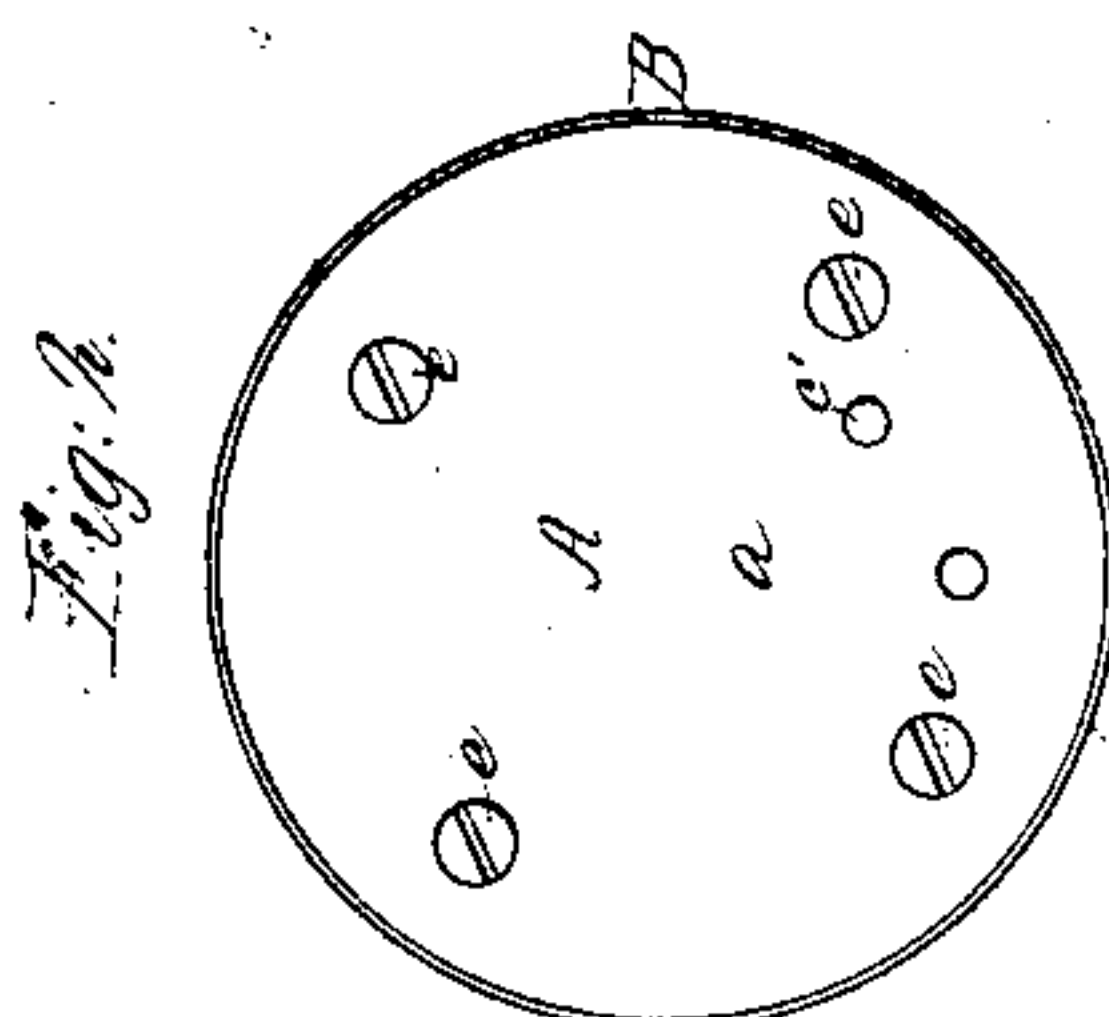
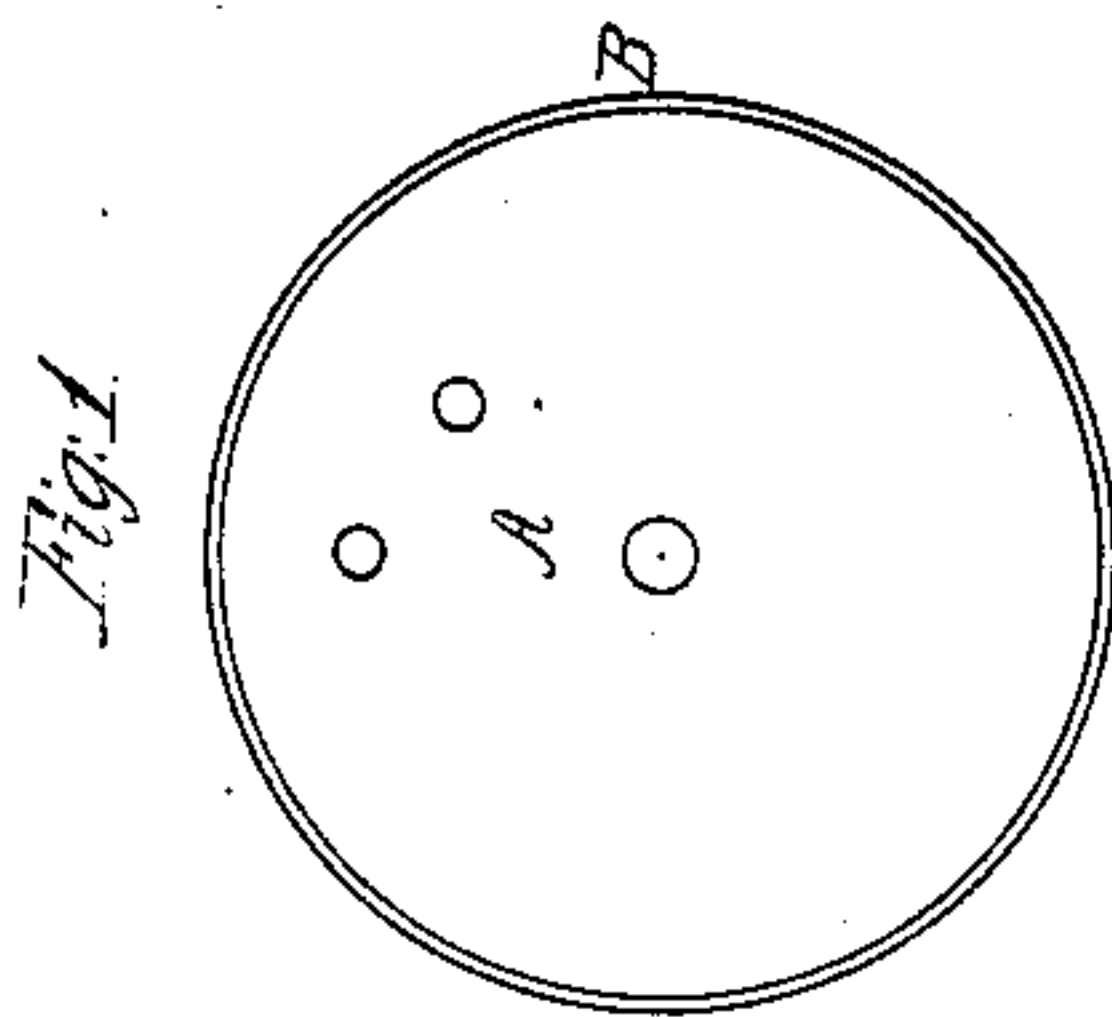
