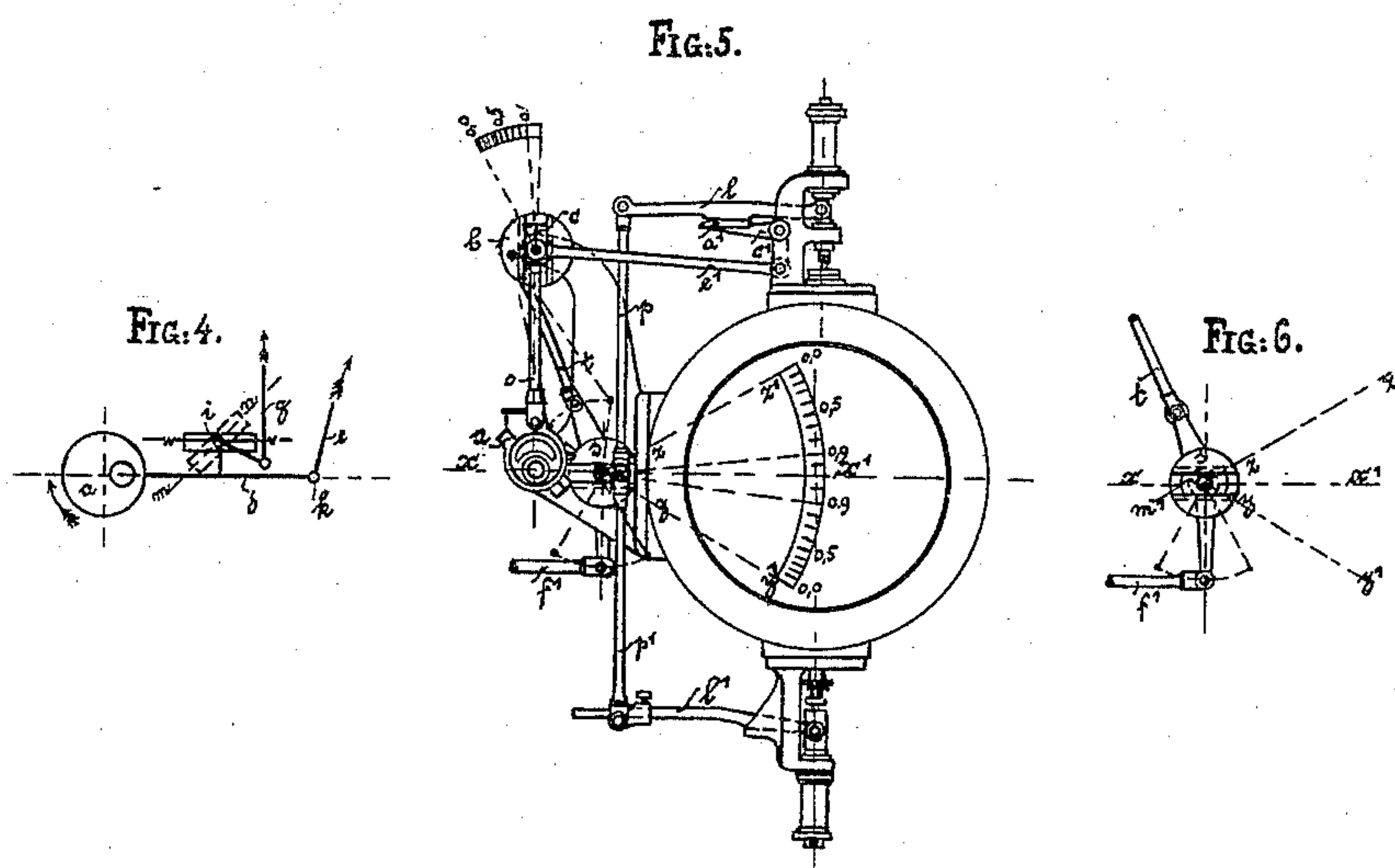
