No. 617,620. Patented Jan. 10, 1899.

R. L. WEIGHTON & D. B. MORISON.

ENGINE HAVING TWO OR MORE CYLINDERS.

(Application filed Dec. 22, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 3.

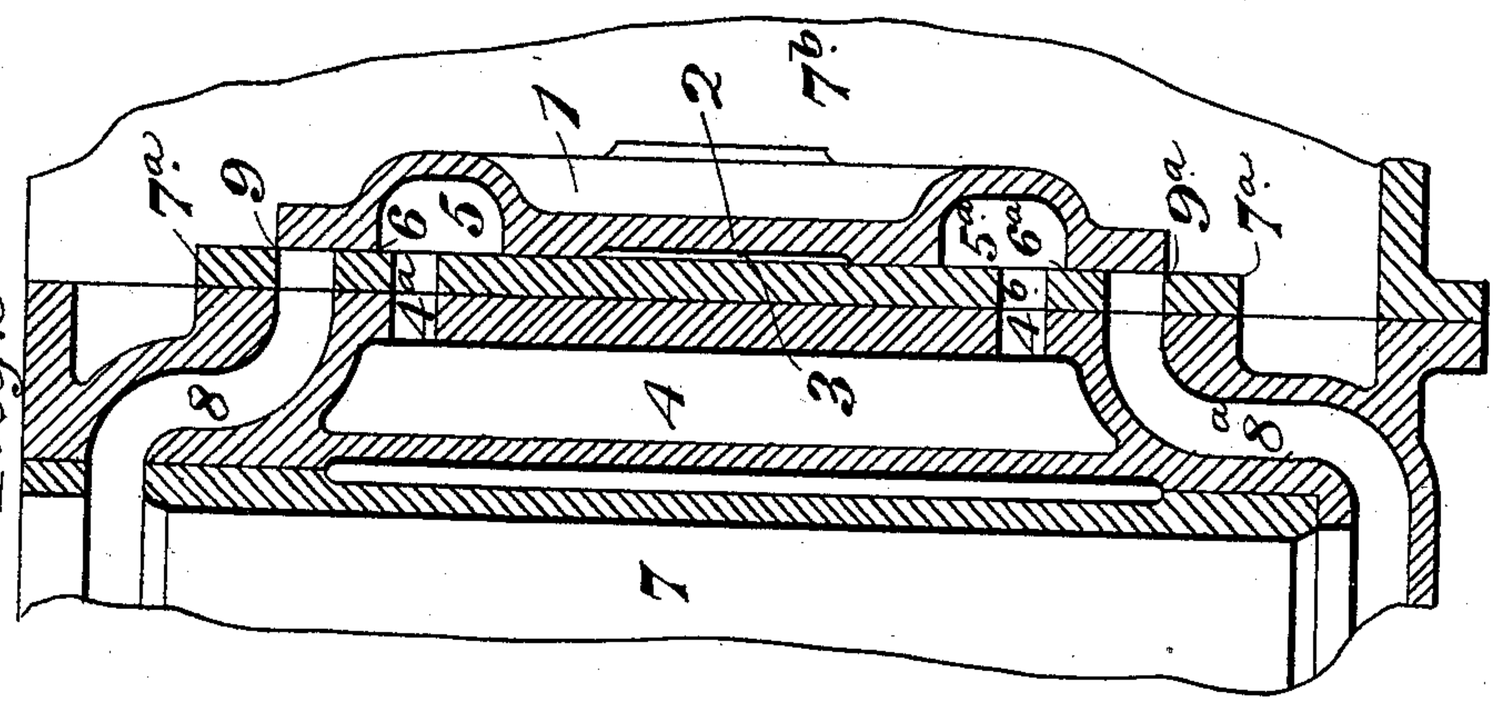

Fig. 2.

