

No. 607,582.

Patented July 19, 1898.

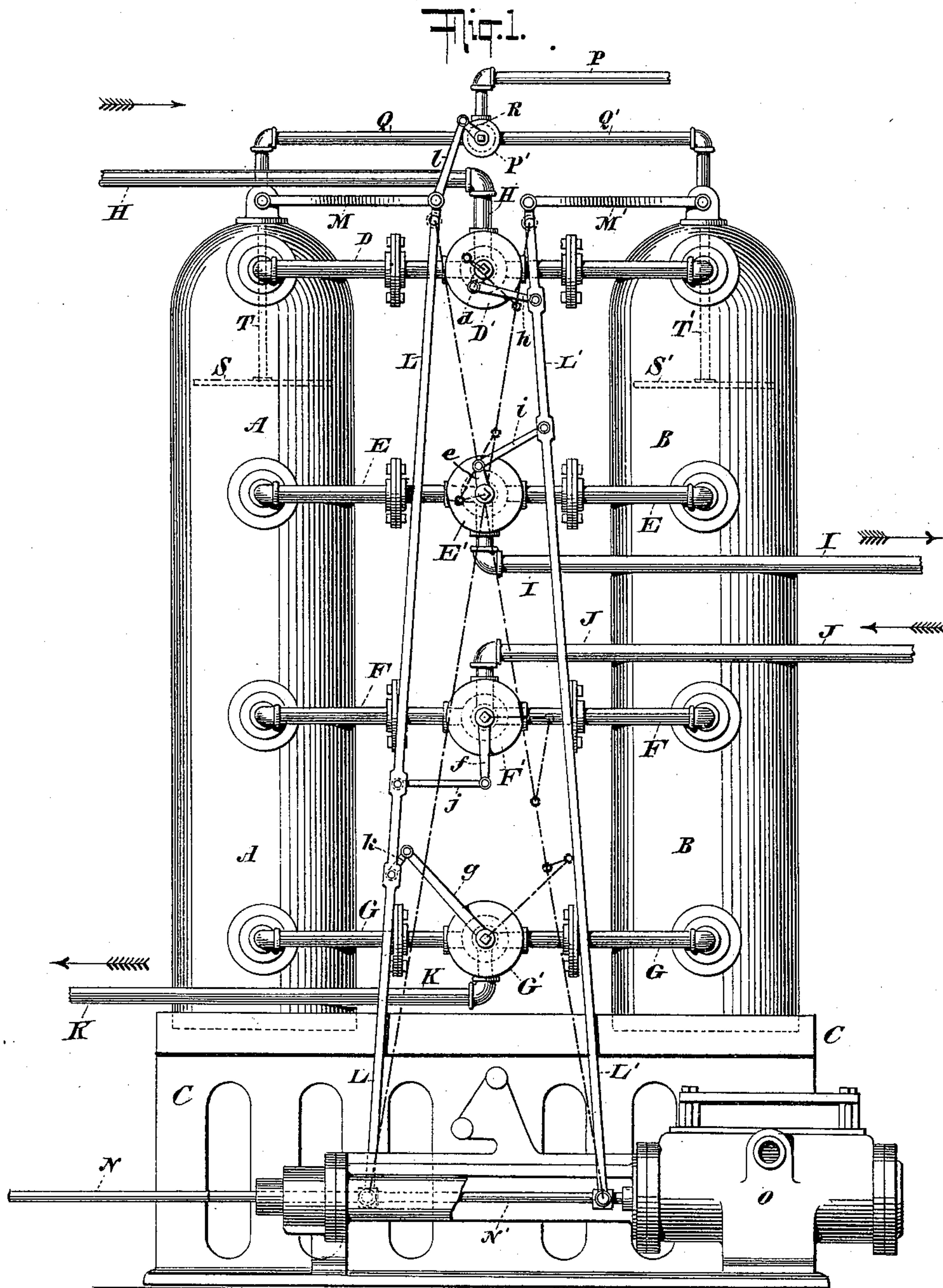
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APPARATUS FOR REGENERATING EXHAUST STEAM.

(Application filed Feb. 28, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES :

Fig. 3.

