corresponding openings in the bottom of the valve-shell, which, with its openings, is shown distinctly in Fig. 6.

I describe my invention and its mode of operation as follows:

In Figs. 1 and 2 of the drawings the cylin-

ders (partially outlined in Fig. 2) of the duplex engine indicated, as they and their immediate adjuncts and mode of operation, being well understood, need no specific description here, may be considered as represented by their valve-chests. In the engine here represented the shell *a* of the switching-valve *c* is by the two pipes *b* and *b'* connected with the two smaller or high-pressure cylinders through exhaust-openings below their valve-chests *A* and *A'*, as shown for pipe *b* at *m*, Fig. 2, and by pipes *d* and *d'* is also connected with the two larger or low-pressure cylinders through the sides shown of the valve-chests *B* and *B'*. Of the two pipes shown in section in Fig. 2, pipe *t* connects the said valve-shell with the main steam-inlet *e*, and by branches *g* and *g'* with the two smaller or high-pressure cylinders through their valve-chests *A* and *A'*, as shown, while pipe *r* connects the said shell with the main exhaust-outlet *k*, and by branches *z* and *z'* with the larger or low-pressure cylinders through their exhaust-openings, of which one is shown at *w*, Fig. 2. The switching-valve *c*, Fig. 2, is a solid cylinder, except that on each of two opposite sides a portion of it in form of a segment is removed, the cavities so made and the adjoining sides of the shell forming two chambers *v* and *s*, from each of which, as shown by dotted lines, extends an interior separate passage *u* or *i*, through the valve to its lower end, which, with the openings therein of these passages, (*u* and *i*), is shown by Fig. 3. The openings of the pipes *t* and *r*, Figs. 1 and 6, in the bottom of the valve-shell correspond with the two similar ones in the valve, as shown in Fig. 3. The recess *y*, Fig. 6, and the small opening *x*, Fig. 3, to a corresponding passage through the valve (shown by dotted lines, Fig. 2) allow steam to pass from pipe *t* to the space above the valve to hold it firmly to its seat. The valve, if desired, may be ring-packed, as indicated in Fig. 2, and may be moved, as shown, by a hand-wheel *l*, pinion *o*, and sector *p* of a racked wheel attached to its rod *q*. The position of the valve as shown in Fig. 2 is that given to it when it is desired, as in the emergency of a fire, (where the engine is used for pumping,) to greatly increase the effective power without change of



the boiler-pressure. The openings *u* and *i* in the valve now coincide with *t* and *r* in its seat, as shown in Fig. 5. Direct steam from the boiler received through the main inlet *e* is carried, not only to the smaller cylinder through branches *g* and *g'* and valve-chests A and A', but also to the larger cylinders through pipe *t*, passage *u*, and chamber *s* in the valve, pipes *d* and *d'*, and valve chests B and B', while the exhaust from the smaller cylinders is now carried through pipes *b* and *b'*, the chamber *v* and passage *i* in the valve, and the pipe *r* to the main exhaust-outlet *k*, through which, by connecting branches *z* and *z'*, the exhaust-steam from the larger cylinders passes, with that from the smaller, to the atmosphere or a condenser. A movement of the valve equal to one-quarter of a revolution will immediately restore to the engine its original and usual character. Communication through pipes *t* and *r* will then be cut off, as shown by the relative positions, Fig. 4, of the openings *u* and *i* in the valve and *t* and *r* in its seat. Direct steam will in the same manner as above described be carried to and will actuate the smaller cylinders; but the exhaust-steam therefrom will then pass, as

shown by the arrows in Fig. 1, through pipes *b* and *b'*, chambers *s* and *v* in the valve, and pipes *d* and *d'* to the valve-chests B and B' of the larger and (as they will then be) low-pressure cylinders, and after use therein will be finally exhausted through branches *z* and *z'* and the main outlet *k*, as before described.

I do not claim, broadly, as novel the combination, with the cylinders and main steam and exhaust passages of an engine of the class described, of a valve constructed and arranged for the purpose described.

What I claim, and desire to secure by Letters Patent, is—

In a compound direct-acting steam-engine, single or duplex, the cylindrical rotary switching-valve *c*, constructed as shown and described, and having its chambers *v* *s* and its interior passages *u* *i* arranged as shown with reference to the ports or openings in its shell *a* to and from the pipes *b*, *d*, *t*, and *r*, all substantially as and for the purpose described.

CHARLES P. DEANE.

Witnesses:

GEO. H. DEANE,

JAMES R. WELLS.