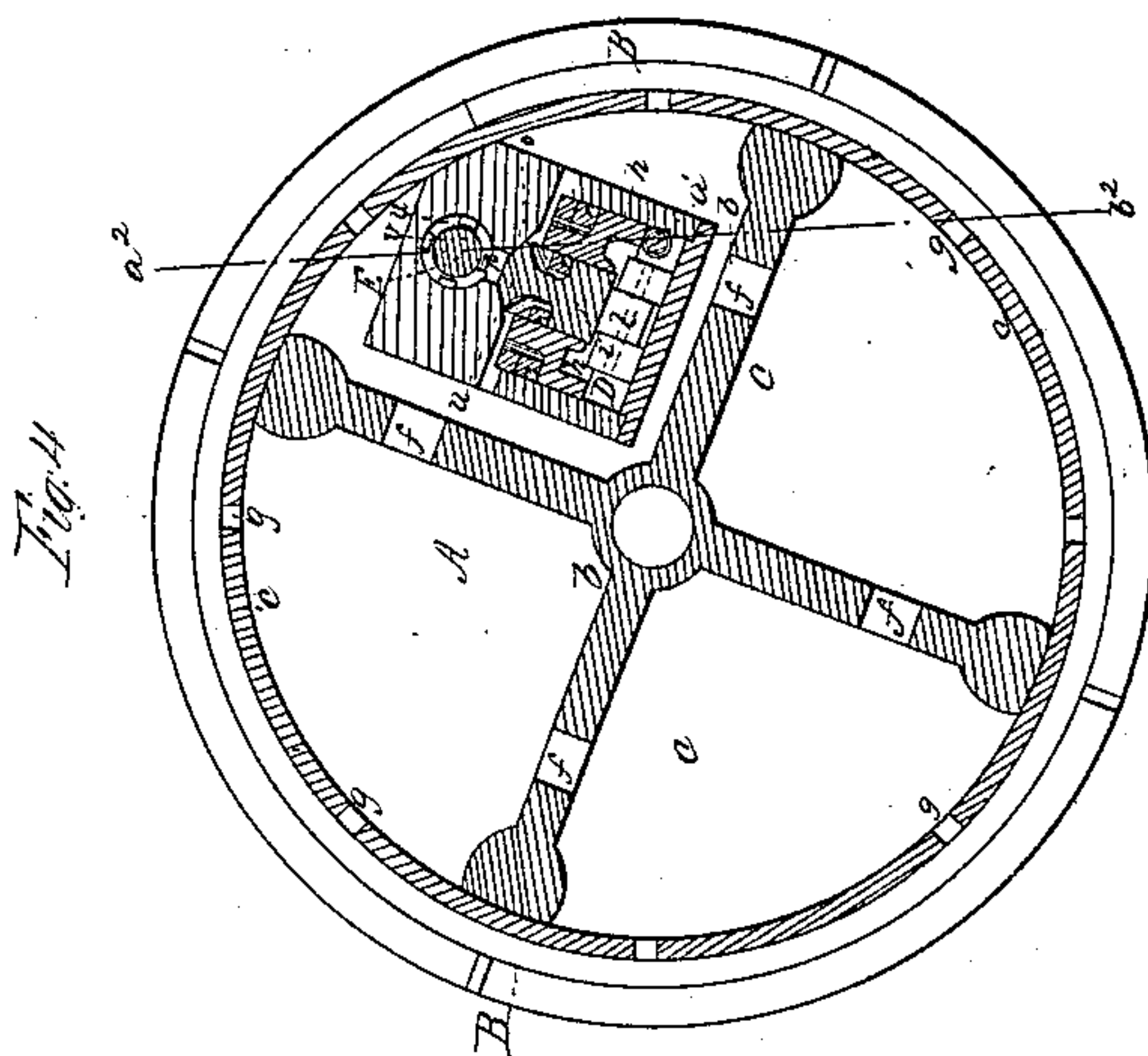