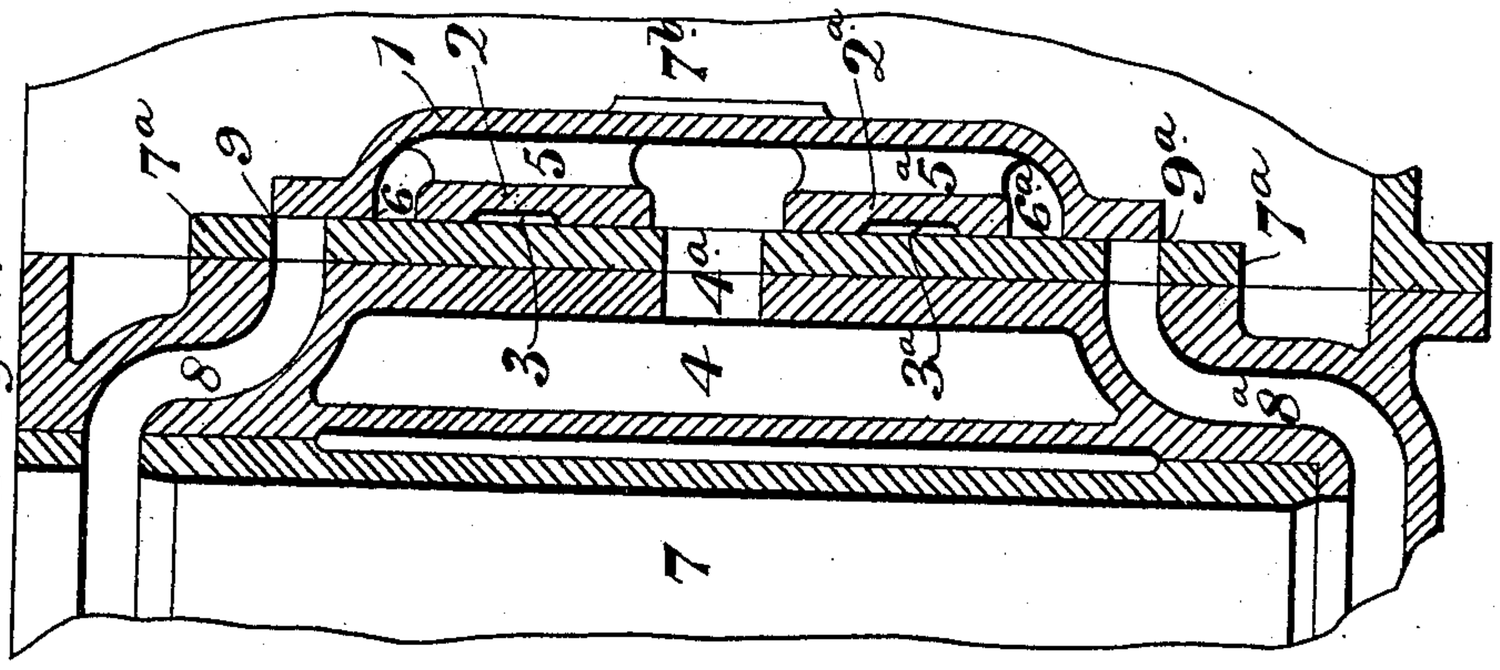

Fig. 1.

