

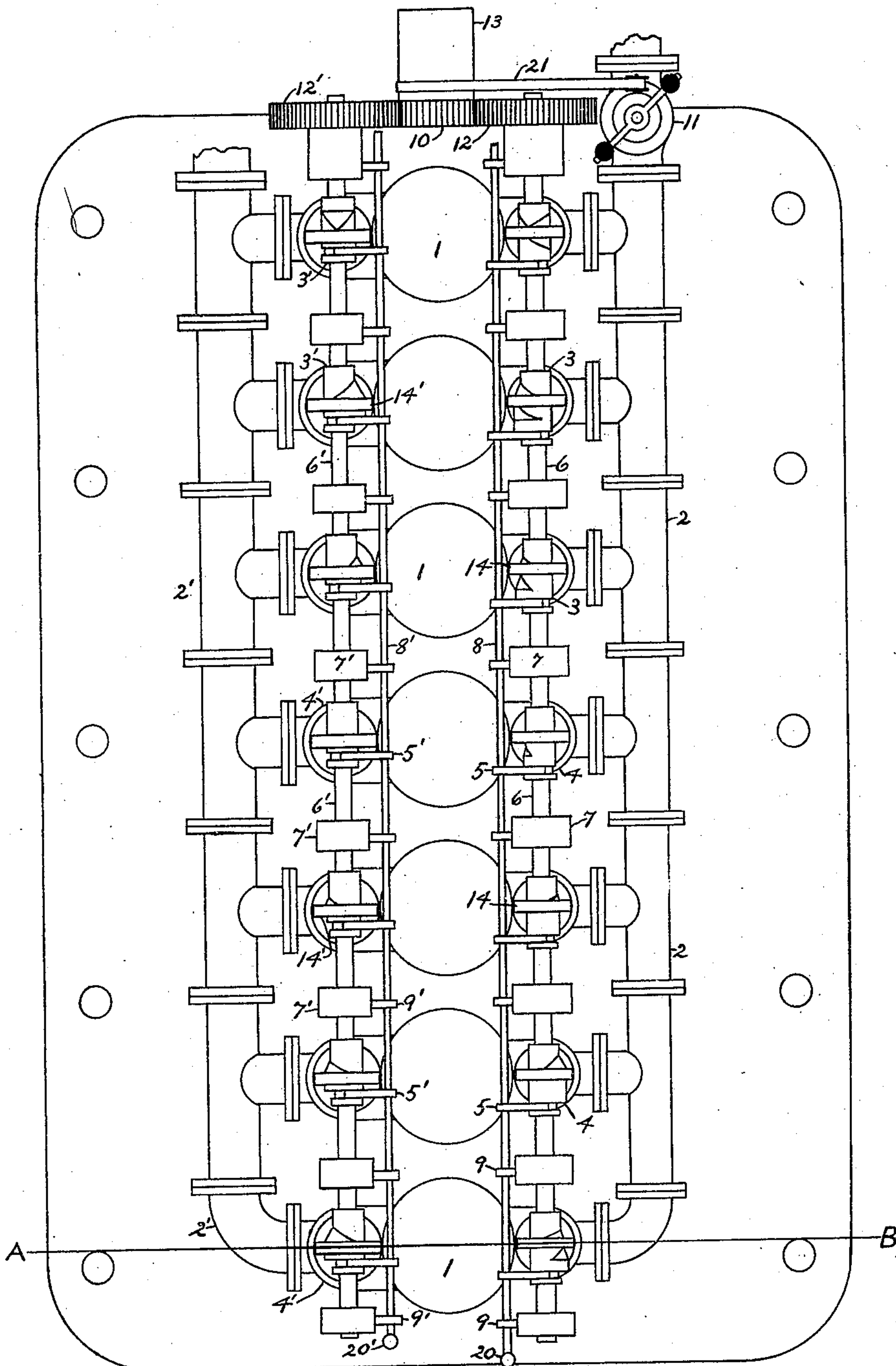
E. F. EDGAR.  
STEAM ENGINE.

APPLICATION FILED APR. 17, 1909.

935,194.

Patented Sept. 28, 1909.

3 SHEETS—SHEET 1.



WITNESSES:

E. B. Edgar.  
J B Edgar

Fig. 1.