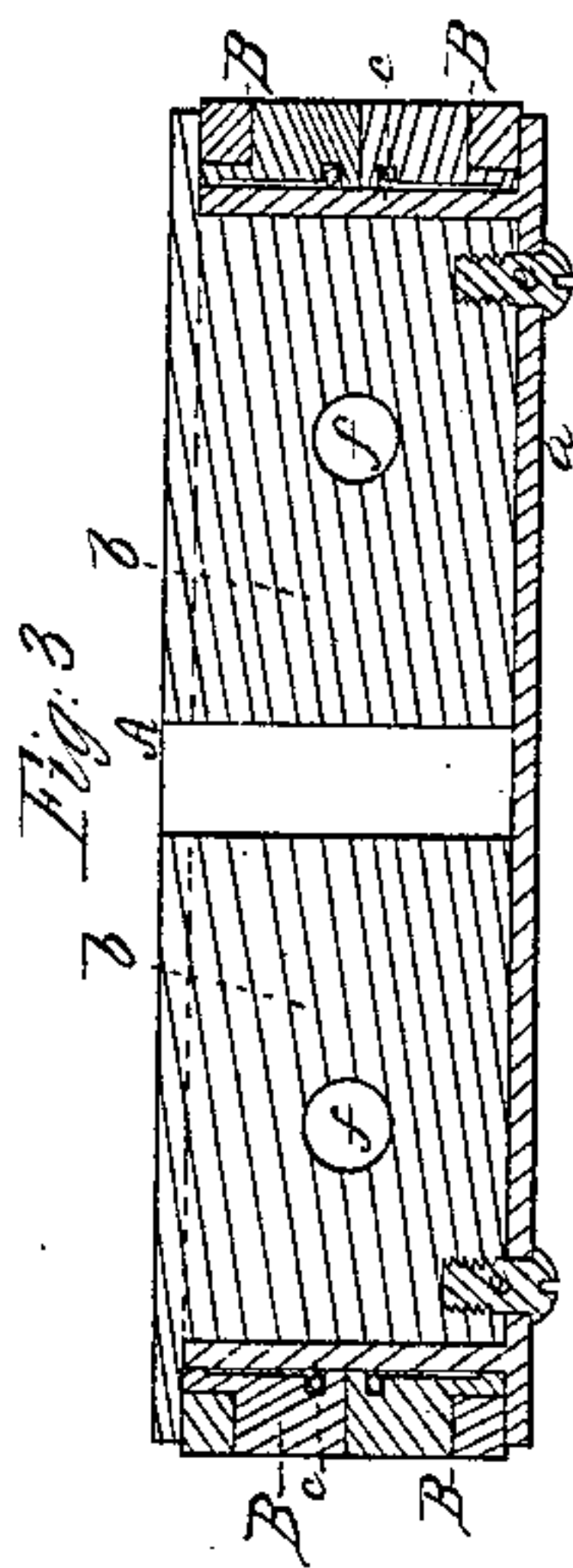
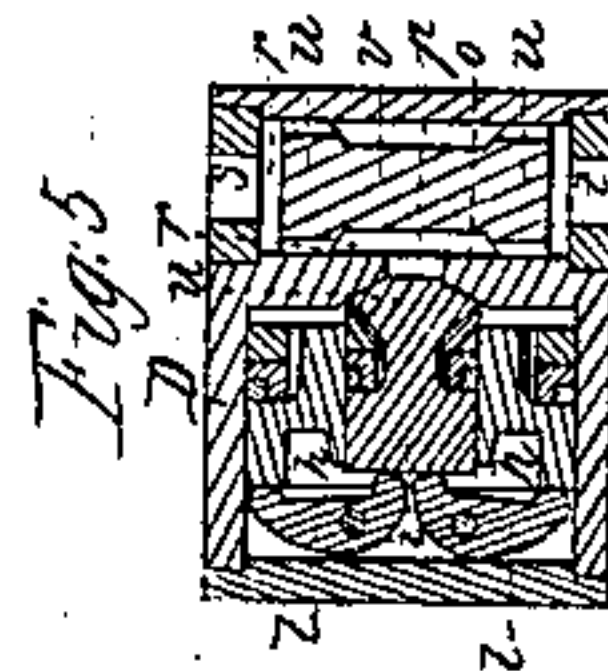