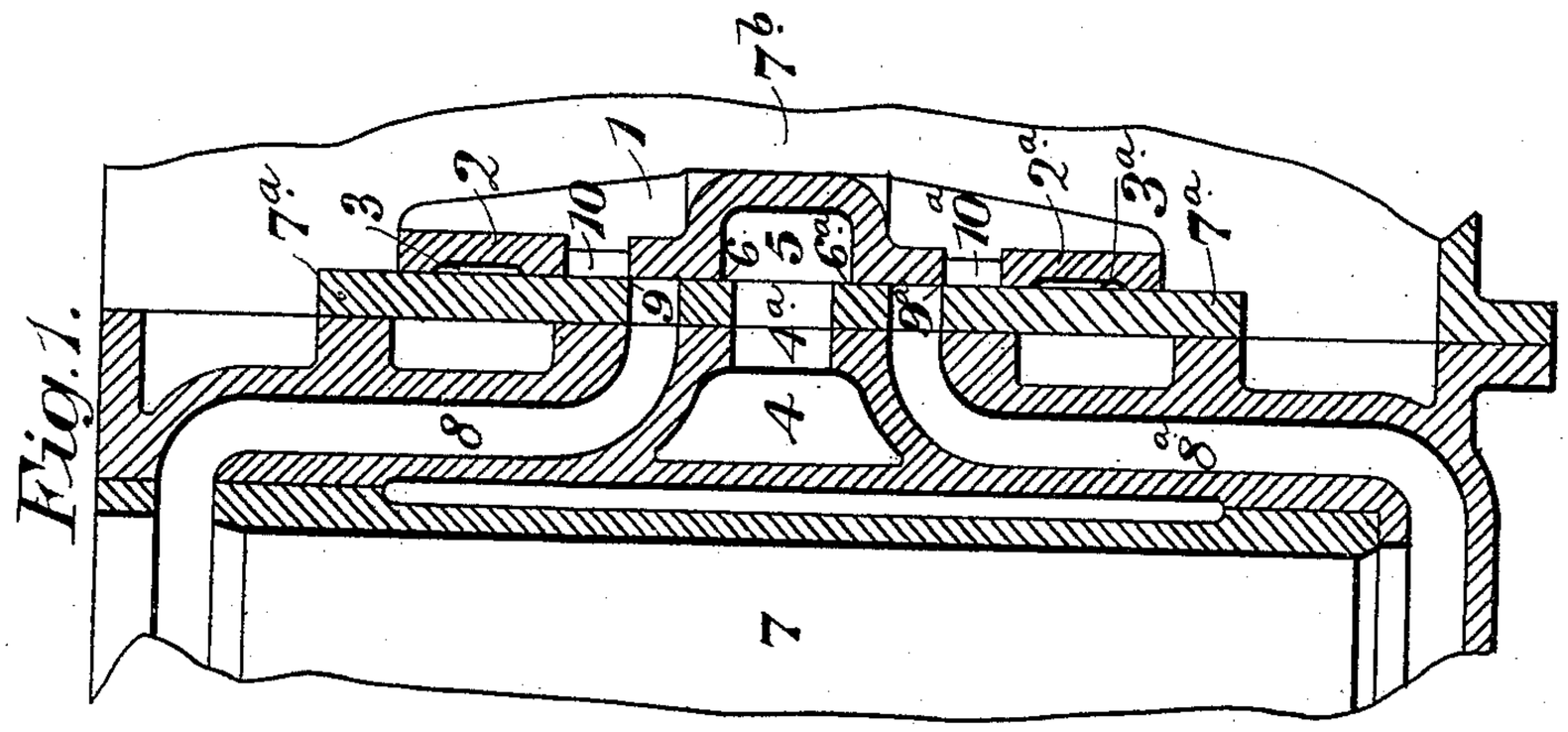

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Fig. 4.

