No. 689,745. Patented Dec. 24, 1901.

F. PRATT.

DIRECT ACTING STEAM ENGINE.

(Application filed May 21, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

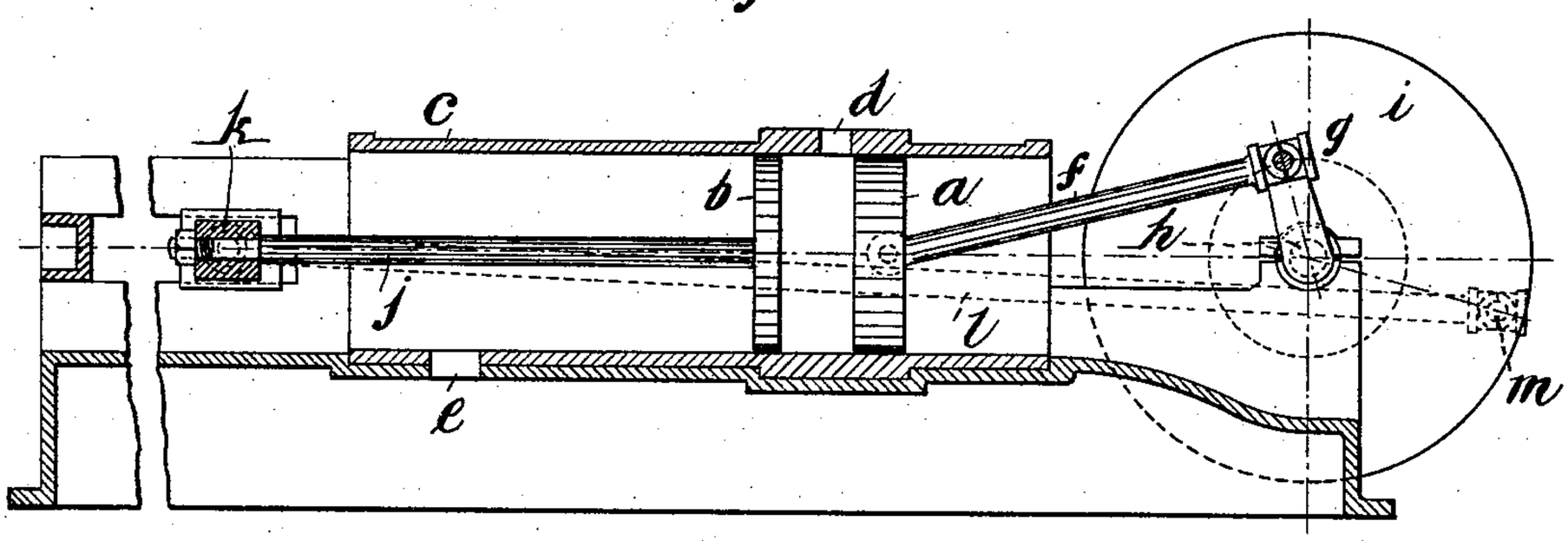

Fig. 2.