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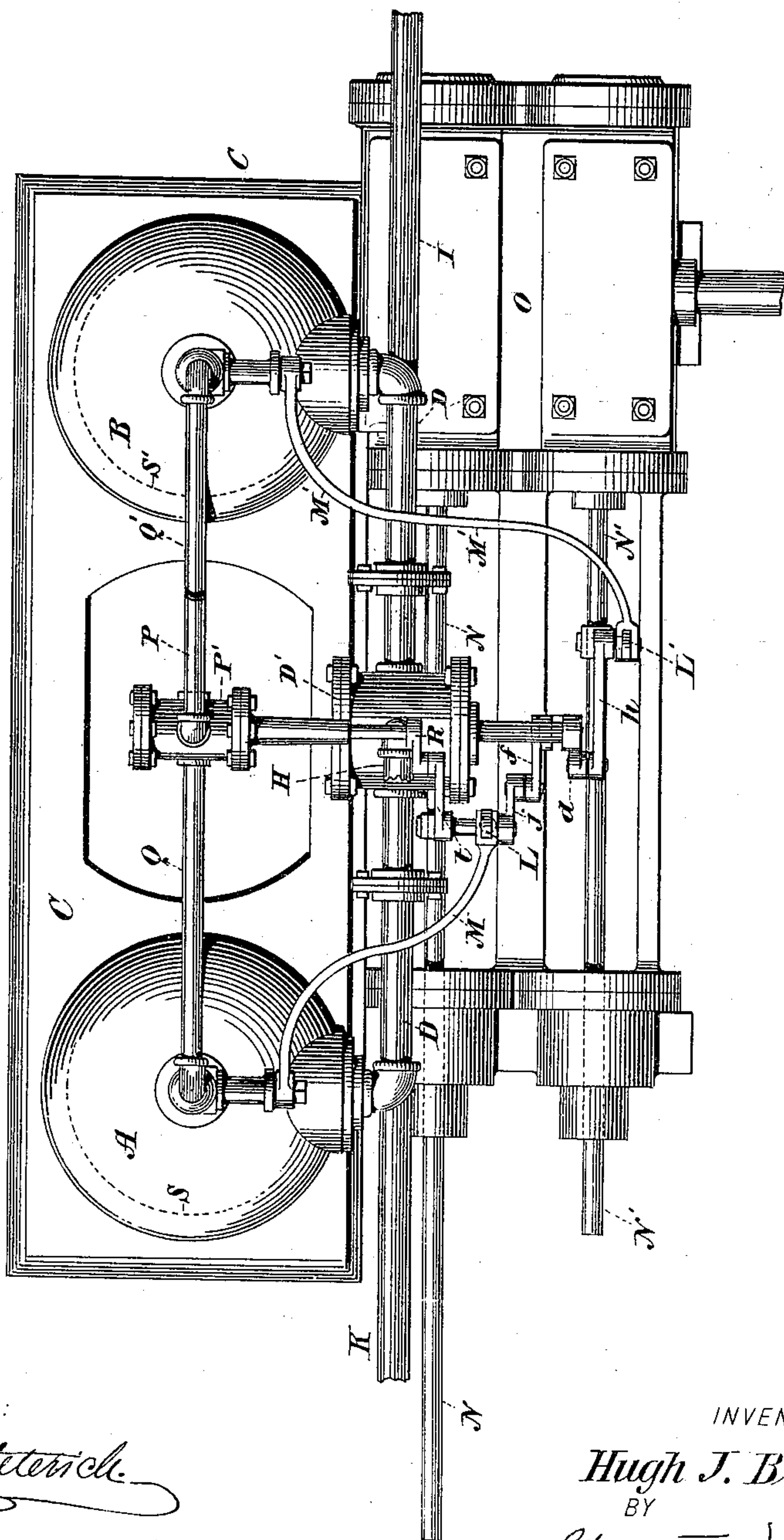
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(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

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APPARATUS FOR REGENERATING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 607,582, dated July 19, 1898.

Application filed February 28, 1898. Serial No. 671,992. (No model.)

To all whom it may concern:

Be it known that I, HUGH J. BARRON, a citizen of the United States, residing at the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Apparatus for Regenerating Exhaust-Steam, of which the following is a full, clear, and exact specification.