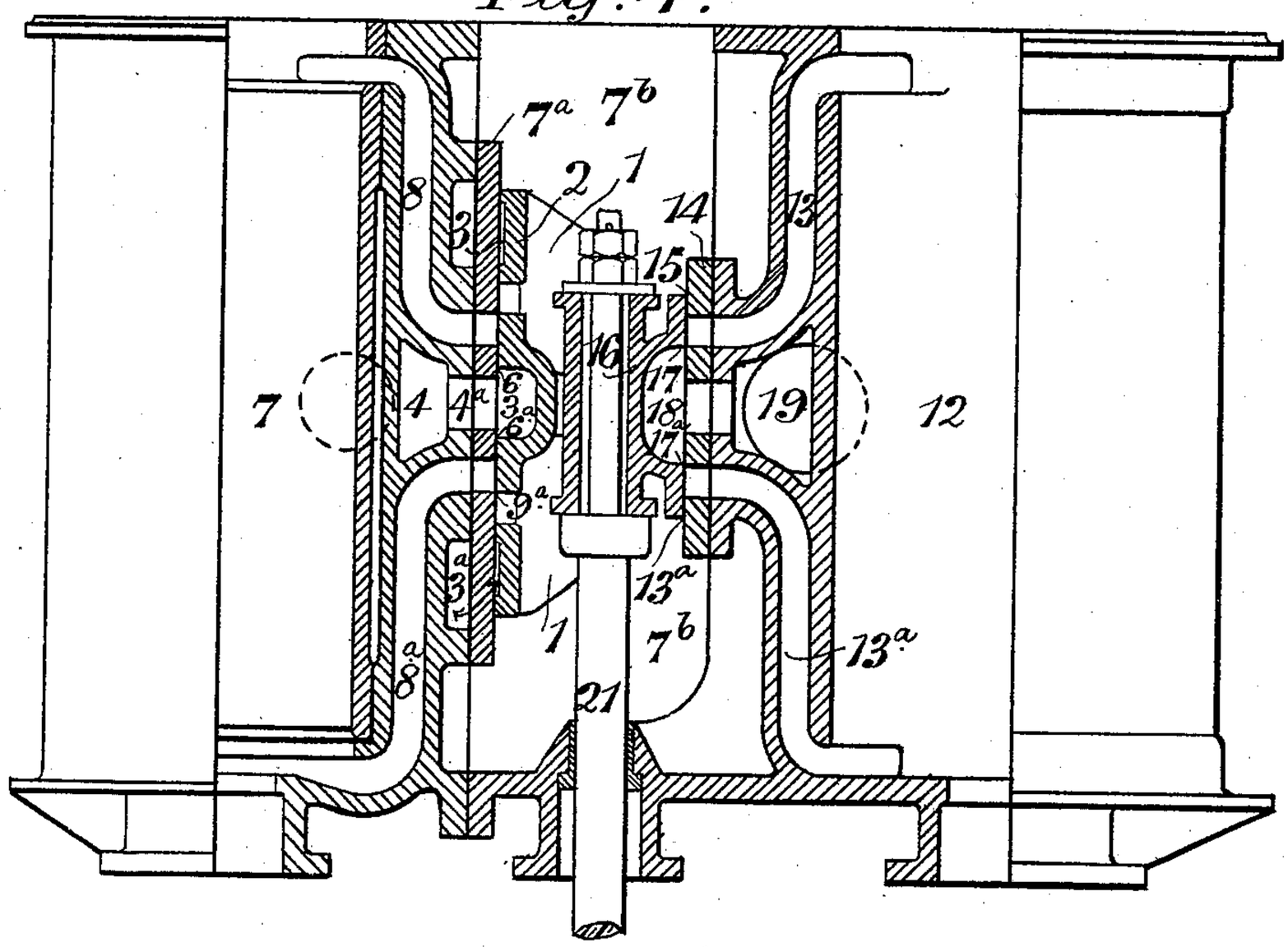


Fig. 5

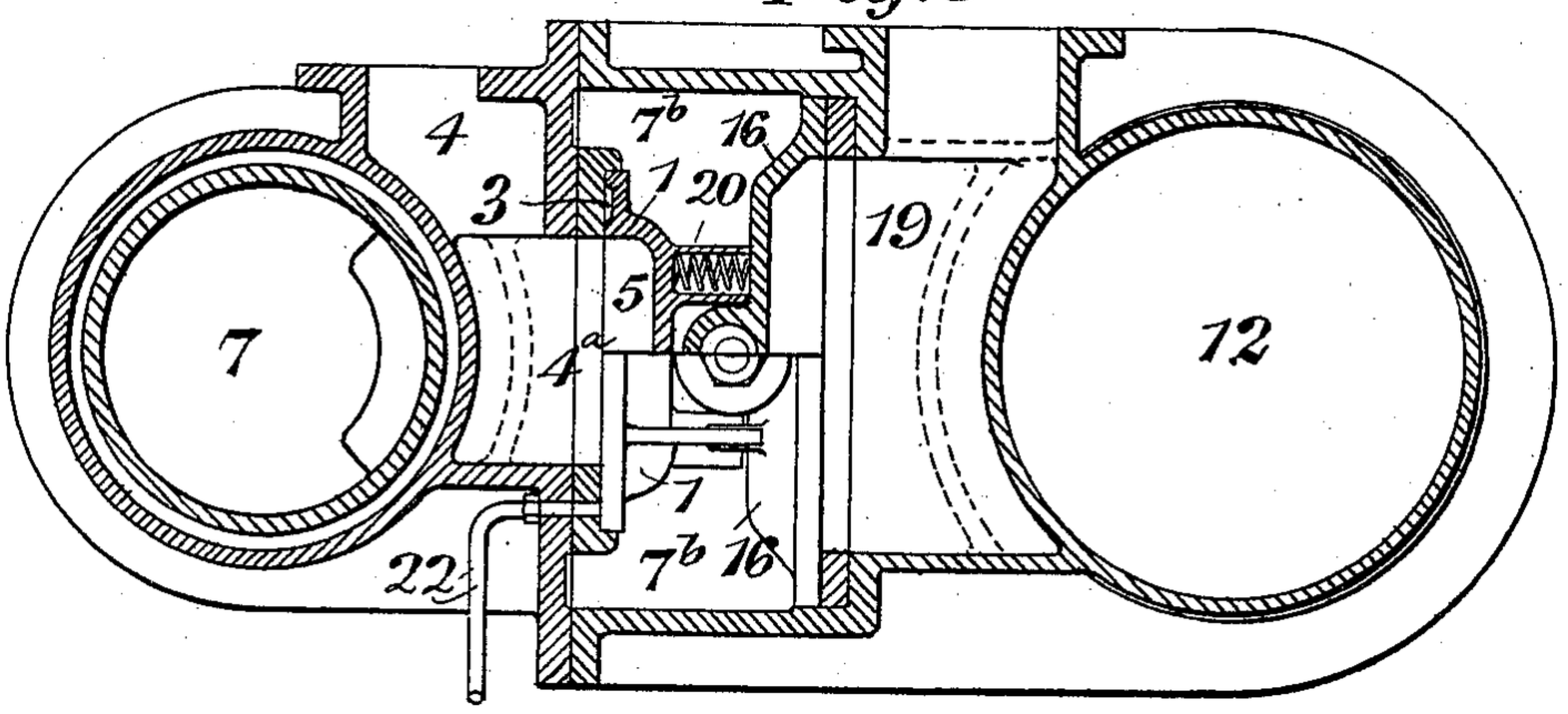
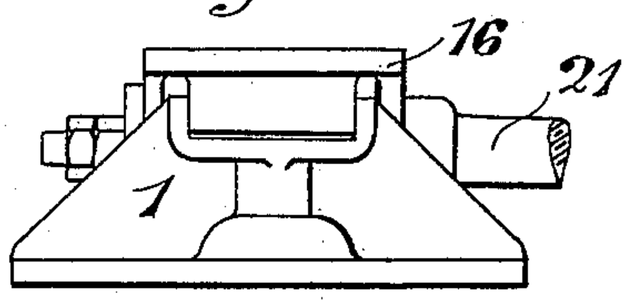


Fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT LUNAN WEIGHTON, OF NEWCASTLE-UPON-TYNE, AND DONALD BARNS MORISON, OF HARTLEPOOL, ENGLAND.

ENGINE HAVING TWO OR MORE CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 617,620, dated January 10, 1899.

Application filed December 22, 1897. Serial No. 662,987. (No model.)

To all whom it may concern:

Be it known that we, ROBERT LUNAN WEIGHTON, residing at Newcastle-upon-Tyne, in the county of Northumberland, and DONALD BARNS MORISON, residing at Hartlepool, in the county of Durham, England, subjects of the Queen of Great Britain and Ireland, have invented Improvements in Engines Having Two or More Cylinders, (for which I have obtained a patent in Great Britain, dated August 11, 1896, No. 17,732,) of which the following is a specification.

Our invention has reference to improved constructions of engines in which particular arrangements and methods of balancing or relieving the valves are adopted and in which the valves of two or more cylinders working upon two cranks are actuated by one set of valve-gear.

