

(No Model.)

2 Sheets—Sheet 1.

F. W. DODD.
SINGLE ACTING STEAM ENGINE.

No. 405,150.

Patented June 11, 1889.

Fig. 2

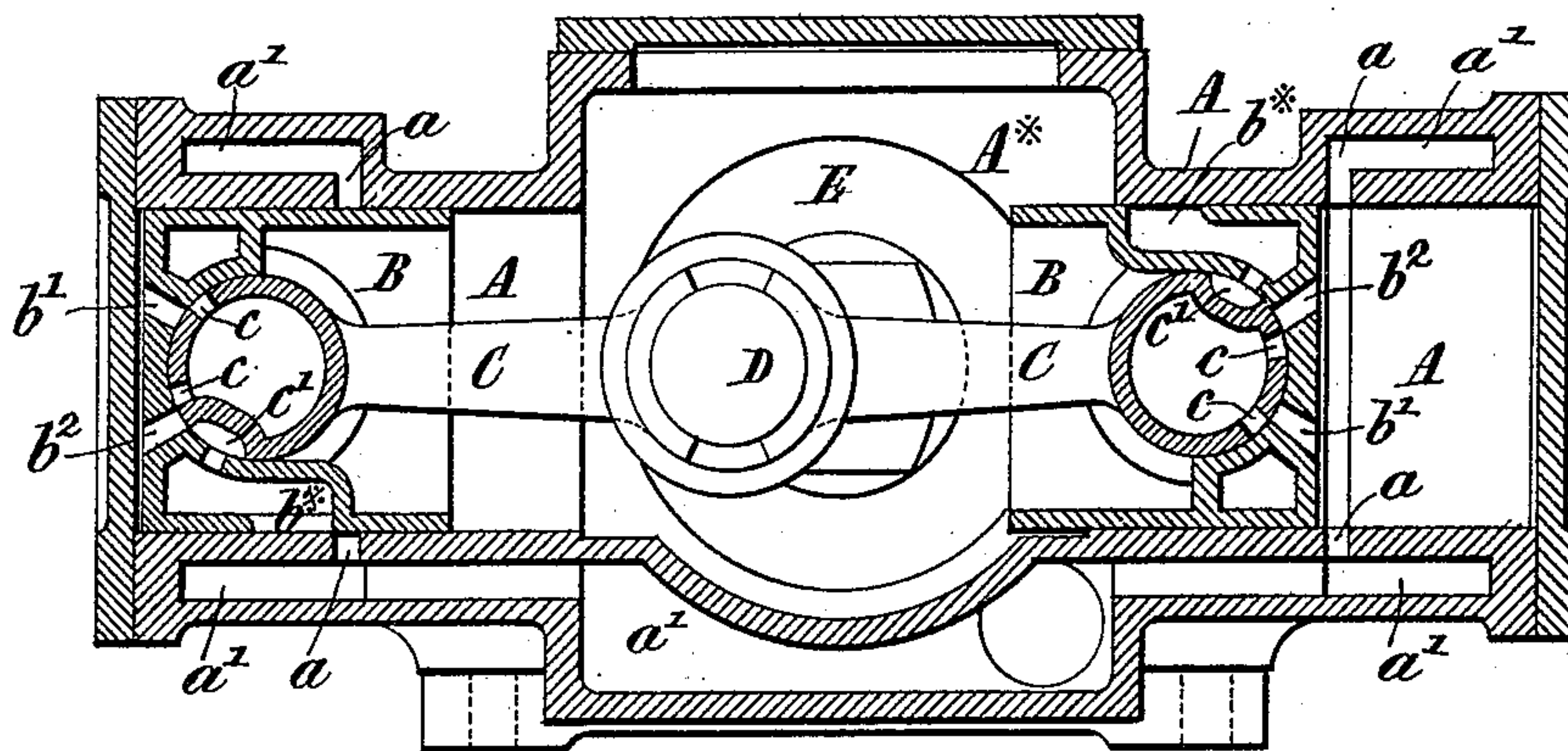
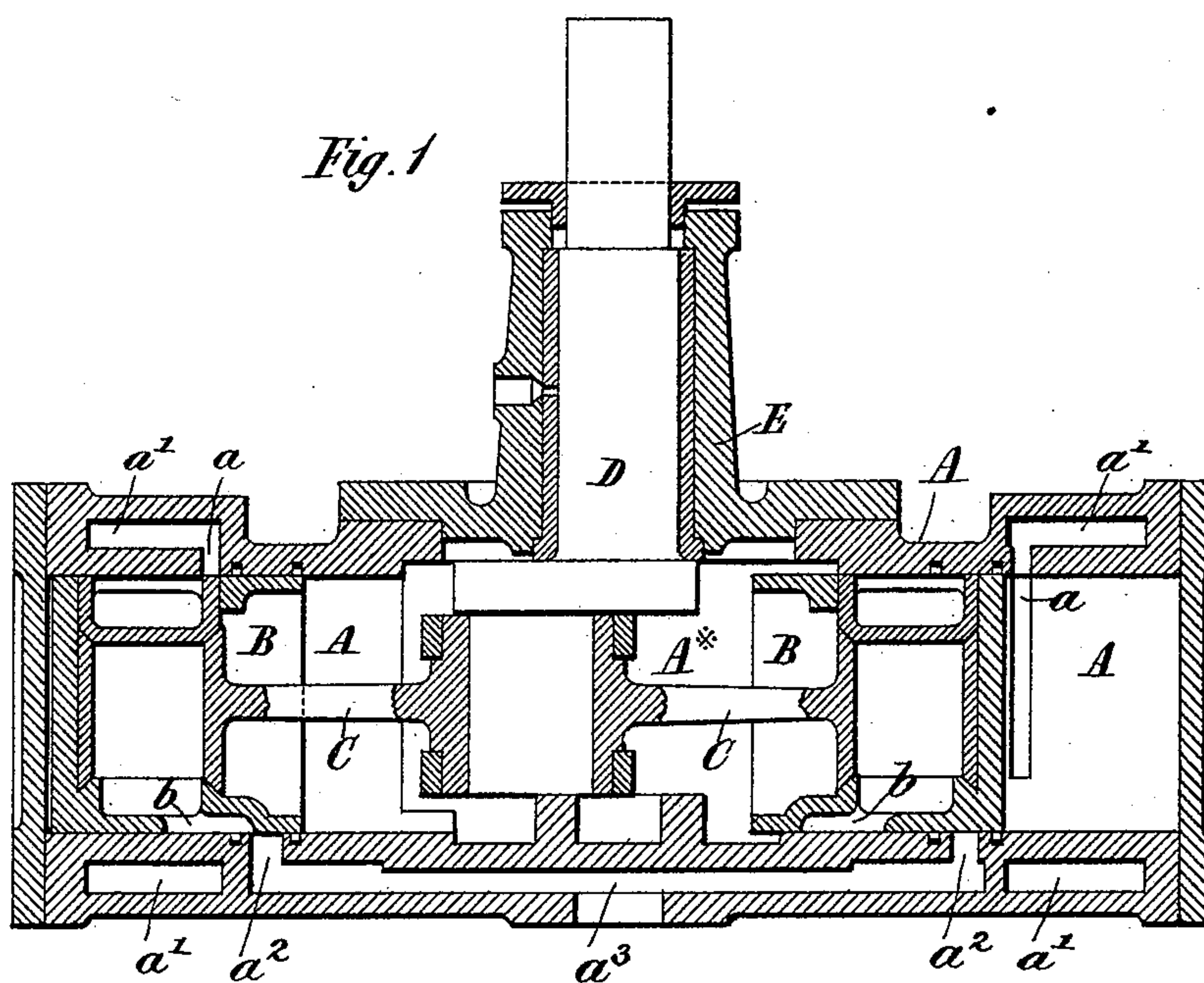


