

No. 628,974.

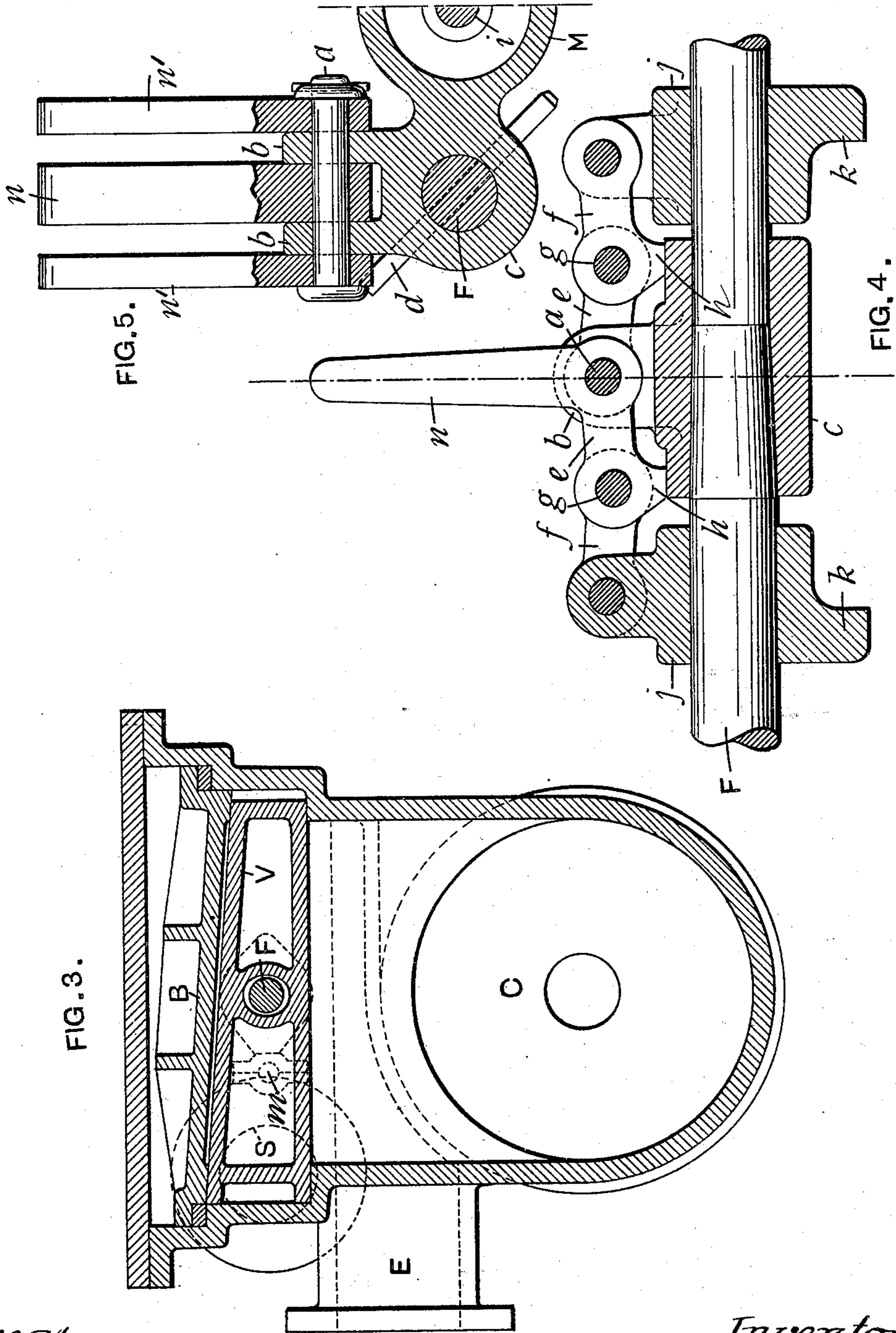
Patented July 18, 1899.

W. D. WIGHT & M. B. WILD.
STEAM ENGINE.

(Application filed Dec. 12, 1898.)

(No Model.)