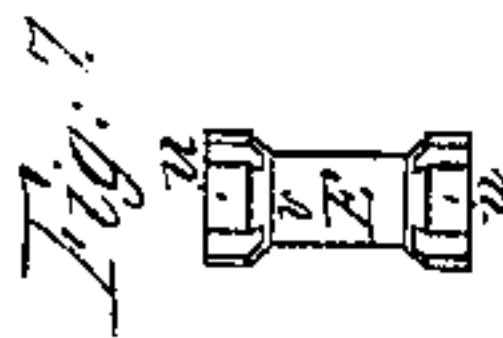
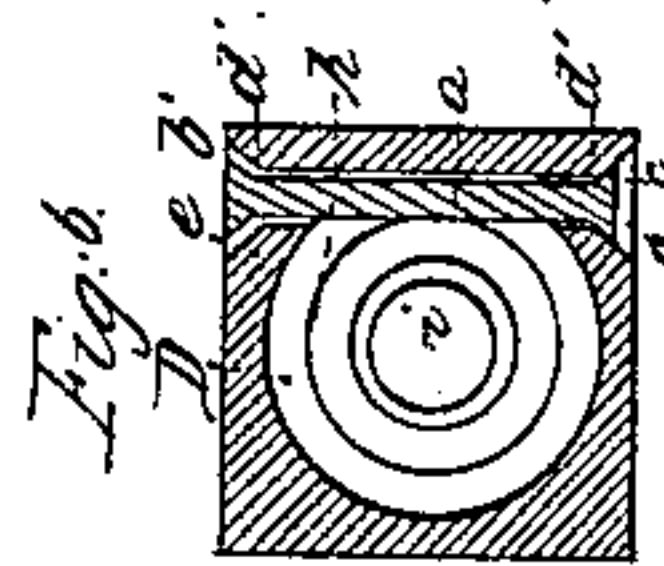
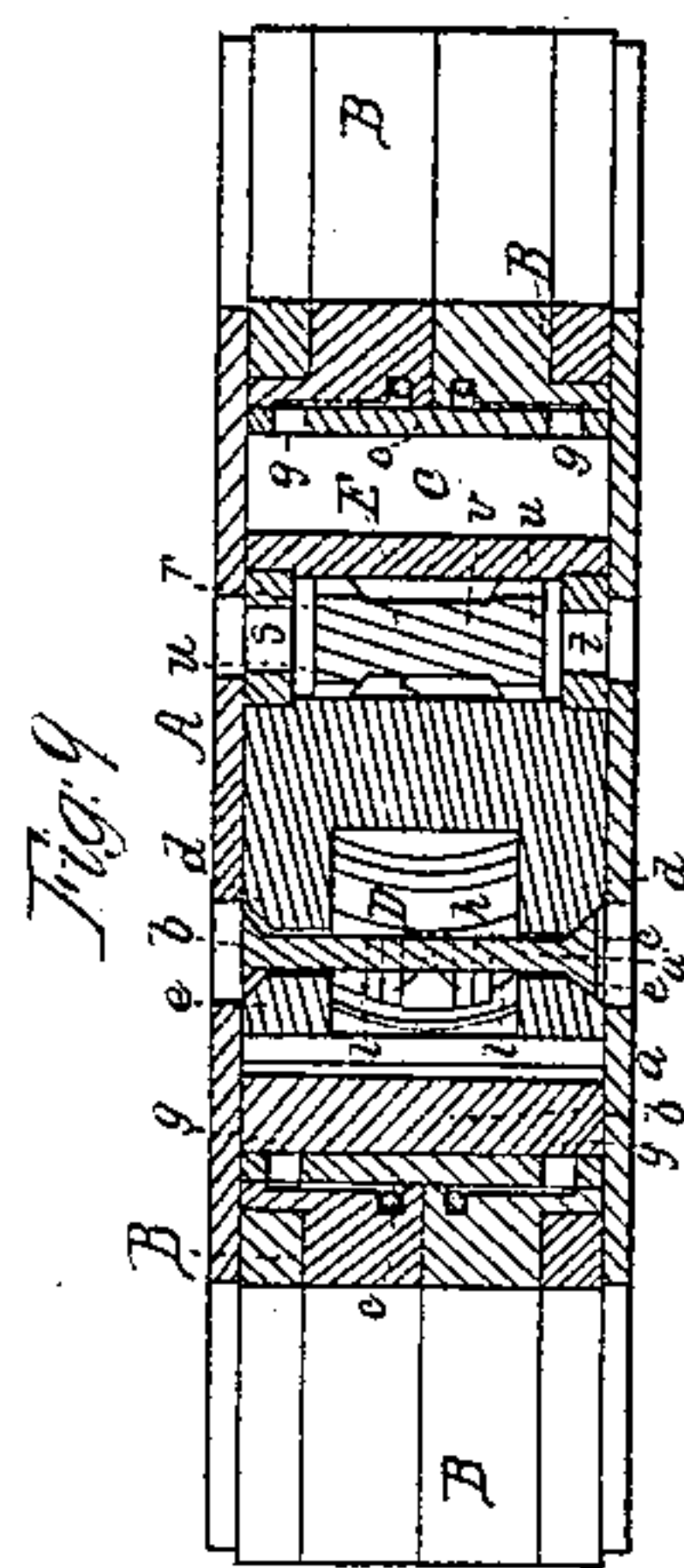