Fig. 1



Witnesses:

Wm. Norton
E. D. Tracy

Inventor:

Frank William Dodd
By E. S. Clark
att'y

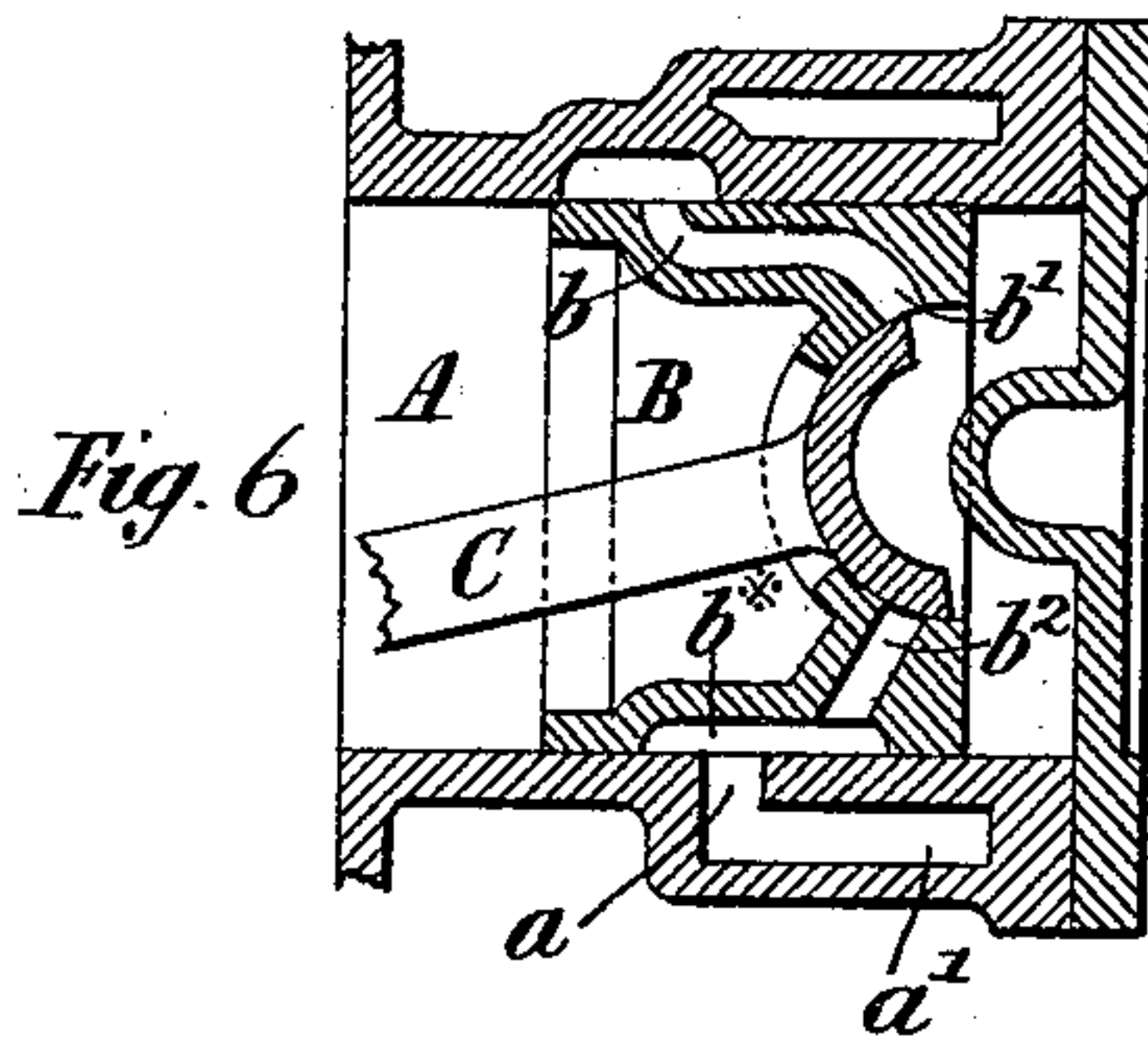
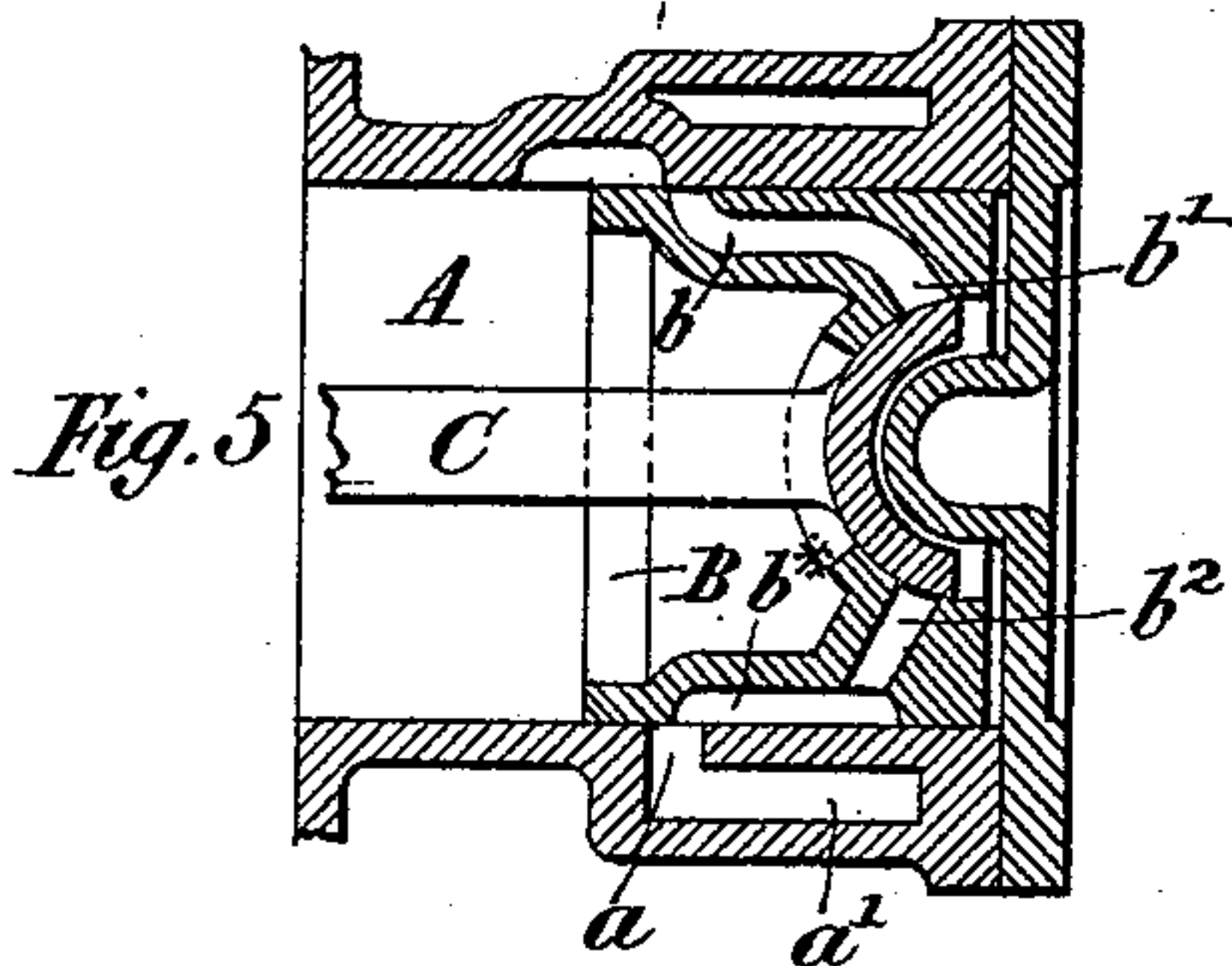