My invention relates to improvements in steam-engines, and has for its object more particularly to provide an apparatus adapted for use in connection with stationary, marine, or locomotive engines, whereby it becomes possible to reëvaporate and reutilize the exhaust-steam and the heat thereof, which is now wasted, and thus render the operation of the engine more perfect and economical than has heretofore been possible. These objects above set forth I am enabled to attain by means of my invention, which consists in the novel details of construction and in the combination, connection, and arrangement of parts, as hereinafter more fully described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, wherein like letters of reference indicate like parts, Figure 1 is a side view of an apparatus constructed according to and embodying my invention. Fig. 2 is a top view thereof, showing the valve-operating levers in a vertical position; and Fig. 3 is an enlarged detail section of one of the valves used therein.

In said drawings, A and B designate cylinders supported in a vertical position upon a suitable base C.

D, E, F, and G denote pipes arranged in the order named, beginning at the top, connecting the cylinders A and B, and D', E', F', and G' denote three-way valves arranged in said pipes about midway of the distance between said cylinders A and B.

H denotes the main steam-pipe leading from the boiler to the valve D'; I, the main steam-pipe leading from the valve E' to the engine; J, the main exhaust-pipe, leading from the engine to the valve F', and K the condensation-pipe, leading from the valve G' to a steam-pump or other apparatus for feeding the boiler.

The stems of the valves D' E' F' G' are respectively provided with levers *d e f g*, and L

L' denote long vertical operating-levers, the upper ends of which are pivotally supported by bent arms M M', having their other ends pivotally secured to the tops of the cylinders A and B, and the lower ends of said levers L L' are pivotally secured to the piston-rods N N', respectively, of a duplex direct-acting steam-engine O.

The ends of the valve-stem levers *d* and *e* of the valves D' and E' are connected to the long lever L, near its upper end, by links *h* and *i* and the ends of the valve-stem levers *f* and *g* of the valves F' and G' connected to the long lever L', near its lower end, by links *j* and *k*.

Above the cylinders A and B is a feed-water-supply pipe P, having branches Q and Q', the ends of which are respectively connected to the tops of the cylinders A and B, and P' denotes a three-way valve located in said pipe P at the junction of the branch sections Q Q'. To the end of the stem of said valve P' is secured a lever R, having its outer end connected with the top of the long lever L by a link *l*.

To spray the feed-water within the cylinders A and B, the same are respectively provided with disks S S', which are suspended therein from the tops thereof by means of rods T T', respectively.

The operation is as follows: If we assume the apparatus to be in the position indicated in full lines at Fig. 1, steam will be admitted to the cylinder A through the main steam-pipe H, valve D', pipe D, and thence pass through said cylinder A into the pipe E, valve E', and into the main steam-pipe I to the engine, the exhaust-steam being returned through the main exhaust-pipe J, valve F', pipe F, and into the cylinder B. At about the same time the valve P' of the feed-water-supply pipe P will be opened to admit water to the branch section Q' and cause a small quantity of water to enter the cylinder B and fall upon the disk S' and be sprayed in said cylinder, and thereby sufficiently reduce the temperature of any live steam remaining in said cylinder, and thus facilitate the entrance of exhaust-steam therein. The steam condensing, if there be any, will thence be conducted from said cylinder by the pipe K and again partly fed to the boiler and the apparatus by means of a steam-pump or other apparatus. At this pe-

riod or stage of operation steam under high pressure will be admitted to the engine through the main steam-pipes H and I and the cylinder A, while exhaust-steam will be conducted from the engine through the main exhaust-pipe J and into the cylinder B, the condensation, if any, being conducted from the apparatus by the condensation-pipe K. As soon as the operation above described has taken place the valves D' and E' and the valves F', G', and P' will be reversed by the levers L L', operated by the piston-rods N N' of the engine O, and assume the positions indicated by broken lines at Fig. 1, the valve D' closing a trifle in advance of the valve E'. Hereupon steam will pass from the boiler through the main steam-pipe H, valve D', pipe D into the cylinder B, and there unite with and thereby regenerate the exhaust-steam therein and thence pass out of said cylinder B through the pipe E, valve E', and be conducted to the engine by the main steam-pipe I, the exhaust-steam now being returned from the engine through the exhaust-pipe J, valve F', pipe F, and into the cylinder A, the condensation, if any, being, as heretofore, conducted from the apparatus by the pipe K and recirculated. Immediately hereupon the valves will be again shifted by the operating-levers L L' and the operation first described be repeated, and so on.