INVENTOR

Ellis F Edgar

935,194.

E. F. EDGAR.  
STEAM ENGINE.  
APPLICATION FILED APR. 17, 1909.

Patented Sept. 28, 1909.  
3 SHEETS—SHEET 2.

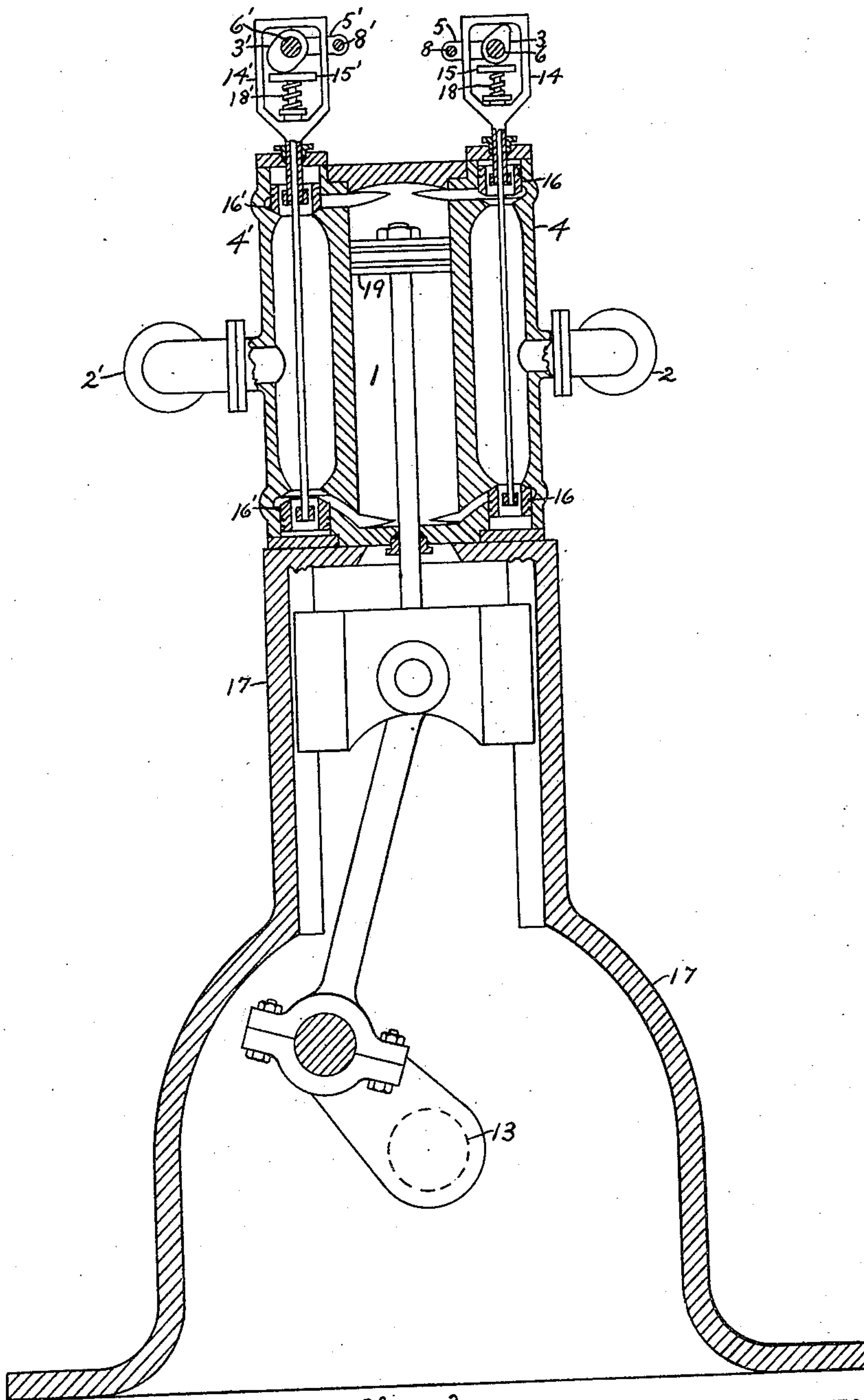


Fig. 2.

WITNESSES:

E. B. Edgar,  
J. B. Edgar

INVENTOR

Ellis F. Edgar

E. F. EDGAR.

STEAM ENGINE.

