

No. 610,573.

Patented Sept. 13, 1898.

R. WRIGHT.
GAS COMPRESSOR.

(Application filed Dec. 24, 1897.)

(No Model.)

4 Sheets—Sheet I.

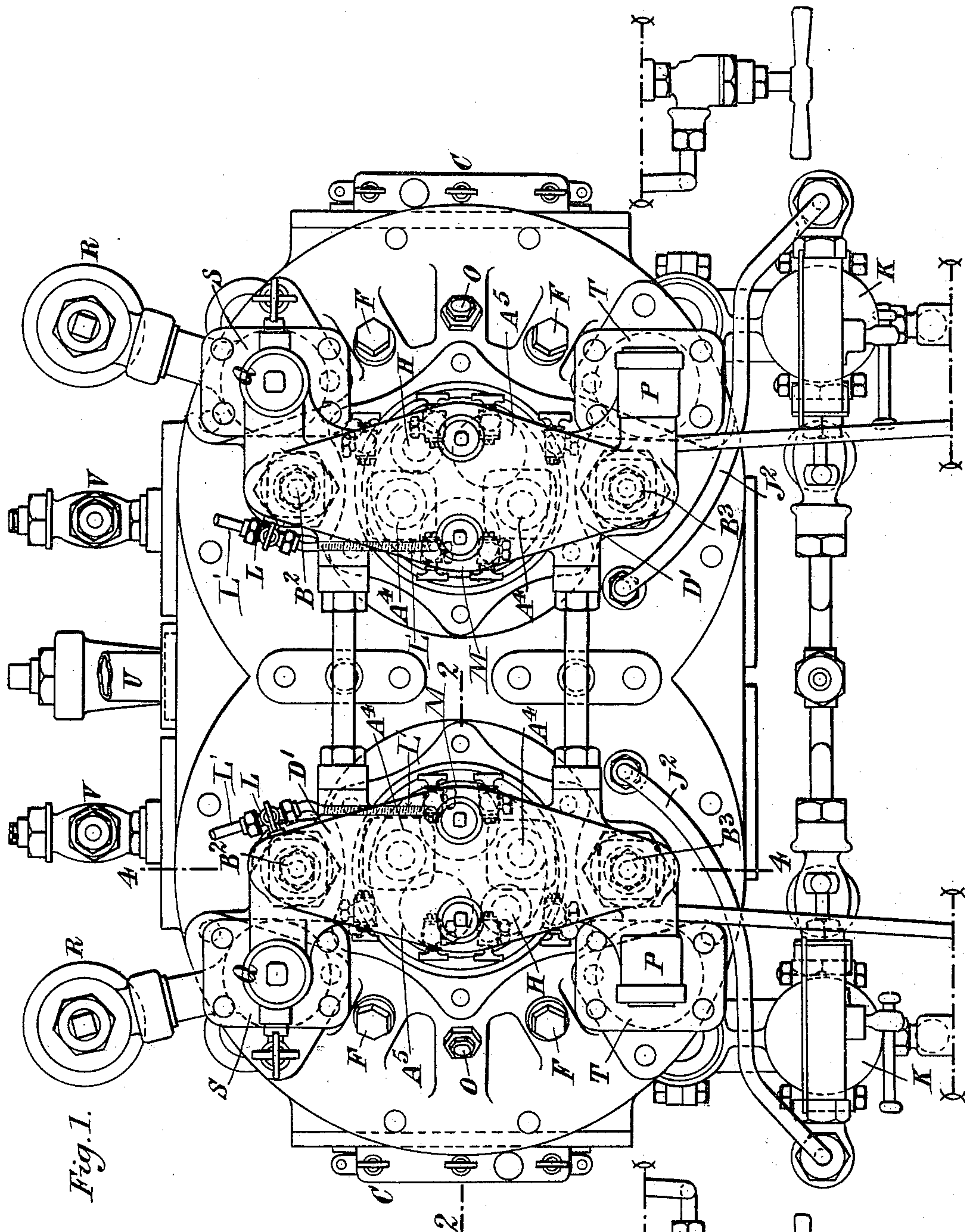


Fig. 1.