N. P. Stevens, Steam-Engine Piston.

N^o 39,431.

Patented Aug. 4, 1863.



Witnesses:
R. L. Eddy
A. P. Hale Jr.

Inventor:
Nathaniel P. Stevens

UNITED STATES PATENT OFFICE.

NATHAN P. STEVENS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PISTONS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 39,431, dated August 4, 1863.

To all whom it may concern :

Be it known that I, NATHAN P. STEVENS, a resident of Boston, in the county of Suffolk and State of Massachusetts, have made a new and useful Improvement in Engine-Pistons; and I do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings.

The nature of my invention consists in the combination, with a piston-head and its expansive ring or rings, of an apparatus by which, through the action of the steam used in the cylinder for propelling the main piston thereof, the pressure or rate of pressure for expanding the rings may be diminished with respect to the pressure or rate of pressure exerted on the end of the piston while such piston may be in operation; and my invention further consists in an apparatus for such purpose.

Of the said drawings, Figure 1 is a top view, Fig. 2 a bottom view, Fig. 3 a cross-section, and Fig. 4 a horizontal section, of a piston-head provided with my invention. Fig. 5 is a vertical and longitudinal section of the pressure-regulating apparatus placed within the piston-head. Fig. 6 is a transverse section of its valves and ports for the discharge of any steam that may accumulate in rear of its pistons.

In the drawings, A denotes a steam-engine piston-head as furnished with a set of expansive metallic segments or cut-rings, B B B, which are to be expanded by the pressure of steam let into the chamber C, arranged within the piston-head. There projects downward from the top plate, *a*, of the piston-head a cross *b*, which may be cast in one piece with the said plate, and is encompassed by the rim *c* of the piston-head, such rim being cast in one piece with the cap-plate *d*. The said cap-plate is fastened to the arms of the cross by means of screws *eeee*. Furthermore, there should be one or more holes, *f*, made horizontally through each of the arms of the cross, and there should also be holes, *g g*, so made through the rim *c* as to allow steam when within the chamber C to get access to the rings B B, so as to expand them in the manner required to press them into close contact with the interior surface of the cylinder in which the piston may be situated, such expansion of the rings serving to make a close joint around the piston-head and between it

and the cylinder. Within the chamber C there is a box or small cylinder, D, provided with two concentric pistons, *h i*. The larger of these pistons is to slide freely within the cylinder D, while the smaller is to slide as freely within the larger, the two being arranged as shown in the drawings. In rear of the two pistons, *h i*, are two levers, *l l*, so arranged that their shorter arms rest against the lesser, while their longer arms bear against the greater of the two pistons. The inner or lesser piston has a valve, *n*, on its front end, or has the latter so formed as to serve the purpose of a valve, such valve being to operate with a valve-seat, *o* arranged at the front end of the cylinder D and around a passage or opening, *p*, leading endwise out of the cylinder and into a valve-chest, *r*, (see Figs. 5 and 4,) which is a cylindrical chamber arranged vertically and provided at its two opposite ends with steam ports or passages *s t*. Within the valve-chest *r* there is a double valve, E, composed of two circular heads, *u u*, united by a stem, *v*, Fig. 7 is a side view, and Fig. 8 an end view, of this double valve. Each head has a diameter corresponding with that of the valve-chest, and is provided with one or more notches in and across its periphery, all of them being outside of a circle concentric with the head and having a diameter equal to that of the steam-port *s* or *t* next to either head. Each of the ports or passages *s t* is to be continued through the adjacent part of the piston—that is to say, through the bottom or the cap plate of the piston—in manner as shown in the drawings. Furthermore, aside of the levers *l l*, there is a double valve stem, *a'*, which goes vertically through the cylinder D and in rear of the two pistons thereof, and is provided with two valves, *b' c'*, arranged as shown in Fig. 9, which is a vertical section of the piston-head taken through this double valve-stem. Each valve *b' c'* has a seat, *d*, arranged at the inner extremity of a port or passage, *e'*, leading out of the piston, as shown in Fig. 9, the length of the valve-stem being somewhat greater than the distance between the two valve-seats. The opening of each valve-seat should be larger in diameter than the stem which passes through it, the same being in order that, when either valve may be off its seat, steam may flow through the valve-opening, provided there may be any steam in rear