APPLICATION FILED APR. 17, 1909.

935,194.

Patented Sept. 28, 1909.

3 SHEETS—SHEET 3.

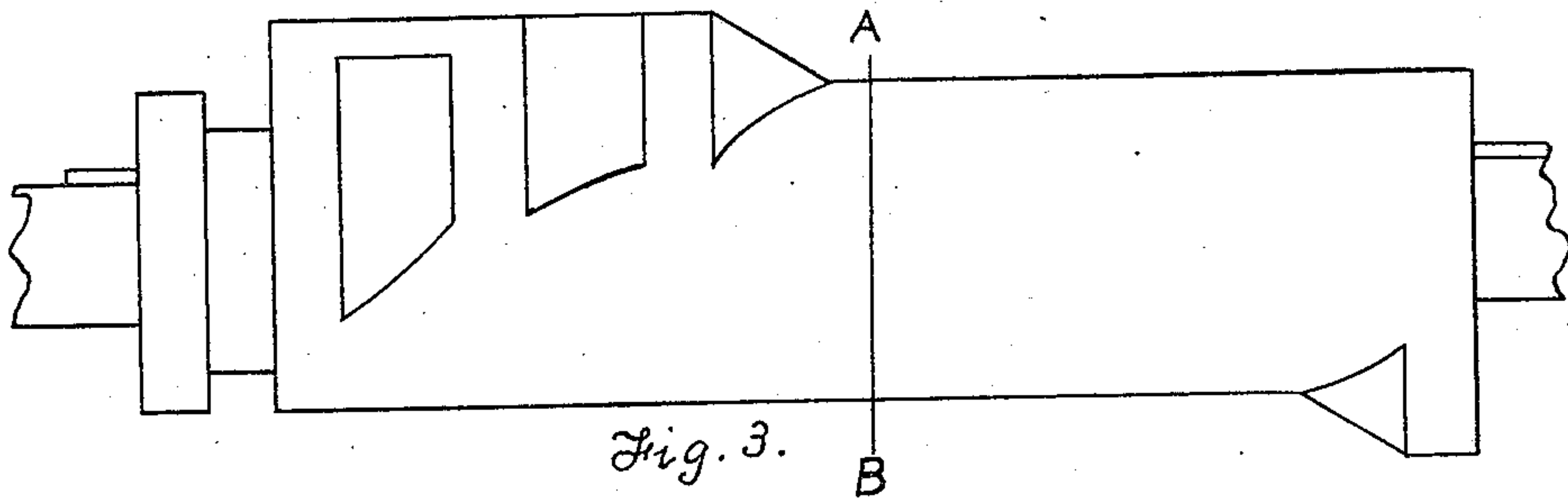


Fig. 3.