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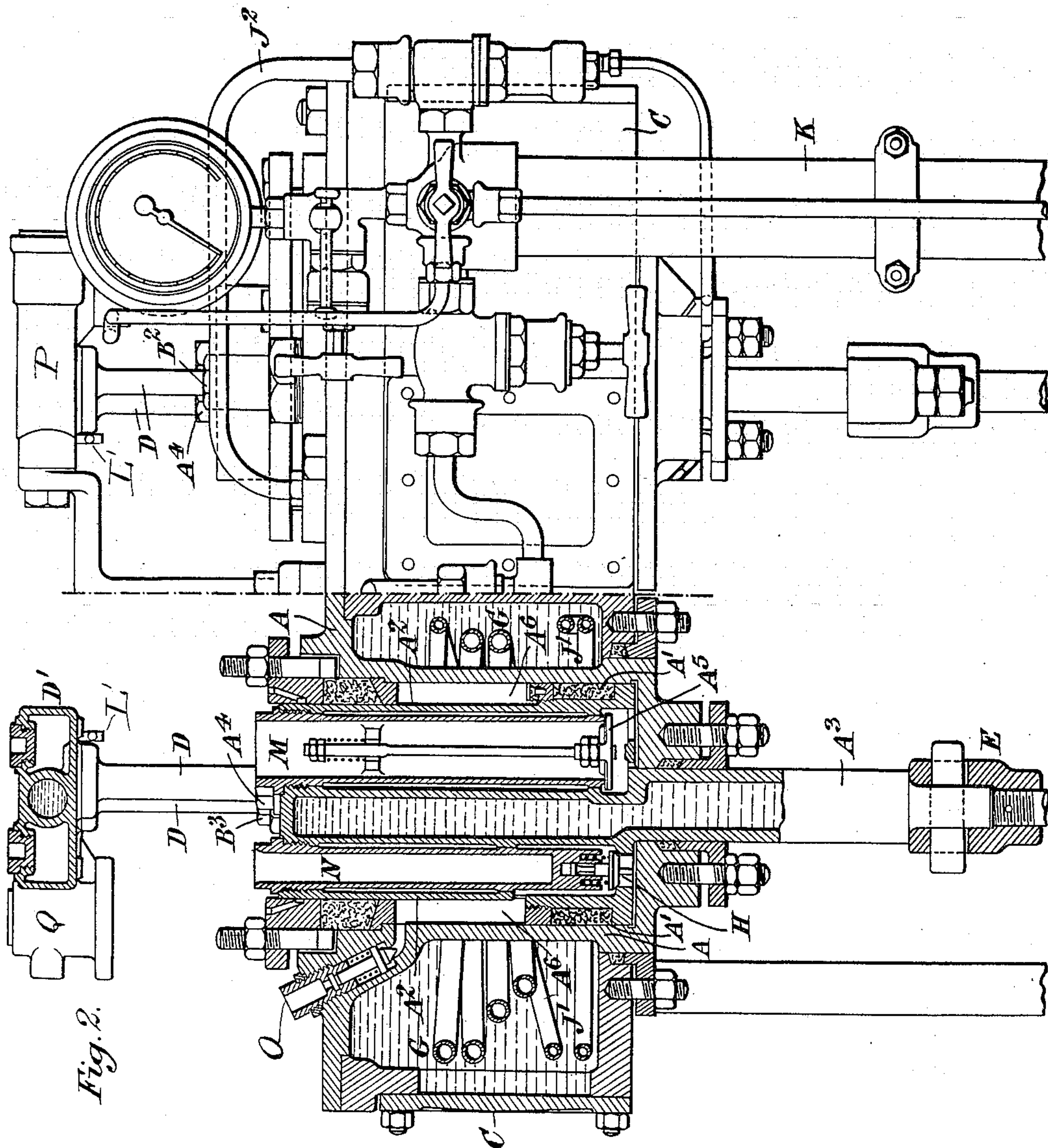
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4 Sheets—Sheet 2.