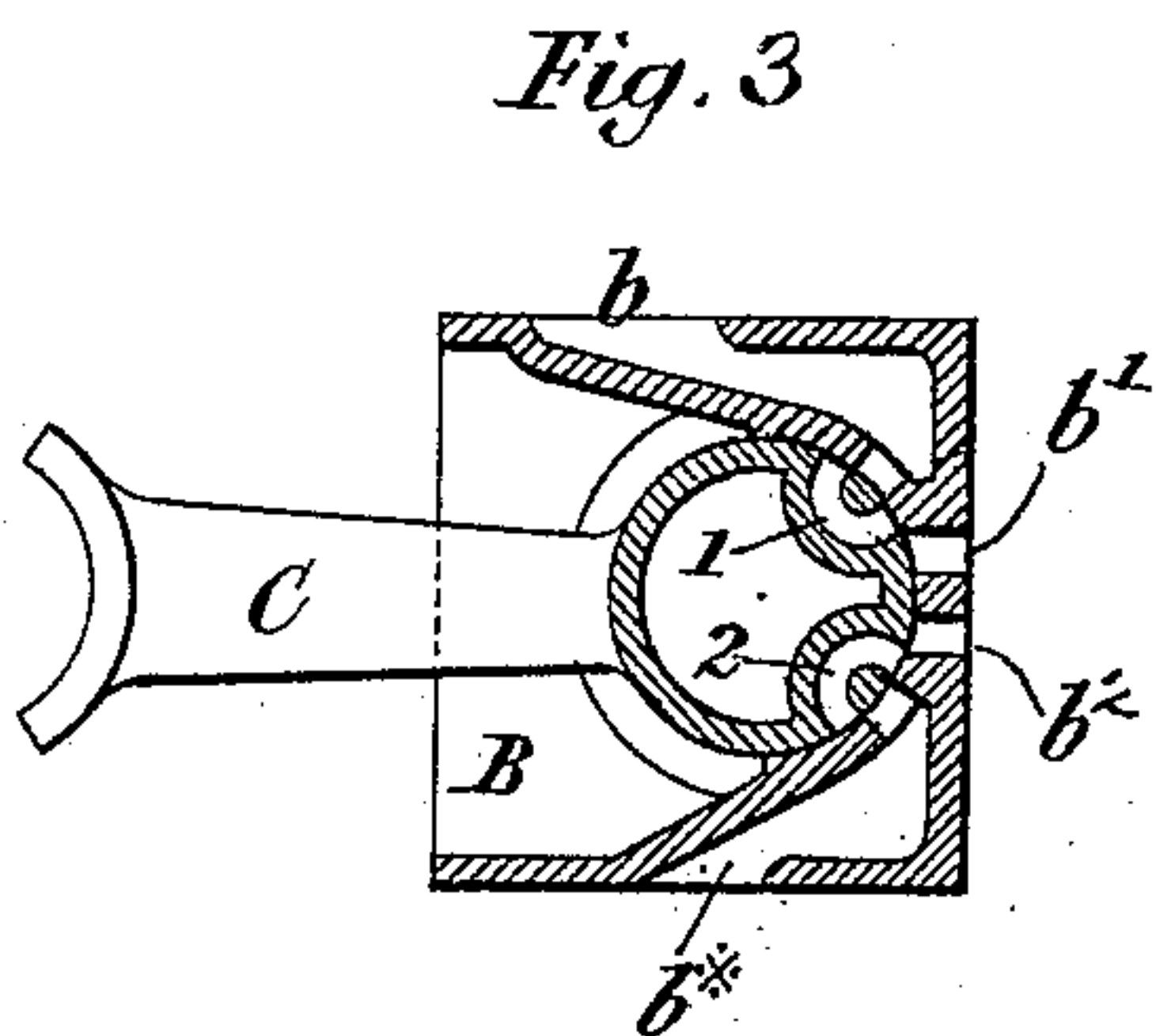
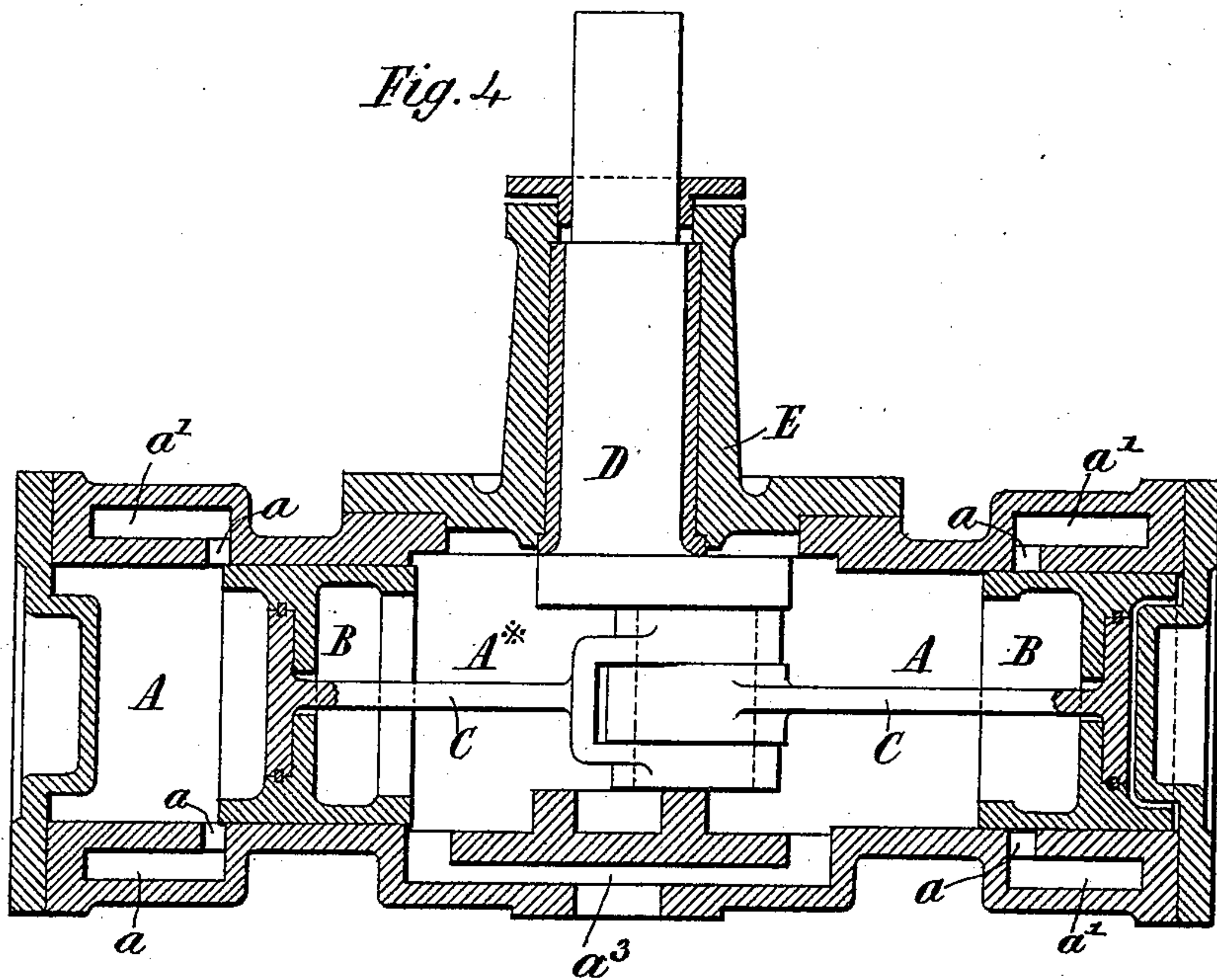
(No Model.)