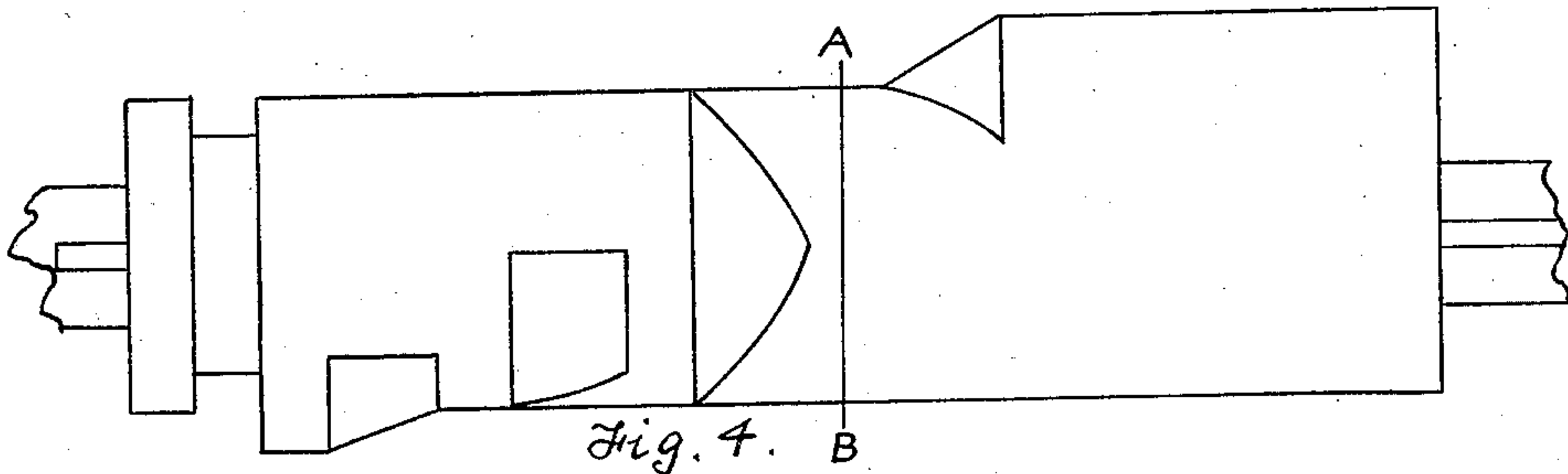


Fig. 4.

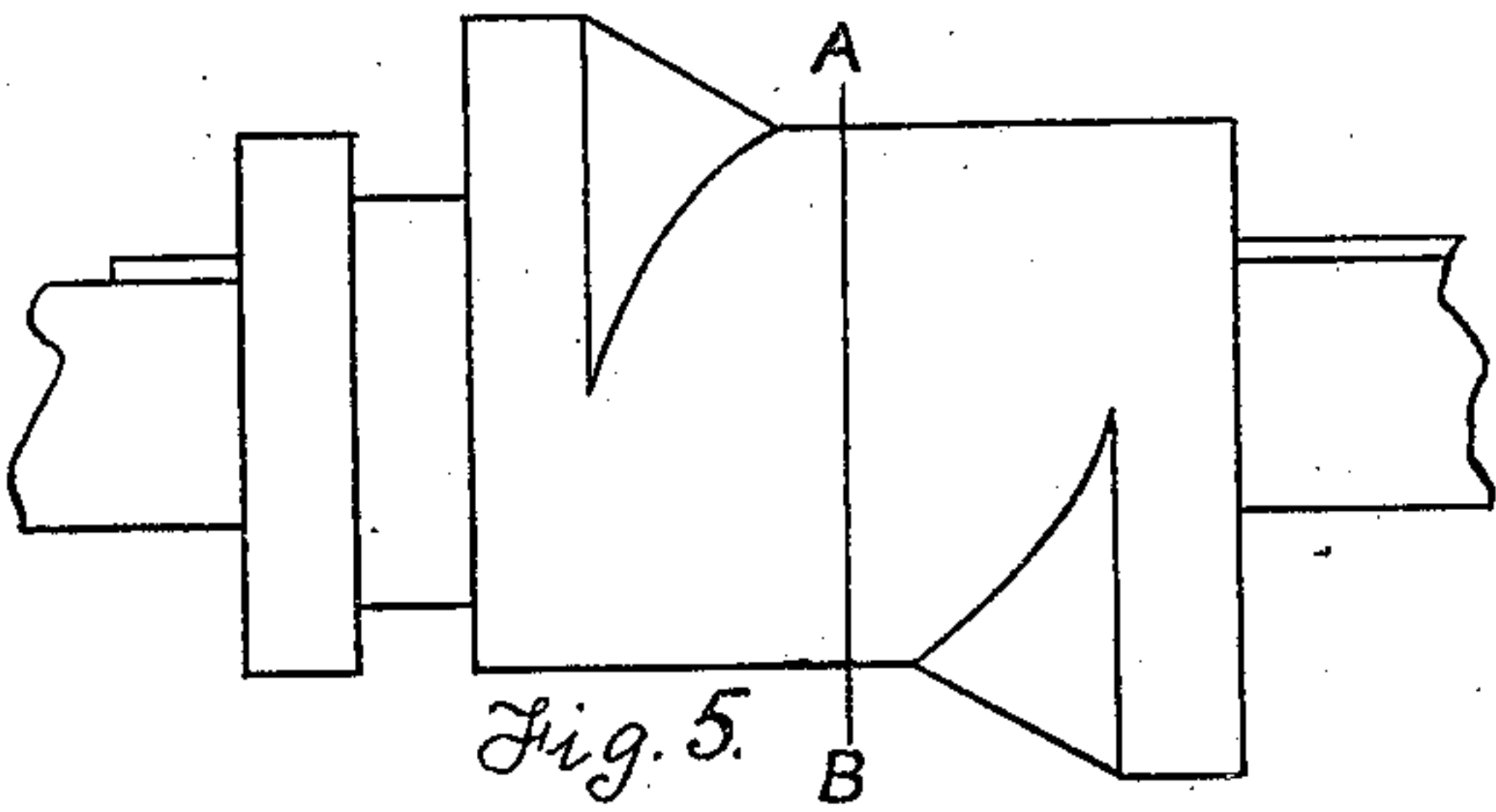


Fig. 5.