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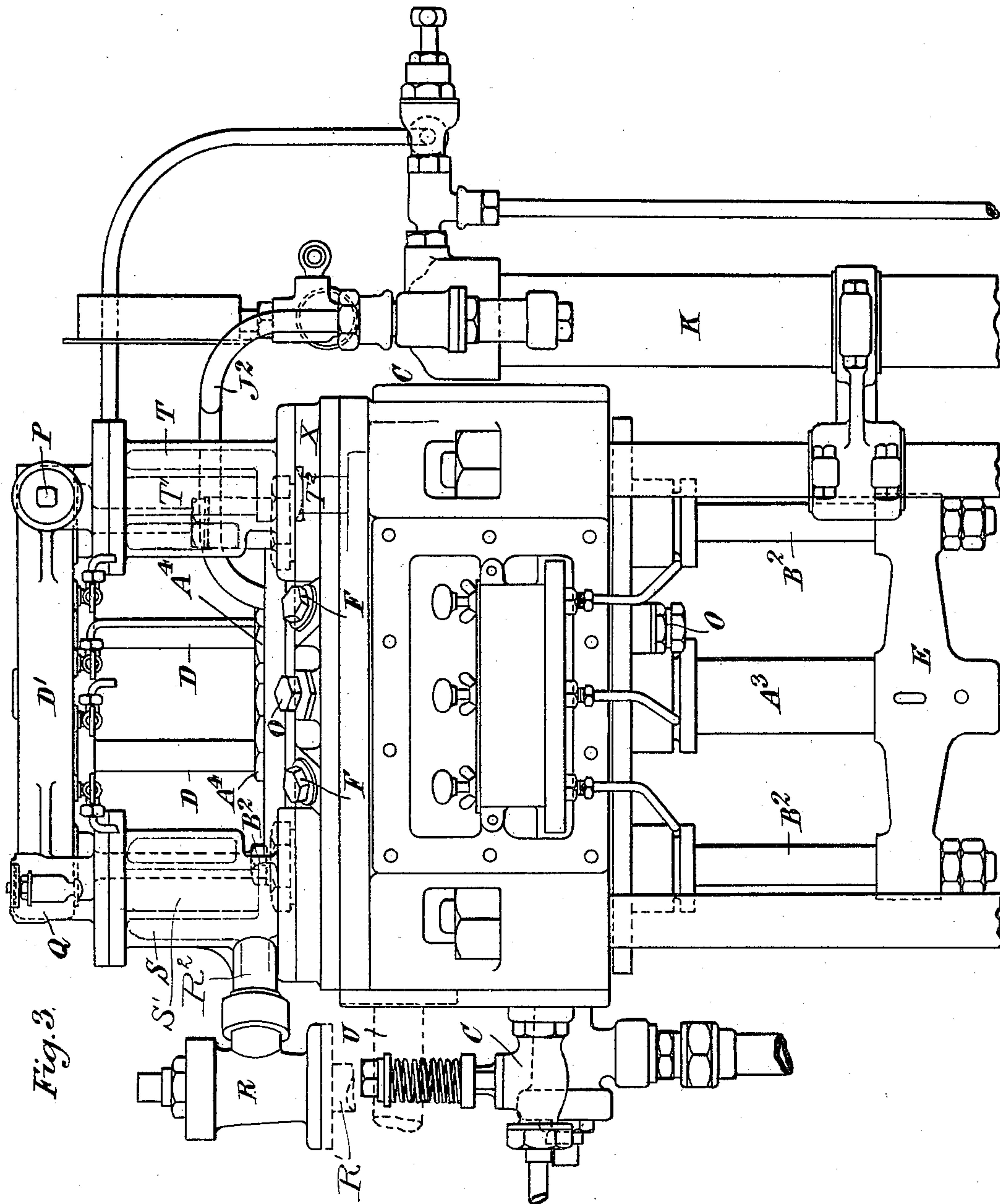


Fig. 3.