In the case of a steam-distribution valve of the flat or slide type for a cylinder of a multiple-expansion engine we so arrange that supply-steam is first admitted to the central portion of the valve, the inside edges of the valve constituting the admission and cut-off edges and the outside edges the release and compression edges. The valve when working under steam is kept in contact with the valve-seat on the cylinder by the action of extensions of the valve-face, which afford an increased area to be acted upon by the steam-pressure in the receiver in which the valve works. These extensions of the valve-face may be made either at the ends or at the sides of the valve or in both directions, as may be found convenient in particular cases, and these extensions of the valve or the valve-seat on the cylinder, or both, are or may be recessed on the face and such recesses connected by a pipe or pipes or otherwise, as found convenient, to any suitable source of lower steam-pressure—*e. g.*, to another receiver of the engines, to the hot-well, the condenser, or the atmosphere.

To assist in retaining the valve on its seat or to insure that it will readily take its seat after the engine starts, a spring or springs or other suitable means may be used, as found necessary or convenient.

The valve above described being a valve in equilibrium or a valve relieved from the load due to steam-pressure to any desired degree, it obviously may with advantage be used in any arrangement of multiple-expansion engines, independent of the nature of the valve-gear or of the angles at which the cranks are set.

In the case of any two consecutive cylinders of multiple-expansion engines in which the exhaust-steam of the first cylinder is the supply-steam of the second cylinder and which cylinders work on separate cranks, the valves being driven by one set of valve-gear, we arrange valves of the flat or slide type back to back in a common chamber or receiver. The valve of the first or higher-pressure cylinder is a valve of the type described in the first part of this specification, supply-steam being first admitted to its central portion, whence its distribution to the cylinder is governed by the inside edges of the valve, the exhaust taking place over its outside edges into the containing-receiver and the valve being kept up to its seat when working by means of the provisions already described. The valve of the second or lower-pressure cylinder is a flat or slide valve, taking steam in the reverse manner from the first valve, the outside edges governing the admission and cut-off and the inside edges the release and compression. The two valves are suitably connected together and are driven by means of one spindle and one set of driving-gear, and their relative positions may be adjusted and maintained by a spring or springs or by other means, as may be found necessary or convenient, the steam passing from the first to the second cylinder directly through the containing chamber or receiver, in which both valves work.

In order that our invention may be fully understood, we append two sheets of explanatory drawings, Figures 1, 2, and 3 showing in vertical section three various constructions of our balanced valve, and Figs. 4 and 5 showing in sectional elevation and sectional plan, respectively, an arrangement in which the valves of two consecutive cylinders are driven

by one set of valve-gear. Fig. 6 illustrates in elevation a method by which the valves illustrated in Figs. 4 and 5 are connected to enable them to be driven by one spindle and one set of valve-gear.

Referring to Fig. 1, the valve 1 is arranged with extensions 2 2^a, which may be provided with recesses 3 3^a, connected (by pipe or otherwise) to any source of lower pressure—such as another receiver, the hot-well, or condenser. We prefer that communication between the recesses 3 3^a and the source of lower pressure should be established by means of a passage formed through the valve-seat and a fixed pipe connected thereto as, shown at 22, Fig. 5; but a passage might be formed for the same purpose through the valve itself, the connecting-pipe in that case being attached to the valve so as to move with it and being arranged to work through stuffing-boxes where necessary. Recesses are here shown in the valve-face only; but they may equally be formed in the valve-seat, or in both. Supply-steam is admitted through the passage 4 and port 4^a to the central portion 5 of the valve I, the inside edges 6 6^a forming the admission and cut-off edges, and steam enters the cylinder 7 through the ports 8 8^a in the usual manner. The release and compression are controlled by the outside edges 9 9^a, the exhaust taking place through the ports 10 10^a into the chamber or receiver 7^b. It will be seen that by means of the extensions 2 2^a and other extensions, if any, the increased area of the valve I, acted upon by the steam-pressure in the receiver 7^b, may be so arranged and adjusted that the valve is relieved or balanced to any desired extent and retained in position on the valve-face 7^a.