It will be observed that by the use of two cylinders or receptacles, each of which intermittently receives steam under high and low pressure, the same alternately become the high or plus pressure and the low or minus pressure receptacles, and by means of the valve mechanism I am enabled to normally maintain steam under high pressure intermediate the boiler and engine and steam under lower pressure (exhaust-steam) intermediate the engine and the boiler or apparatus.

It will be further observed that my apparatus is applicable to engines of every character, whether used for stationary, marine, or locomotive purposes, and that the valve mechanism may be operated directly by the engine or by any suitable or convenient independent mechanism.

Without limiting myself to the details of construction or the precise arrangement of parts, which may be varied to suit the conditions of use without departing from the spirit of the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a boiler and engine of an apparatus adapted to receive steam interposed between said boiler and engine and communicating therewith, and valve mechanism for intermittently supplying steam to a portion of said apparatus prior to admitting the same to the engine, substantially as specified.

2. The combination with a boiler and engine of an apparatus adapted to receive steam interposed between said boiler and engine and communicating therewith, and valve mechanism

for intermittently supplying steam to a portion of said apparatus prior to its admission to the engine, and intermittently supplying steam to a portion of said apparatus after its admission to, and discharge from the engine, substantially as specified.

3. The combination with a boiler and engine of an interposed apparatus communicating therewith and adapted to receive steam under different pressures, and valve mechanism for constantly supplying steam from the boiler to a portion of said apparatus, substantially as specified.

4. The combination with a boiler and engine of an interposed apparatus communicating therewith comprising a plurality of receptacles, adapted to receive steam, and valve mechanism for intermittently supplying steam to a part of said receptacles, substantially as specified.

5. The combination with a boiler and engine of an interposed apparatus communicating therewith comprising a plurality of receptacles adapted to receive steam, and valve mechanism for alternately supplying steam to said receptacles, substantially as specified.

6. The combination with a boiler and engine of an apparatus for the purposes specified interposed between said boiler and engine and communicating therewith comprising a plurality of receptacles adapted to receive steam under high and relatively low pressures, valve mechanism for reversing the course of the fluids through said receptacles, and means for reducing the temperature of steam which may be confined in said receptacles prior to the admission of relatively low-pressure steam thereto, substantially as specified.

7. The combination with a boiler and engine of an apparatus for the purposes specified communicating therewith comprising a receptacle for steam interposed between the boiler and high-pressure side of the engine, a receptacle for steam interposed between the boiler and low-pressure side of the engine, and valve mechanism for reversing the course of the fluids through said receptacles, substantially as specified.

8. The combination with a boiler and engine of an interposed apparatus communicating therewith adapted to receive steam, comprising a high-pressure receptacle and a relatively low-pressure receptacle, and valve mechanism for converting the said receptacle, substantially as specified.

9. The combination with a boiler and engine of an interposed apparatus communicating therewith comprising two receptacles adapted to alternately receive steam under high and relatively low pressures, and valve mechanism for admitting steam under high pressure to the receptacle containing steam under relatively low pressure, substantially as specified.

10. The combination with a boiler and engine of an apparatus for the purposes speci-

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fied communicating therewith comprising two receptacles adapted to alternately receive steam under high and relatively low pressures, and valve mechanism for intermittently admitting steam under high pressure to one of said receptacles, and steam under relatively low pressure to the other of said receptacles, substantially as specified.

11. The combination with a boiler and engine of an interposed apparatus communicating therewith comprising two receptacles adapted to alternately receive steam under high and relatively low pressures, and valve mechanism for simultaneously admitting steam under high pressure to the receptacle containing steam under low pressure, and steam under low pressure to the other receptacle, substantially as specified.