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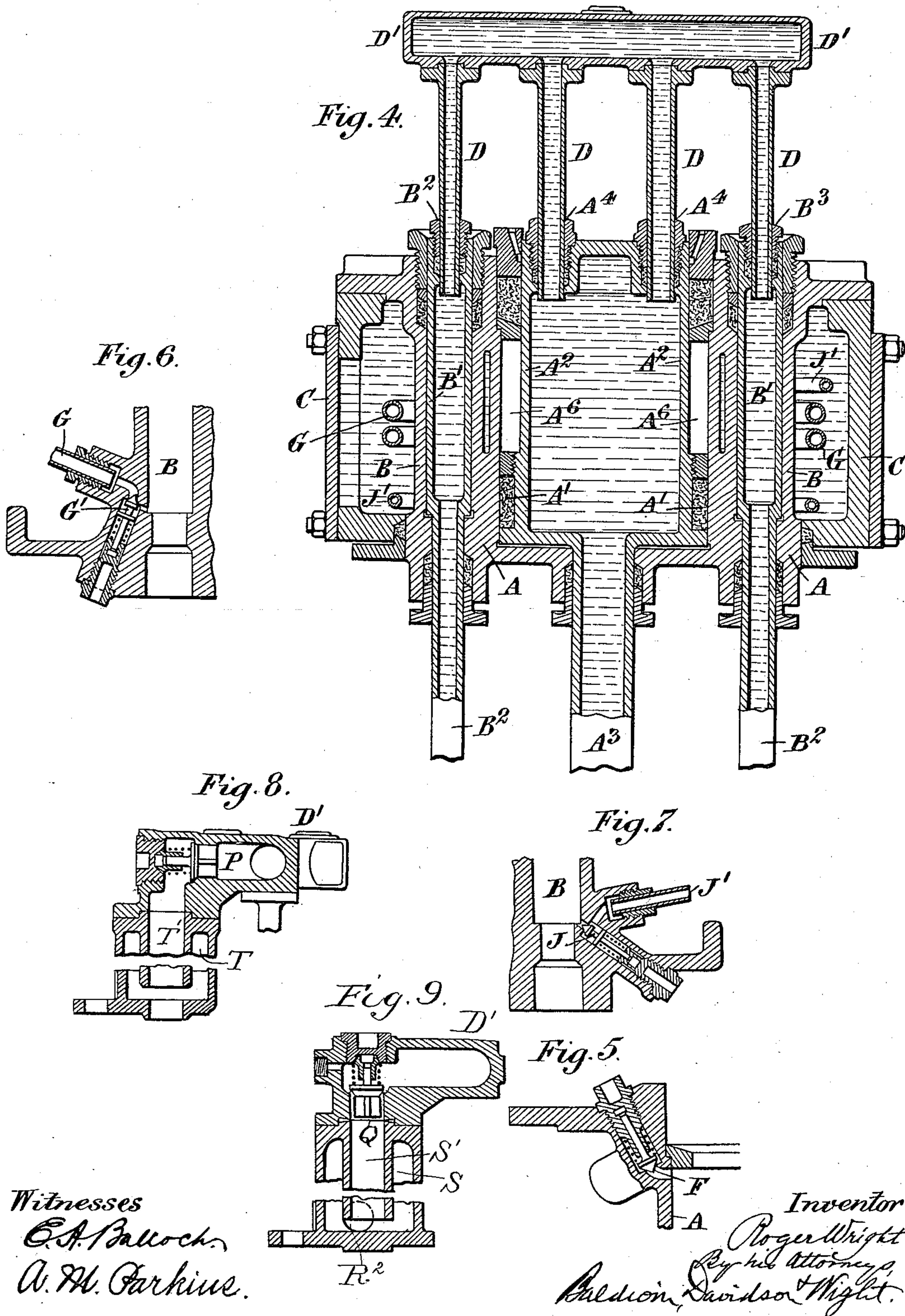
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

ROGER WRIGHT, OF NEWCASTLE-UPON-TYNE, ENGLAND.

GAS-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 610,573, dated September 13, 1898.

Application filed December 24, 1897. Serial No. 663,281. (No model.)

To all whom it may concern:

Be it known that I, ROGER WRIGHT, engineer, a subject of the Queen of Great Britain, residing at Elswick Works, Newcastle-upon-Tyne, England, have invented certain new and useful Gas-Compressors, of which the following is a specification.

According to this invention the gas or air is cooled both during and after compression by means of circulating water both outside the compressing-cylinders and inside the plungers which work in those cylinders and by means of additional cooling-surface, which is provided by dividing the final compressing-chamber into two separate cylinders. The cooling-water also is caused to circulate by utilizing the hollow air-compressing plungers as pump-barrels working on fixed pump-plungers, serving as inlet-pipes to the moving circulating-pumps. All valves also and the glands of the piston and plunger rods are made accessible from the outside of the circulating-tank in which the compressing-cylinders are fixed.

The compressors may be arranged singly or in groups of two, three, or four. The drawings show a double machine.