2 Sheets—Sheet 2.

F. W. DODD.
SINGLE ACTING STEAM ENGINE.

No. 405,150.

Patented June 11, 1889.



Witnesses:

Will. J. Norton
E. D. Tracy

Inventor:

Frank William Dodd
By E. S. Clark
Atty.

UNITED STATES PATENT OFFICE.

FRANK WM. DODD, OF OSBORNE ROAD, FOREST GATE, COUNTY OF ESSEX,
ENGLAND.

SINGLE-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 405,150, dated June 11, 1889.

Application filed October 17, 1888. Serial No. 288,401. (No model.)

To all whom it may concern:

Be it known that I, FRANK WILLIAM DODD, of 16 Osborne Road, Forest Gate, in the county of Essex, England, have invented certain new and useful Improvements in Single-Action Steam and other Motive-Power Engines, of which the following is a specification.

This invention relates to those single-acting engines in which the connecting-rod is attached directly to the piston, the object being to render the engine cheaper in construction and lighter than the usual forms by dispensing with the eccentrics, rods, valves, &c., generally employed to control the various conditions of pressure in the working-cylinder.

According to this invention these conditions are controlled by the motion of the piston itself, together with the rocking motion of the joint or coupling, where the connecting-rod is attached to the piston. This joint or coupling will hereinafter be termed a "rocking coupling."