12. The combination with a boiler and engine of an interposed apparatus comprising two receptacles adapted to receive steam, a main live-steam-inlet pipe, a main live-steam-outlet pipe, and an exhaust-steam-inlet pipe, all common to said receptacles, valve mechanism for alternately admitting live steam to one of said receptacles, and exhaust-steam to the other of said receptacles, and means for shifting said valve mechanism, substantially as specified.

13. An apparatus for the purposes specified, comprising two receptacles, a live-steam-inlet pipe common to said receptacles, a live-steam-outlet pipe common to said receptacles, an exhaust-steam-inlet pipe common to said receptacles, valve mechanism arranged in said pipes for alternately admitting live and exhaust steam to said receptacles, and means for operating said valve mechanism, whereby to simultaneously permit live steam to enter one of said receptacles, and exhaust-steam to enter the other of said receptacles, substantially as specified.

14. An apparatus for the purposes specified comprising two receptacles, a live-steam-inlet pipe having branch sections each connected to one of said receptacles, a live-steam-outlet pipe having branch sections likewise connected to said receptacles, an exhaust-steam-inlet pipe having branch sections likewise connected to said receptacles, and an outlet-pipe having branch sections and likewise connected to said receptacles, three-way valves located in the aforesaid pipes at the junctions of the main and branch sections, and means for shifting said valves, substantially as specified.

15. An apparatus for the purposes specified comprising two receptacles; a live-steam-inlet pipe having branch sections connected to said receptacles, and a three-way valve at the junction of the main and branch sections, a live-steam-outlet pipe likewise connected to said receptacle and provided with a three-way valve at the junction of its main and branch sections, said valves normally communicating with the live-steam inlet and outlet pipes and one of said receptacles; an exhaust-steam-

inlet pipe having branch sections connected to said receptacles, and a three-way valve at the junction of its main and branch sections, and an outlet-pipe having branch sections likewise connected to said receptacles and provided with a three-way valve at the junction of its main and branch sections, said valves normally communicating with said last-named outlet-pipe, and the exhaust-inlet pipe and the other of said receptacles, and operating-levers having their upper ends pivotally supported, one of said levers being adapted to operate the valves of the live-steam inlet and outlet pipes, and the other of said levers adapted to operate the valves of the exhaust-steam-inlet pipe and the outlet-pipe, substantially as specified.

16. An apparatus for the purposes specified comprising two receptacles, pipes D, E, F, G connecting said receptacles, a main steam-inlet pipe H connected to the pipe D, a main steam-outlet pipe I connected to the pipe E, a main exhaust-steam pipe J connected to the pipe F, an outlet-pipe K connected to the pipe G, a feed-water-inlet pipe P having branches Q, Q' connected to the receptacles, three-way valves D', E', F', G', P' arranged in pipes D, E, F, G and P respectively, said valves being provided with arms at the ends of their stems, links pivotally connected to the ends of said stems, arms M, M' each having one of its ends pivotally secured to the top of one of the receptacles, and operating-levers L, L', said lever L being pivotally connected at its upper end to the end of the arm M, and the link of the arm of the valve P', and adjacent to its upper end to the arms of the valves D' and E', and said lever L' pivotally connected at its upper end to the arm M', and adjacent to its lower end to the arms of the valves F' and G', substantially as specified.

17. An apparatus for the purposes specified, comprising two receptacles, a live-steam-inlet pipe common to said receptacles, a live-steam-outlet pipe common to said receptacles, an exhaust-steam-inlet pipe common to said receptacles, valve mechanism arranged in said pipes for alternately admitting live and exhaust steam to said receptacles, a water-supply pipe common to said receptacles, and valve mechanism arranged in said water-supply pipe, and means for operating the valve mechanism, first mentioned, whereby to simultaneously permit live steam to enter one of said receptacles, and exhaust-steam to enter the other of said receptacles, and the valve mechanism, last mentioned, to permit water to enter said receptacles prior to the admission of exhaust-steam thereto, substantially as specified.

Signed at the city of New York, in the county and State of New York, this 26th day of February, 1898.

HUGH J. BARRON.

Witnesses:

GUSTAVE DIETERICH,
JOHN KEHLENBECK.