of the concentric pistons *h i*. While the piston-head may be in the act of being moved by the pressure of steam within the engine-cylinder, the force of such steam on the next adjacent valve (*b'* or *c'*) will close such valve on its seat, and thereby so open the other or mate valve as to suffer to escape from the exhaust side of the piston whatever steam may have accumulated in that part of the cylinder *D* which is in rear of its pistons *h i*. The double valve or valve-stem *a'* and valves *b'* *c'* and their seats *d'* and ports *e'* constitute a useful adjunct to the cylinder *D* and its concentric piston. They may, however, be dispensed with in many cases, and are to be viewed in the light of an improvement on my invention. In proportion to the superficial areas of the ends of the two concentric pistons, so will be the rate of the pressure of the steam on the end of the piston head to that of the pressure of the steam within the piston-head and exerted on the rings thereof to effect their expansion—that is to say, if the area of the end of the larger of the concentric pistons be six times that of the end of the smaller piston, and the pressure on the engine-piston to drive it be sixty pounds per square inch, the pressure per square inch within the piston-head and against its rings would be ten pound or thereabouts per square inch. During each stroke of the piston head steam from the engine-cylinder will be caused to enter the small cylinder *D* and to press against the two pistons thereof. It will flow out of the cylinder *D* and into the chamber *C* of the piston-head. As soon as it may have filled the latter it will exert a pressure on the two concentric pistons, and, as one has an end area larger than that of the other, the larger one will be forced back against the levers *l l* in rear of it and so as to move them and crowd the lesser piston forward and force its valve *n* against the seat of the entrance-port *p* of the cylinder *D*. In this manner the further admission of steam into the cylinder *D* will be checked, the rate of pressure of that within

the said cylinder and in the chamber *C* of the piston being to the rate of pressure of the steam that may be driving the piston as the area of the end of the lesser is to the area of the end of the greater of the two concentric pistons.

I do not claim in combination with a piston and its expansion ring or rings a mechanism for effecting a steam-tight packing between the piston and its cylinder by means of the direct pressure of steam exerted upon or against the packing ring or rings and employed separately and distinct from the steam used in the cylinder for the propulsion of its main piston; nor do I claim the means or mechanism for such purpose as set forth and described in the British Patent No. 747 for the year 1859, as with my invention the steam used in the cylinder and to propel its main piston is employed to effect the expansion of the packing ring or rings and for the purpose of making a steam-tight packing.

I claim—

1. In combination with the piston-head and its expansive ring or rings, an apparatus by which, through the action of the steam used in the cylinder for propelling the main piston thereof, the pressure or rate of steam-pressure for expanding the rings may be diminished with respect to the pressure or rate of steam-pressure exerted on the piston to drive it while such piston may be in operation within an engine-cylinder.

2. The apparatus, substantially as described, for diminishing the steam-pressure on the piston-rings relatively to that on the end of the piston, meaning to claim the apparatus, whether inclusive or exclusive of the means as described for discharging the waste steam from the rear of the two concentric pistons of such apparatus.

N. P. STEVENS.

Witnesses:

R. H. EDDY,
F. P. HALE, Jr.