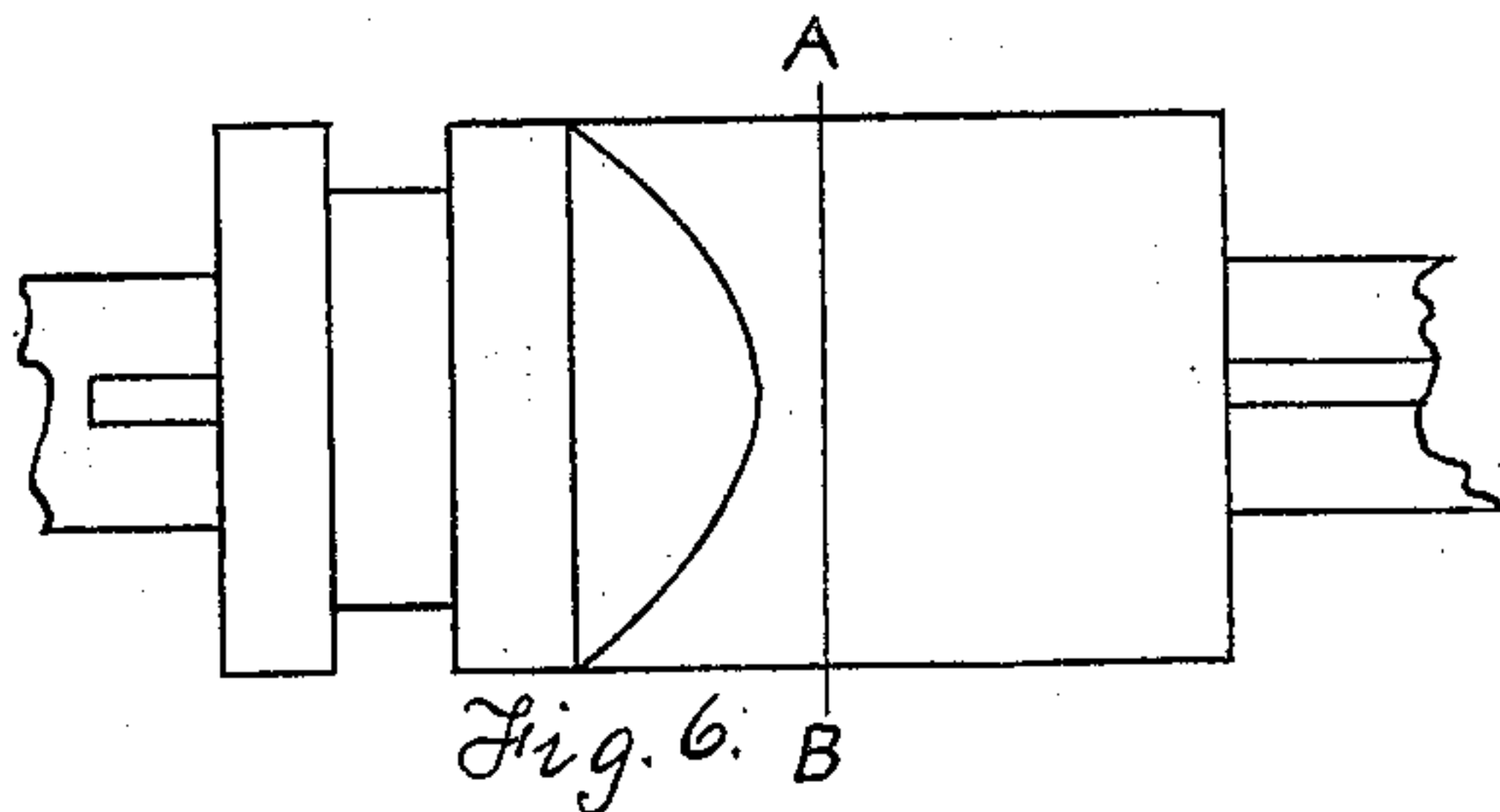


Fig. 6.