Fig. 2 is a modification in which the extensions 2 2^a are arranged between the ports of the valve I, steam-supply being admitted through the passage 4 and port 4^a to the inside portions 5 5^a, which correspond with the central portion 5 in Fig. 1.

Fig. 3 is a further modification in which there is a single extension 2 of the valve I, the inside portions 5 5^a corresponding with the central portion 5 in Fig. 1. Steam-supply is admitted through the passage 4 and ports 4^a 4^b in the cylinder-face, these ports corresponding with the port 4^a in Figs. 1 and 2.

Figs. 2 and 3 show two modifications embodying this invention; but it is evident that various other modifications may be employed, depending on the particular design of engine to which they may be applied. In Figs. 1, 2, and 3 extensions are shown at the ends of the valves only. It is, however, obvious that the sides of the valves, as in Fig. 5, may be also extended and recessed to any degree necessary for the efficient working of the valve.

Fig. 4 shows an arrangement in which the valves of two consecutive cylinders of a multiple-expansion engine are driven by means of one set of valve-gear, the construction of the valve I of the first cylinder 7 being similar to that described with reference to Fig. 1, steam exhausting into the receiver 7^b, whence the second cylinder draws its supply. The second cylinder 12, with its ports 13 13^a and valve-face 14, takes steam in the reverse manner—that is to say, the outside edges 15 15^a of the valve 16 form the admission and cut-off edges, the inside edges 17 17^a governing the release and compression, exhaust taking place through the central portion 18 and passage 19. The relative positions of the valves 1 and 16 are adjusted and maintained by springs 20 or other suitable means, the single spindle 21 forming the driving-gear.

For the sake of clearness in the drawings we have shown the valves as single-ported only; but it is obvious the ports may be increased to two or more, as desired.

We wish it to be understood that we do not claim as our invention the mere driving of two valves for two separate cylinders by one set of valve-gear, nor do we claim a slide-valve so arranged as to take steam into the inside of the valve and exhaust it at the outside, as we are aware that both of these arrangements have been used; but

What we do claim is—

1. The combination with a steam-cylinder having a valve-seat, and having passages 8, 8^a, from the ends of the cylinder to separate points of the valve-seat, and a steam-inlet passage extending to said valve-seat intermediate the first-mentioned passages, of a flat slide-valve on the valve-seat having outer parts 9, 9^a controlling the passages from the ends of the cylinder and having an intermediate chambered part with edges 6, 6^a controlling the connection of the steam-inlet to passages 8, 8^a, said valve having extensions to increase its area, and a steam-chamber inclosing the valve and into which steam from the cylinder is exhausted.

2. The combination with a steam-cylinder having a valve-seat, and having passages 8, 8^a from the ends of the cylinder to separate points of the valve-seat, and a steam-inlet passage extending to said valve-seat intermediate the first-mentioned passages, of a slide-valve on the valve-seat having outer parts 9, 9^a controlling the passages from the ends of the cylinder and having an intermediate chambered portion with edges 6, 6^a controlling the connection of the steam-inlet to passages 8, 8^a, said valve having extensions to increase its area, said extensions or the valve-seat, or both being recessed on the working faces, a connection from said recess or recesses to a source of lower pressure, and a steam-chamber inclosing the valve and into which the steam from the cylinder is exhausted.

3. The combination of two consecutive cylinders of a multiple-expansion engine having valve-seats, passages from the ends of the

cylinders to the valve-seats, and passages intermediate thereto, a steam-chamber between the cylinders, slide-valves within said chamber controlling passages to both cylinders, one set of valve-gear operating both valves, the valve of the higher-pressure cylinder being provided with extensions of its face in the manner and for the purpose substantially as described and illustrated; said valve admitting steam at its central part and exhausting at outer parts into the steam-chamber, the valve for the low-pressure cylinder admitting and exhausting steam in a reverse manner, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ROBERT LUNAN WEIGHTON.
DONALD BARNS MORISON.

Witnesses to the signature of the said Robert Lunan Weighton:
HARRY BENSON,
PERCY CORDES.
Witnesses to the signature of the said Donald Barns Morison:
T. HARRY TILLY,
J. BARRWELL STROVER.