The steam or other fluid passes into the piston by one or more ports in the cylinder, and then passes through one or more ports in the seat of the rocking coupling into the working part of the cylinder. The steam-passage may then be closed in two ways during the working of the engine—first, by the motion of the piston in its cylinder; second, by the motion of the rocking coupling in its seat. I have found that whereas an economical set of conditions cannot be obtained by using either of these motions alone every condition obtainable by the usual forms of valve-gear can be obtained by using them together. The actual form of the rocking coupling and its seat, and also the form and position of the port in the cylinder must necessarily vary according to the conditions under which the invention is applied. The ports may vary in area, and the various parts may vary in strength and size, according as steam, air, or other fluid at greater or less pressure is to be used. In engines of the closed-in type the steam-supply may be drawn from the crank-chamber, or it may be taken straight to the cylinder without passing through the crank-chamber. The nature of the strain in the connecting-rods may be either a pull or a thrust, necessitating some

modifications in the nature and position of the working-surfaces, as will be hereinafter explained.

In the accompanying drawings, Figure 1 shows in sectional plan view, and Fig. 2 in longitudinal sectional elevation, a pair of single-action horizontal engines constructed according to one form of my invention, the T-head, which connects the piston-rod with the piston, consisting of a hollow cylinder and forming a passage for the live steam to pass through on its way to the cylinder. Fig. 3 shows in section a modification of the T-head coupling-piece, no passage for the steam being made through it. Fig. 4 is a sectional plan view of a pair of single-action engines in which the cylindrical form of the T-head is changed to a segment of a cylinder. Fig. 5 is a longitudinal vertical section of these engines, the piston being, as in Fig. 4, at the end of its return-stroke; and Fig. 6 is a similar view of the engine to Fig. 5, but showing the piston advanced one-third of its stroke.

A A are the working-cylinders, cast in one with a connecting-chamber A*.

B B are the trunk-pistons, to which are fitted the connecting-rods C. These rods, connected to the base of their respective pistons, as described, are also coupled to a crank-pin of the crank-shaft common to both rods by socketed ends, and they are held to the crank-pin by bracing-rings, which leave them free to oscillate independently of each other. The crank-shaft D has its bearing in a hollow flanged casting E, which is secured by bolts to one side of the chamber A*. The cylinders A A are jacketed to form steamways for the exhaust-steam, there being ports *a* in the cylinders to connect with the exhaust-passages *a'*, which are in communication with an exhaust-steam pipe.

*a*² are the steam-supply ports for the two engines. They are connected together by a passage *a*³ cored out in the casting, which passage is also connected with the steam-supply pipe. The ports *a*² are always covered by their respective pistons, which are formed with elongated passages *b* for leading the steam into the sockets prepared to receive the hollow T-heads of the connecting-rods, and a

similar arrangement of passages b^* is provided in the pistons for the discharge of the exhaust-steam. These T-heads or plug-couplings, which are free to rock like the plug of
 5 of a tap in their sockets to provide for the oscillatory movements of the piston-rods, have open ends, and are therefore in direct communication with the steam-passages b of their respective pistons. From these oscillating
 10 heads the steam passes to the front of the pistons by ports c , when they are brought into coincidence with ports b' b^2 in the head of the piston, and when the steam has expanded in the front of the piston it escapes by the port
 15 b^2 through a passage c' in the rocking plug-coupling and off by the ports a and passages a' to the exhaust-pipe.

Instead of fitting the pistons with packing, as is usual, I prefer that the cylinders should
 20 carry elastic packing, as shown in the drawings, and for securing the plug-coupling of the rod to the piston and insuring a steam-tight joint its open ends are beveled inward to fit conical seats formed for it in the ends
 25 of the piston-socket.