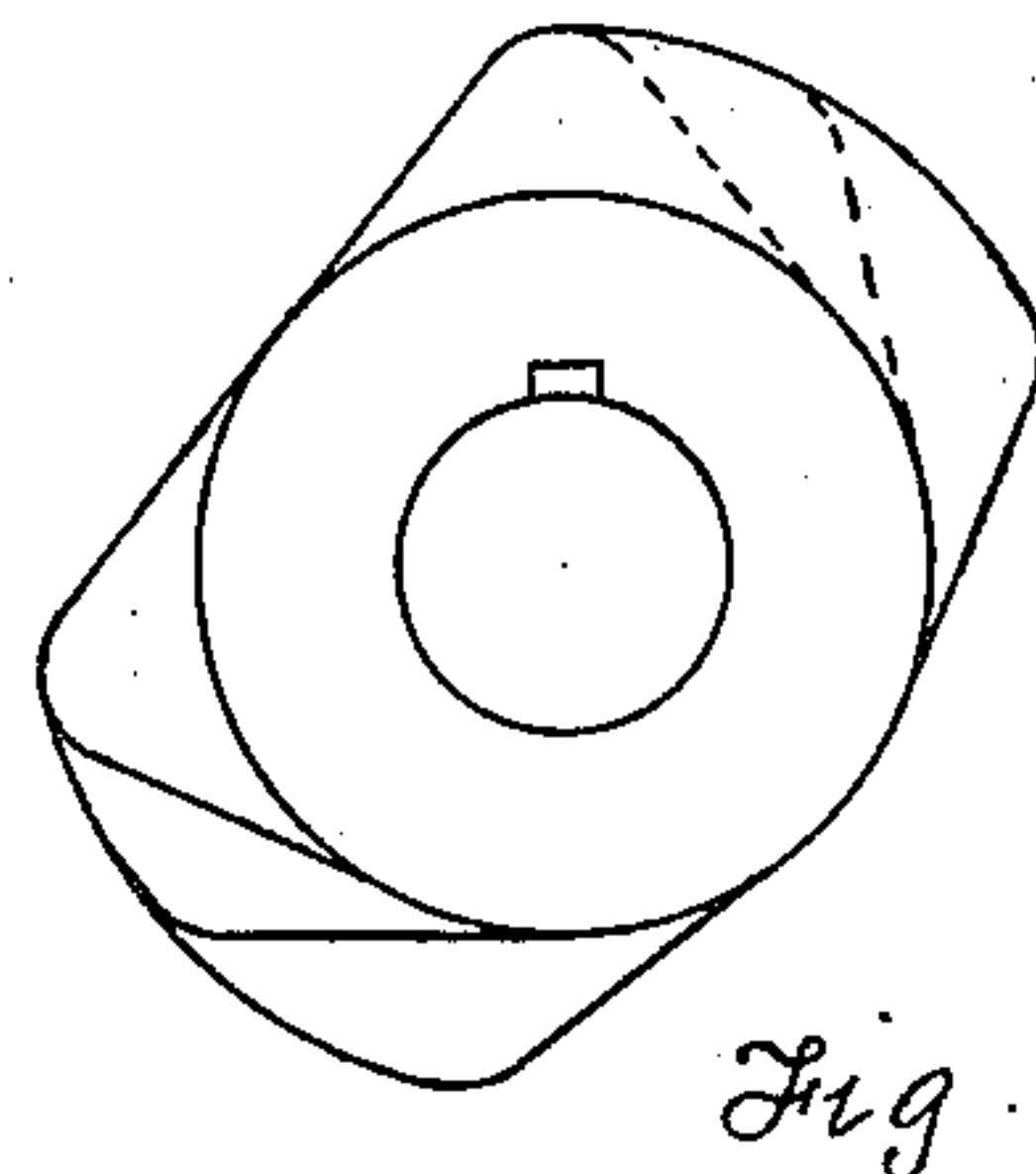


Fig.