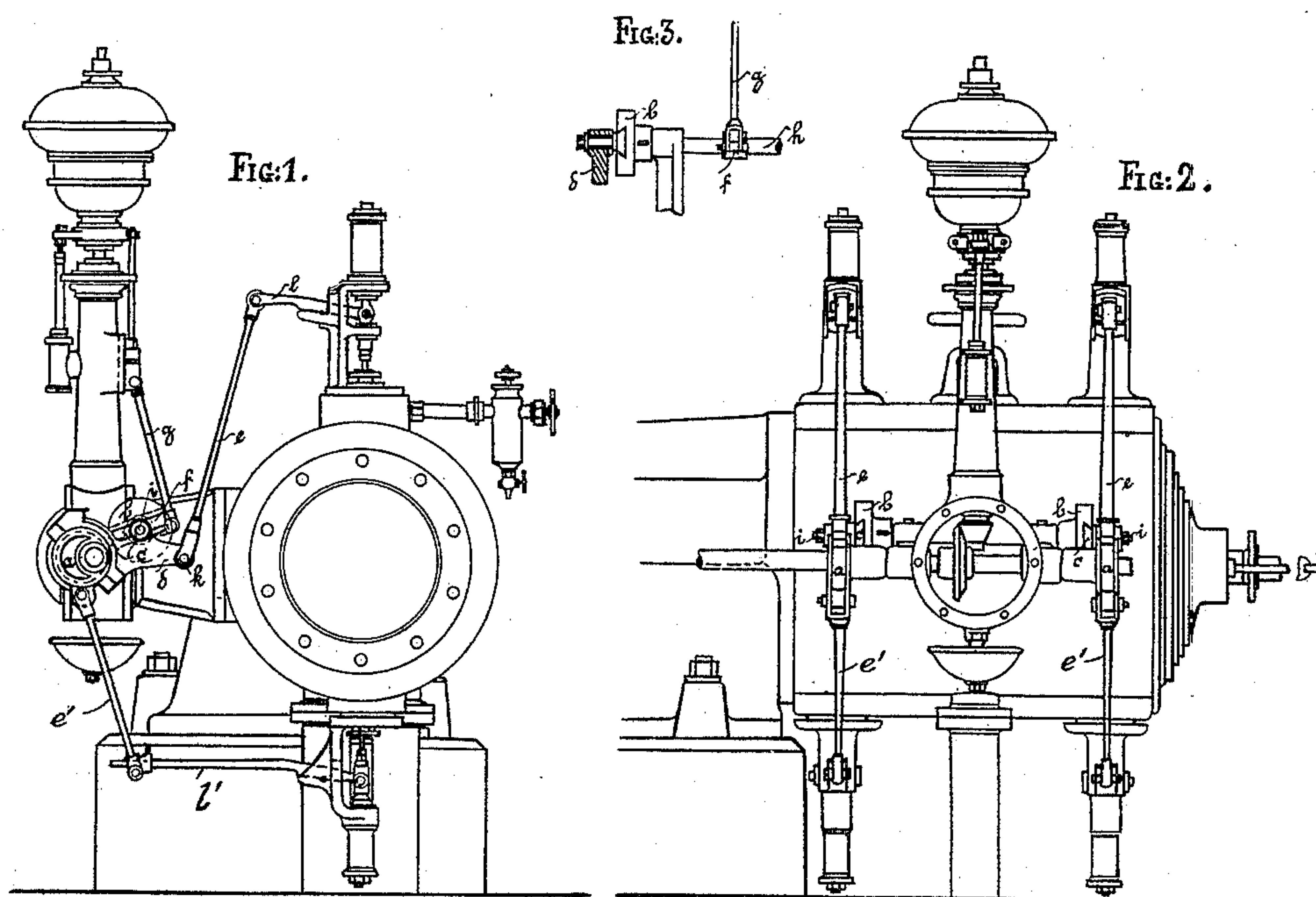