3 Sheets—Sheet 2.



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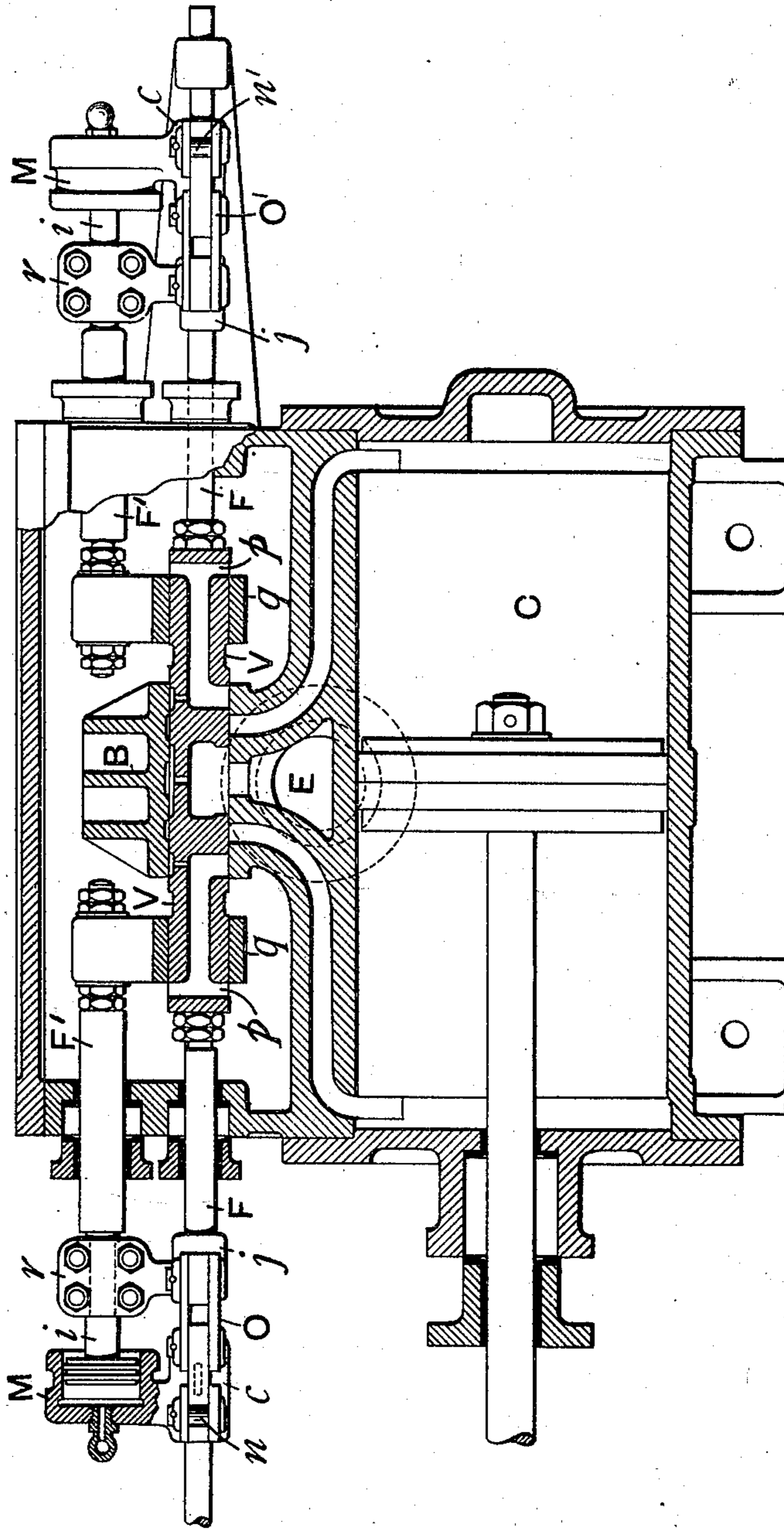
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FIG. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM DUNDAS WIGHT, OF PONTYPRIDD, AND MATTHEW BROWN WILD,
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STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 628,974, dated July 18, 1899.

Application filed December 12, 1898. Serial No. 699,002. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM DUNDAS WIGHT, residing at Pontypridd, in the county of Glamorgan, and MATTHEW BROWN WILD, residing at Birmingham, in the county of Warwick, England, citizens of Great Britain, have invented certain new and useful Improvements in Steam-Engines, (for which we have obtained a patent in Great Britain, No. 12,056, dated the 27th day of May, 1898,) of which the following is a full, clear, and exact description.