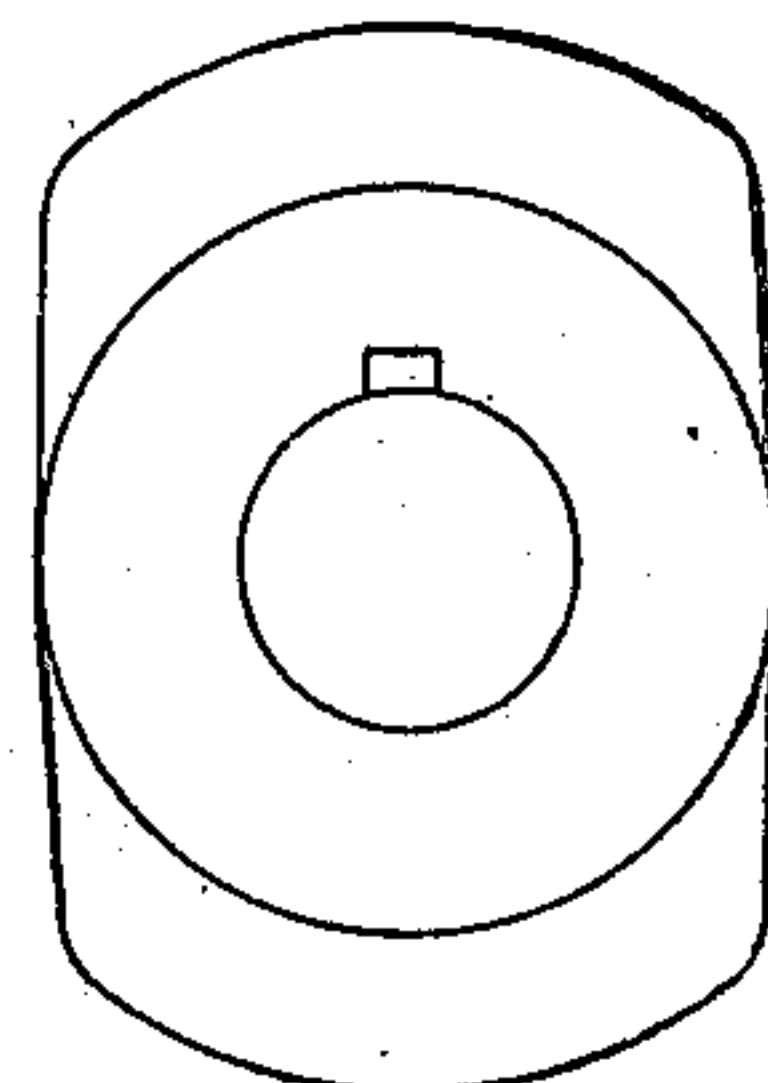


Fig. 8.  
INVENTOR

WITNESSES:

E. B. Edgar.  
J. B. Edgar

Ellis F. Edgar



# UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

## STEAM-ENGINE.

935,194.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed April 17, 1909. Serial No. 490,615.

To all whom it may concern:

Be it known that I, ELLIS F. EDGAR, citizen of the United States, and resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

Figure 1 is a plan view of a seven cylinder engine showing live steam line and exhaust line, multiple cams, multiple cam shafts, ratchets and ratchet shafts, steam governor, end of driving shaft, gear connection from said driving shaft to said multiple cam shafts and belt connection to governor. Fig. 2 is a sectional elevation view through one cylinder at line A—B in Fig. 1. Fig. 3 is a side view of a double acting, reversing multiple cam for use on the live steam valves. Fig. 4 is a plan view of a double acting, reversing multiple cam for use on the live steam valves. Fig. 5 is a side view of a double acting reversing cam for use on the exhaust valves. Fig. 6 is a plan view of a double acting reversing cam for use on the exhaust valves. Fig. 7 is an end view of Fig. 3 and Fig. 4. Fig. 8 is an end view of Fig. 5 and Fig. 6.

I had in view in designing this engine, an engine capable of using steam at a pressure of six hundred to eleven hundred pounds with economy, as I will hereinafter set forth.