(No Model.)

C. HARTUNG.
VALVE GEAR.

No. 409,197.

Patented Aug. 20, 1889.



Witnesses

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UNITED STATES PATENT OFFICE.

CARL HARTUNG, OF MAGDEBURG, GERMANY.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 409,197, dated August 20, 1889.

Application filed March 14, 1889. Serial No. 303,253. (No model.) Patented in Germany December 22, 1880, No. 15,808, and October 7, 1884, No. 31,367; in Austria-Hungary March 18, 1882, No. 3,726 and No. 9,811; in Belgium June 24, 1882, No. 58,299, and in England January 8, 1885, No. 286.

To all whom it may concern:

Be it known that I, CARL HARTUNG, engineer, a subject of the King of Prussia and German Emperor, residing at Magdeburg, in the Kingdom of Prussia and German Empire, have invented certain new and useful Improvements in Valve-Gears for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Letters Patent have been obtained for this invention as follows: Germany, No. 15,808, dated December 22, 1880, and No. 31,367, dated October 7, 1884; Great Britain, No. 286, dated January 8, 1885; Belgium, No. 58,299, dated June 24, 1882, and Austria-Hungary, Nos. 3,726 and 9,811, dated March 18, 1882.

This invention relates to expansion-gear for slide or lift valves to steam-engines, arranged and operating substantially as I will explain with reference to the accompanying drawings.

Figure 1 is an end view, and Fig. 2 a side view, of the expansion-gear actuated by a governor for non-reversible engines. Figs. 3 and 4 show diagrammatically the acting parts of the gear.

For each end of the cylinder the parts are as follows: *a* is an eccentric driven by a counter-shaft at the same speed as the engine. Its rod *d* is, first, connected by a rod *e* to the lever *l*, that actuates the lift-valve for admission of steam to the cylinder, while the rod *e'* and the lever *l'* actuate the exhaust-valve; and, secondly, the rod *d* is pivoted to a pin *i* on a block *c*, sliding in a slot on a disk *b*, the axis *h* of which is connected by an arm *f* and rod *g* to the sliding collar of a governor, so that the motion of the latter will bring the slotted disk from the position shown in full lines *w v* to that shown in dotted lines *m n*, Fig. 4, or any intermediate position.

When the engine is running at its lowest speed and the governor-collar is in its lowest position, the slot of the disk is in a horizontal position *w v*, and the sliding block *c* con-

sequently moves to and fro horizontally, or nearly so, with the motion of the eccentric-rod. The end *k* of the latter is actuated so as to cause steam to be admitted to the cylinder during the greater part of the stroke. On the speed of the engine increasing the governor will cause the slotted disk *b* to turn into an angular position more or less approaching *m n*, Fig. 4, thus giving the block *c*, and with it the pin *i*, on which the eccentric-rod *d* is pivoted, an upward and downward motion in addition to its horizontal to-and-fro motion. The movement of the end *k* of the eccentric-rod is thus so modified as to cause the valve to close and cut off the steam-supply at an earlier part of the stroke, the cut-off taking place sooner the greater the obliquity of the slot. In the position *m n* steam is quite cut off.

Fig. 5 represents a modified arrangement, of which Fig. 6 is a diagram showing the expansion-gear applied to a reversing-engine. In this case, also, the eccentric-rod is pivoted to a sliding block *m'* in a slotted disk *s*, as in the known "Hackworth" reversing-gear, and its end is connected to rods *p p'*, that actuate the levers *l l'* of the steam and exhaust valves respectively. When the slot of *s* is in the middle position *x x'*, the steam-valves are not opened. When it is in the direction *y y'*, the engine moves at full speed forward. When it is in the direction *z z'*, the engine moves at full speed backward. At intermediate positions the engine receives more or less steam for movement forward or backward. The eccentric *a* is further connected by a rod *o* to a sliding block *c* in the slot of a disk *b*, as in the arrangement shown in Fig. 1. The block *c* is also connected by a rod *e'* to one arm of a bell-crank lever *c'*, the other arm *a'* of which forms a fulcrum for the valve-lever *l*, so that according as the slot of the disk *b* is moved into a more or less oblique position relatively to the motion of the rod *o* the fulcrum *a'* is raised and lowered to a greater or less extent, and the steam-valve is consequently made to close at a different part of the stroke. The disks *b* and *s* are connected by a jointed rod *t*, so that on altering the position of *s* by

the pull or push of the rod f' the position of b is altered. In the middle position $x x'$ of the slot in s the slot in b is in the line $q q'$. When s is turned so that its slot takes the
5 line $y y'$ or $z z'$, the slot of b is brought into the line $r r'$. Thus, whether the engine is moving forward or backward, the cut-off is determined by the greater or less inclination of the slot in b toward $r r'$.

10 What I claim is—

In a valve-gear, the combination, with a continuously-revoluble eccentric, of an eccentric-rod, a pivoted reversing-disk provided with a guide-slot, a block sliding in the said
15 slot and operatively connected with the said

eccentric-rod and with the engine valve or valves, a second pivoted disk, also provided with a guide-slot, a block sliding in the said slot and pivotally supporting the said eccentric-rod, a rod pivotally coupling the two said
20 disks, and lever mechanism operatively connecting the sliding block of the said second disk with the steam-valve, substantially as and for the purpose set forth.

In testimony whereof I affix my signature
25 in presence of two witnesses.

CARL HARTUNG.

Witnesses:

MORITZ STEINDORFF,
GUSTAV MAERZKE.