This invention relates to valves and valve-gear of steam-engines and similar motors actuated by expansible fluids; and its object is to provide mechanism and devices whereby a positive and variable cut-off of the expansible fluid may be secured.

In carrying out our invention we actuate the cut-off valve from the main-valve spindle through the toggle-joint gear hereinafter particularly described.

In the accompanying drawings, to which reference is hereinafter made, Figure 1 represents a partial side elevation of the valves and valve-motion in an engine having separate valves at opposite ends of the cylinder. Fig. 2 is a sectional plan corresponding with Fig. 1. Fig. 3 shows a cross-section through the valves. Fig. 4 illustrates a side elevation of the trip-gear; Fig. 5, a cross-section of Fig. 4, and Fig. 6 a sectional plan of an engine having a single steam-chest and central valves.

The toggle-joint trip-gear is arranged upon and in connection with the main spindle F, which receives the motion from the crank-shaft in the usual way by means of an eccentric or otherwise. It consists of a toggle-joint O O' for each cut-off valve. As indicated by Figs. 1 and 2, the toggle-joints may be arranged together for engines having a long stroke, or for engines having a short stroke they may be arranged at opposite ends of the cylinder, as indicated by Fig. 6.

As shown by Figs. 4 and 5, the central pin *a* of the duplex toggle-joint is secured in a lug or lugs *b b* on a cross-head *c*, which also carries the duplex dash-pot M. The two pistons of this dash-pot are respectively fixed upon the corresponding ends of the valve-spindles *i i*, which operate the cut-off valves.

If, however, the trip-gear is arranged at opposite ends of the cylinder, as illustrated by Fig. 6, two separate dash-pots are required, one in connection with each part of the trip-gear, and each dash-pot is carried upon a suitable part of the main-valve spindle or an extension thereof, as shown. The cross-head *c* may be secured upon the spindle by means of a pin *d* or otherwise. Those links *e e* of the toggle-joints which are secured to the pin *a* are pivoted to the links *f f* by the pins *g g*, below which there may be formed upon one or other of the links *e f* a slight projection *h h*, which can rest upon the cross-head *c*, as shown by Fig. 4, and thus prevent the downward bending of the toggle-joint. The outer ends of the outer links *f f* are pinned to cross-heads *j j*, fixed upon the expansion-valve spindle and sliding upon the main-valve spindle. These cross-heads have projections *k k* thereon, which are brought into contact with the adjustable spring buffer-blocks *l l*, Fig. 1, by means of the steam-pressure acting upon the cut-off-valve spindle. These blocks are fixed upon a stationary rod *m*, parallel with the valve-spindles, for a purpose to be hereinafter described. The ends of the links *e e* are turned upward above the center pin *a* to form the tailpieces *n n'*.

The bending of the toggle-joint at the proper moment may be effected by means of the two arms *o o'*, which are respectively connected with the governor in such a manner that with an increase of speed in the engine the two arms *o o'* are brought closer together, as indicated by the dotted lines, Fig. 1, while with a reduction of speed they separate or open out. On one side the tailpieces *n' n'* are brought into contact with corresponding arms *o' o'* and on the other side the tailpiece *n* is brought into contact with the arm *o*. In either case the tailpiece is turned upon its pivot, and that toggle-joint with which it is connected is bent, as also indicated by dotted lines in Fig. 1.

Steam has access to the main valve V through the ports *p p*, which can be opened or closed by the relative motion of the cut-off valve *q*. The motion of the cut-off valve can occur only when the toggle-joint has been bent. When this occurs, the steam-pressure acting on the unbalanced area of the cross-

section of the cut-off-valve spindle instantly forces it outward. The cross area of this spindle may be increased by fixing upon it a tubular casing F'. The motion of the valve in the opposite direction is obtained from the eccentric by the restraighening of the toggle-joint. This is permitted by the cross-heads *j j* being rigidly connected with the cut-off-valve spindles at the points *r r*, thereby enabling that spindle to have the same motion as the main-valve spindle when the toggle-joint is straight. The reopening of the closed port *p* is effected by the contact of the projection *k* on the cross-head *j* with the stop *l*, by which the motion of the cut-off valve is delayed, while that of the main valve continues, carrying with it the ends of the links *e* until the toggle-joint is straightened.