Figure 1 is a plan, and Fig. 2 a half front elevation and a half-section on the line 2 2, Fig. 1. Fig. 3 is a left-hand side elevation; and Fig. 4, a section on the line 4 4, Fig. 1, many parts being omitted. Figs. 5 to 9 are sections, to a larger scale, showing the details of the various valves.

The air-compressor consists of a cylinder A, fitted with a piston A' and plunger A², and of two smaller cylinders B, fitted with plungers B'. The cylinders are fixed in a water-tank C. The piston and plunger rods A³ and B² are attached to one cross-head E, Figs. 2 and 3, actuated by a steam-engine or other motor, which is not shown in the drawings.

The plungers are made hollow and are fitted with pipes D, dipping from a fixed overhead circulating-pump-valve case D'. The dipping pipes pass through glands A⁴ and B³, fitted in the upper ends of the hollow plungers, so that the cavities of these plungers form the circulating-pump barrels. The air is further cooled during and after compression by coiling the connecting-pipes J' between the compressing-cylinders and the final delivery-pipe in the circulating-tank.

The drawings show all the plungers in their lowest position, and the following four operations, numbered 1, 2, 3, and 4, are effected in each revolution of the engine, Nos. 1 and 2 taking place during the upstroke and Nos. 3 and 4 during the downstroke.

1. As the piston A' in the larger cylinder A ascends free air is drawn through air-suction valves A⁵, Figs. 1 and 2, into the cylinder A.

2. Simultaneously the air in the annular space A⁶ around the plunger A² in the larger cylinder A, which has already been compressed, (see operation No. 3,) is still further compressed until it is superior in pressure to the compressed air contained in the annular spaces around the plunger-rod B² in the smaller cylinders B, when it passes to the small cylinders through delivery-valves F (shown separately at Fig. 5) into the pipes G, led through the cold water in the cooling-tank C. These pipes are fitted with check delivery-valves G', Fig. 6, at their entrance into the cylinders B.

3. As the piston A' in the larger cylinder A descends it compresses the air beneath it until it is superior in pressure to the air in the annular space A⁶ around the plunger A², into which space it then passes through a delivery-valve H, Fig. 2, and is there further compressed during the remainder of the downstroke.

4. Simultaneously the compressed air already in the annular spaces around the plunger-rod B² in the smaller cylinders B is further compressed by the downward stroke of the inverted plungers until it reaches the maximum pressure required, when it is forced through delivery-valves J, Fig. 7, into a coil of pipe J' in the cooling-tank, thence passing through the top of the tank by a pipe J² to the air-reservoir. Any water that may be carried with the compressed air from the compressing-cylinders is trapped in a separator K.

Oil-boxes are cast on the sides of the overhead circulating-pump casing, and oil-pipes, each fitted with an independent oil-cock, are led to the glands of the plungers, which work through the top of the tank. Similar oil pipes and cocks are provided for lubricating the glands of the rods working through the under side of the tank. Provision is also

made for dropping oil into the air-suction valves for lubricating the inside of the compressing-cylinders.

A small cock L is provided on a pipe L', Figs. 1 and 2, connected to any convenient supply, for regulating a jet of cold water playing down the hollow casing M through the currents of air drawn into the air-suction valve A⁵.

The air-suction valves A⁵ and the delivery-valve H, leading to the annular space around the plunger in the larger cylinder A, are carried in casings M and N, fitted inside the plunger A², from the top of which the casings and valves can be readily withdrawn. The delivery-valves F, between this annular space and the pipe G in the tank, are accessible from the outside of the tank at the top. The check delivery-valves G' at the other end of the pipe G and the delivery-valves J, between the smaller cylinders B and the coils J', are accessible from the outside of the tank at the bottom.

The larger cylinder A is fitted at top and bottom with relief-valves O, which are accessible from the outside of the tank.

Cold water is drawn into the casing D and hollow plungers when the latter descend by the pipe R', Fig. 3, cock R, pipe R², air vessel S, and central pipe S' past the suction-valve Q, Fig. 9. When the plungers ascend, this water is forced into the tank C past the delivery-valve P, Fig. 8, by the central pipe T' of the air vessel T and by the pipe T², leading from the latter. The water escapes from the tank C by the pipe V, Figs. 1 and 3, leaving from its top. The function of the air vessels S and T is to provide an air-cushion which will counteract any shocks caused by the alternate opening and closing of the valves P and Q.