*Details of construction.*—1, cylinder; 2, live steam line; 2', exhaust line; 3 multiple cam on live steam valves; 3' cam on exhaust valves; 4 live steam chest; 4' exhaust steam chest; 5 clutch arm on live steam side; 5' clutch arm on exhaust steam side; 6 cam shaft on live steam side; 6' cam shaft on exhaust side; 7 support for cam shaft on live steam side; 7' support for cam shaft on exhaust side; 8 shaft for clutch arms on the live steam side; 8' shaft for clutch arms on the exhaust side; 9 support for clutch arm shaft on the live steam side; 9' support for clutch arm shaft on the exhaust side; 10 gear on driving shaft; 11 steam governor on live steam line; 12 gear to cam shaft on live steam side; 12' gear to cam shaft on exhaust side; 13 driving shaft; 14 combination yoke and female valve stem on live steam side; 14' combination yoke and female valve stem on exhaust side; 15 head of male valve stem on live steam side; 15' head

of male valve stem on exhaust side; 16 puppet valves on live steam side; 16' puppet valves on exhaust side; 17 engine frame; 18 and 18' springs on valve stems; 19 piston in cylinder 1; 20 and 20' connections for operating clutch arm shafts; 21 steam governor belt.

*General description.*—As this engine is designed to use a steam pressure from six hundred to eleven hundred pounds, preferably eleven hundred in order to obtain the highest economy at this pressure, the cylinders must be so designed as to allow for from forty to fifty expansions of the steam, and as I wished the exhaust to be about five pounds going to the condenser, therefore the cylinders must be of considerable length, preferably from three to four times their diameter with a very early cut-off, which necessitates a number of cylinders, preferably six or more of what is known as the double acting reciprocating type and to be driven from fifty to two hundred revolutions per minute. For this pressure puppet valves are necessary and they to be operated by multiple cams so that in starting steam may be let in several cylinders to be able to take full load by cutting off at about one third stroke. As soon as the engine is running the cams may be moved to provide for an earlier cut-off from one twentieth to one thirtieth of the stroke.

In marine work it is very desirable to have an engine that you can reverse its action by the valves. I have provided for this by a double acting reversing multiple cam shown in Figs. 3 and 4, and end view Fig. 7. This cam is of the multiple type and can be constructed with any desired number of cut-offs, the neutral point being at line A—B. The exhaust cam shown in Figs. 5 and 6 and end view Fig. 8, neutral point is at line A—B; these are not multiple only reversing with one cut-off. I could not show these cams properly in Fig. 1, so have shown them in these details to have them more thoroughly understood.

The cylinders and steam chests should be well covered with a dead air cell covering to prevent any loss by radiation and to prevent condensation, and to further safeguard condensation in the cylinder, I would preferably extend my live steam chest 4 around cylinder 1 to exhaust steam chest 4'; puppet valves 16 and 16' are held closed by



springs 18 and 18'. Any condensation in the steam chests would pass through the center of lower puppet valves 16 and 16' to the bottom of the pocket in which they are located from which it may be drawn off through a trap.

I could build this engine in the tandem compound type, but I prefer the multiple cylinders single expansion, as shown. I could get very good results with three or four cylinders and for a cheap engine one cylinder with a large fly wheel similar to gas engine practice could be used, but an early cut-off could not be obtained with desirable results with any sort of a load.

Having described my invention what I claim as new and desire to secure by Letters Patent, is:

1. A steam engine composed of a cylinder of the double acting reciprocating type, having an inlet port and an exhaust port at each end, a balanced cylinder puppet-valve having packing strips thereon and located in pockets at each port, the said valves at one end being connected with the valves at the other end by male and female valve stems terminating in a yoke containing a

multiple cam, all substantially as shown and described and for the purpose set forth.

2. A steam engine composed of six or more cylinders of the double acting reciprocating type, each cylinder having an inlet port and an exhaust port at each end, a balanced cylinder puppet-valve having packing strips thereon and located in pockets at each port, the said valves at one end being connected with the valves at the other end by male and female valve stems terminating in a yoke containing a multiple cam of such a design whereby in starting steam is admitted to all of the cylinders simultaneously and when the engine is running steam may be admitted to each cylinder independently and successively and cut off at any desired point, all substantially as shown and described for the purpose set forth.

Signed at New York in the county of New York and State of New York this 15th day of April A. D. 1909.

ELLIS F. EDGAR.

Witnesses:

E. B. EDGAR,  
J. B. EDGAR.