It will be understood that various modifications may be made in the arrangement of the valve-gear. Thus instead of attaching the cylinders of the dash-pot or dash-pots to the main-valve spindle and the pistons to the cut-off-valve spindles that arrangement may be reversed. Also instead of the dash-pots any equivalent cataract motion or springs or buffers may be employed.

The main valve is preferred to be beveled upon its back face, as shown by Fig. 3, where it is represented as provided with the balance-plate B.

The dash-pots may be furnished with snifting-valves and petcocks, by means of which the cushioning may be regulated and a noiseless compression obtained.

The parts of the engine illustrated and not hereinbefore referred to are the steam-inlet S, the exhaust-outlet E, and the cylinder C.

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

1. In the valve-gear of engines operated by expansible fluids, the combination and arrangement of a main-valve spindle actuated by the crank-shaft, with a cut-off-valve spindle operated by direct steam-pressure and by the main-valve spindle, a toggle-joint having one end connected with the main-valve spindle and the other end connected with the cut-off-valve spindle, a tailpiece on the toggle-joint whereby the joint may be bent, two arms *o o'* controlled by the engine-governor and serving to bend the toggle-joint by its tailpiece *n*, stops on the toggle-joint to prevent its bending in the wrong direction, a dash-pot or buffer for each cut-off-valve spindle, a cross-head *j* with a projection *k* cooperating with a stop *l* to reopen the closed admission-port, a main valve with a steam-admission port at its end, and a cut-off valve sliding upon and surrounding the end of the main valve and adapted to open and close the steam-admission port therein, substantially as set forth.

2. In the valve-gear of engines operated by expansible fluids, the combination and ar-

range-ment of a main-valve spindle actuated by the crank-shaft, with a cut-off-valve spindle operated by direct steam-pressure and by the main-valve spindle, a toggle-joint having one end connected with the main-valve spindle and the other end with the cut-off-valve spindle, a tailpiece on the toggle-joint whereby the joint may be bent, two arms *o o'* controlled by the engine-governor and serving to bend the toggle-joint by its tailpiece *n*, stops on the toggle-joint to prevent its bending in the wrong direction, a dash-pot or buffer for each cut-off-valve spindle, and a cross-head *j* with a projection *k* cooperating with a stop *l* to reopen the closed admission-port, substantially as described.

3. In engines operated by expansible fluids and in which the cut-off valve is actuated or controlled by the main-valve spindle, a toggle-joint having one end connected with the main-valve spindle and the other end with the cut-off-valve spindle, in combination with a tailpiece on the toggle-joint whereby the joint may be bent, two arms *o o'* controlled by the engine-governor and serving to bend the toggle-joint by its tailpiece *n*, stops on the toggle-joint to prevent its bending in the wrong direction, a dash-pot or buffer for each cut-off-valve spindle, and a cross-head *j* with a projection *k* cooperating with a stop *l* to reopen the closed admission-port, substantially as described.

4. In engines operated by expansible fluids and in which the cut-off valve is actuated or controlled by the main-valve spindle, a toggle-joint having one end connected with the main-valve spindle and the other end with the cut-off-valve spindle, a tailpiece on the toggle-joint whereby the joint may be bent, two arms *o o'* controlled by the engine-governor and serving to bend the toggle-joint by its tailpiece *n*, and stops on the toggle-joint to prevent its bending in the wrong direction, substantially as described.

5. In engines operated by expansible fluids and in which the cut-off valve is actuated or controlled by the main-valve spindle, a toggle-joint having one end connected with the main-valve spindle and the other end with the cut-off-valve spindle and a tailpiece whereby the joint may be bent by suitable arms or stops, substantially as described.

6. In engines operated by expansible fluids, a main valve having steam-admission ports at one or each end in combination with a cut-off collar-valve surrounding and sliding upon the end or each end of the main valve and adapted to open and close the said admission-ports, substantially as described.

In witness whereof we subscribe our signatures in presence of two witnesses.

WILLIAM DUNDAS WIGHT.
MATTHEW BROWN WILD.

Witnesses:

D. LLEWELLYN TREHARNE,
HENRY WALKER.