The glands of all the plungers and rods are adapted for asbestos or similar packing and are all accessible from the outside of the tank.

What I claim is—

1. The combination of a cylinder, a plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, two casings removably fixed in the passages, an admission-valve at the end of one casing, a valve at the end of the other casing, an opening from the second valve into the annular space around the plunger and an escape-valve from the annular space.

2. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, two casings removably fixed in the passages, an admission-valve at the end of one casing, a valve at the end of the other casing, an opening from the second valve into the annular space around the plunger, an escape-valve from the annular space, a stuffing-box fixed to the plunger, a stationary pipe entering the plunger through the stuffing-box and means for supplying water to the pipe.

3. The combination of a cylinder, a hollow

plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, two casings removably fixed in the passages, an admission-valve at the end of one casing, a valve at the end of the other casing, an opening from the second valve into the annular space around the plunger, an escape-valve from the annular space, a stuffing-box fixed to the plunger, a stationary pipe entering the plunger through the stuffing-box, a valve admitting water to the pipe, and an escape-valve from the pipe.

4. The combination of a cylinder, a plunger within the cylinder, a piston fixed to the plunger, an admission-valve to the space beneath the piston, an escape-valve from it into the annular space around the plunger, two smaller cylinders, a plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, and escape-valves from these spaces.

5. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, an admission-valve to the space beneath the piston, an escape-valve from it into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, stationary pipes entering the plungers through the stuffing-boxes, and means for supplying water to the pipes.

6. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, an admission-valve to the space beneath the piston, an escape-valve from it into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, a water-chamber, pipes fixed to the chamber and entering the plungers through the stuffing-boxes, a valve admitting water to the chamber, and an escape-valve from the chamber.

7. The combination of a cylinder, a plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, and escape-valves from these spaces.

8. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, two passages through the plun-

ger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, stationary pipes entering the plungers through the stuffing-boxes, and means for supplying water to the pipes.

9. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, a water-chamber, pipes fixed to the chamber and entering the plungers through the stuffing-boxes, a valve admitting water to the chamber, and an escape-valve from the chamber.

10. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, an admission-valve to the space beneath the piston, an escape-valve from it into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, stationary pipes entering the plungers through the stuffing-boxes, means for supplying water to the pipes, a water-jacket around the cylinders, and pipes in the water-jacket leading respectively from the exit from the larger cylinder to the smaller cylinders and from the exits from the smaller cylinders.

11. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, an admission-valve to the space beneath the piston, an escape-valve from it into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, a water-chamber, pipes fixed to the chamber and entering the plungers through the stuffing-boxes, a valve admitting water to the chamber, an escape-valve from the chamber, a water-jacket around the cylinders, and pipes in the water-jacket leading respectively from the exit from the larger cylinder to the

smaller cylinders, and from the exits from the smaller cylinders.

12. The combination of a cylinder, a plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a water-jacket around the cylinders, and pipes in the water-jacket leading respectively from the exit from the larger cylinder to the smaller cylinders, and from the exits from the smaller cylinders.

13. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, stationary pipes entering the plungers through the stuffing-boxes, means for supplying water to the pipes, a water-jacket around the cylinders, and pipes in the water-jacket leading respectively from the exit from the larger cylinder to the smaller cylinders, and from the exits from the smaller cylinders.

14. The combination of a cylinder, a hollow plunger within the cylinder, a piston fixed to the plunger, two passages through the plunger, an admission-valve at the end of one passage, a valve at the end of the other passage, an opening from the second valve into the annular space around the plunger, two smaller cylinders, a hollow plunger in each, admission-valves from the annular space around the plunger of the larger cylinder into the annular spaces around the plunger-rods in the smaller cylinders, escape-valves from these spaces, a stuffing-box fixed to each plunger, a water-chamber, pipes fixed to the chamber and entering the plungers through the stuffing-boxes, a valve admitting water to the chamber, an escape-valve from the chamber, a water-jacket around the cylinders, and pipes in the water-jacket leading respectively from the exit from the larger cylinder to the smaller cylinders, and from the exits from the smaller cylinders.

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Witnesses:

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