From the foregoing description it will be understood that steam will be admitted to each cylinder at the end of the return-stroke of its piston, by reason of the rocking connecting-rod having brought the steam-ports
 30 c c into coincidence with the steam-ports b' b^2 of the piston-head. The steam will then flow to the face of the piston, the supply being kept up until, by the advance of the piston, the port a^2 is closed. The steam admitted to the cylinder will by its expansion
 35 complete the outward stroke of the piston, the oscillating T-head rod meanwhile closing the ports c c and opening the port b to the exhaust-passage c' , which is at that time in communication with the exhaust-passage b^* of the piston, and through it with the exhaust-
 40 port a and passage a' of the cylinder. As the piston completes its outward stroke, the port a in the cylinder will be entirely uncovered, thus enabling the main portion of the exhaust-steam to escape directly through it. The exhaust-port a will be at about the level
 45 of the supply-port a^2 , and may consist of any number of openings in the jacketed portion of the cylinder. By the completion of the throw of the crank the piston will be driven inward to its starting position, first opening
 50 the port a^2 to the steam-passage b of the piston, and then bringing into coincidence the ports b' b^2 with the ports c c , whereby a fresh supply of steam is admitted to the face of the piston.

The supply-port may, instead of delivering
 60 the steam into the interior of the rocking plug, deliver it into a recess or indentation formed on the periphery of that plug, as shown in Fig. 3, where B is the trunk-piston detached from its cylinder and fitted, as before,
 65 with a connecting-rod C, having a hollow T-head or plug-coupling. In the periphery of this coupling two recesses 1 2 are formed,

through which the live and exhaust steam respectively pass.

b' is the supply-port in the head of the piston, and b^2 is the exhaust-port in the piston-head. The recess 1 communicates with the
 70 passage b and the recess 2 with the exhaust-passage b^* . The steam from the supply-port enters the passage b of the piston, and
 75 through the recess 1 to the port b' in the face of the piston. When by the rocking of the connecting-rod as the piston advances the port b' is closed, the exhaust-port b^2 will be
 80 opened and admit the exhaust-steam to the recess 2, whence it will pass to the exhaust-passage b^* and escape thence by the exhaust port and passage of the cylinder.

In the arrangement illustrated at Figs. 4, 5, and 6 a considerable portion both of the
 85 rocking plug-coupling and of its seat as used in the second arrangement is dispensed with.

A constant pressure is maintained in the central or connecting chamber, whereby the
 90 connecting-rods are constantly subjected to tensile strain, thus rendering it expedient to construct the ports in that portion of the seat of the T-headed connecting-rod which lies
 95 between its center of motion and the crank-shaft nearest the shaft. In this example the cylinders A A are at their open ends in constant communication with the steam-boiler. Thus a pressure of steam (during the work-
 100 ing of the engines) is always maintained on the interior of the trunk-pistons, which consequently balance each other in their movements against the retarding-pressure of the steam.

b is the inlet-passage in the piston for conveying the steam by the port b' to the head
 105 of the piston, and b^2 is the exit-port by which the exhaust-steam passes to the passage b^* , and thence, by the port and passage a a' of the cylinder, to the exhaust-pipe. The rocking of the oscillating rod C, caused, as before,
 110 by the traverse of its piston, opens and closes alternately the ports b' b^2 in the piston-head. When the piston-rod C is at one extreme of its oscillation, the convex face of
 115 the T-head closes, say, the admission-port in the head of the piston, and when at its other extreme position it will close the exit-port precisely as when the whole cylindrical surface of the T-head coupling is used. The admission of steam to the passage b is cut off
 120 by the advance of the piston, as before, and the constant pressure of the steam within or at the back of the pistons serves to hold the pistons in close contact with the T-heads of their respective rods.

From the foregoing explanation it will be understood that other surfaces of revolution—such as cones and spheres—may be employed to take the place of the cylindrical
 130 surfaces of the rocking plugs above mentioned.

It will also be understood that by my invention the complications of valve-gear and the disadvantages connected therewith are

removed, and provision is thereby made for constructing single-action engines in a far more economical manner than heretofore.

5 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

10 A single-acting engine furnished with a trunk-piston in the walls of which are supply and exhaust passages which are opened and closed by the motion of the piston, the one passage receiving steam or other fluid from a port in the cylinder and transmitting the same to the working-face of the piston,

and the other conducting the spent steam to 15 the exhaust-port in the wall of the cylinder, such trunk-piston having a seat for the reception of the head of a connecting-rod so formed as to close and open alternately by its oscillation the supply and exhaust pas- 20 sages in the piston, for the purpose above set forth.

FRANK WM. DODD.

Witnesses:

H. K. WHITE,

G. H. G. MATHIESON.