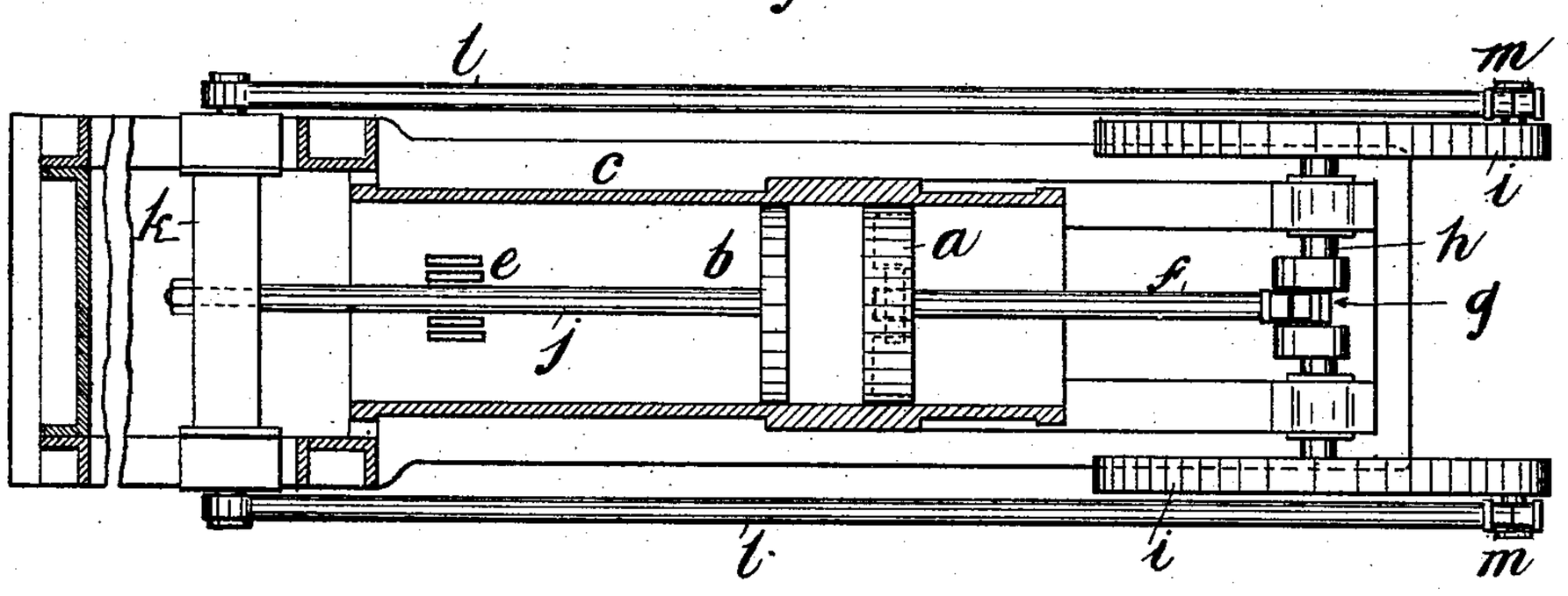

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Fig. 3.

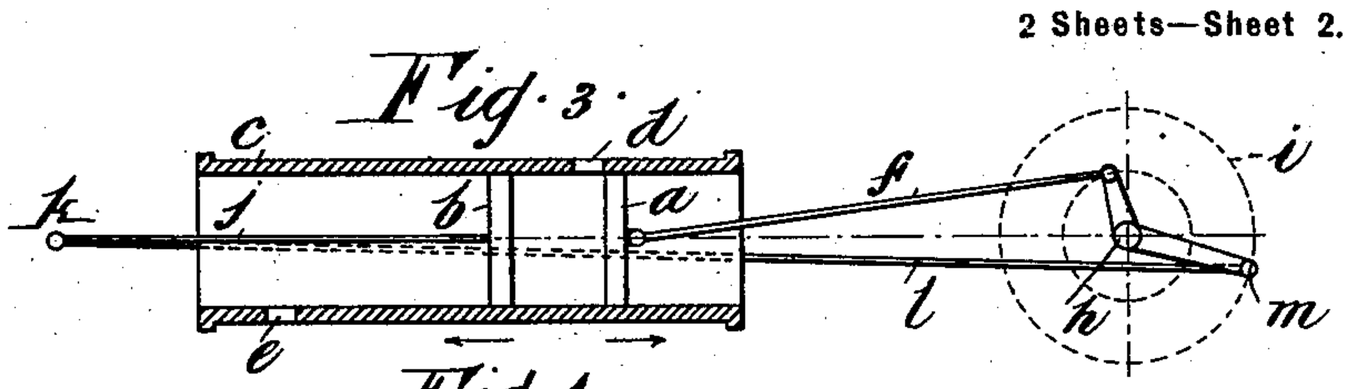


Fig. 4.

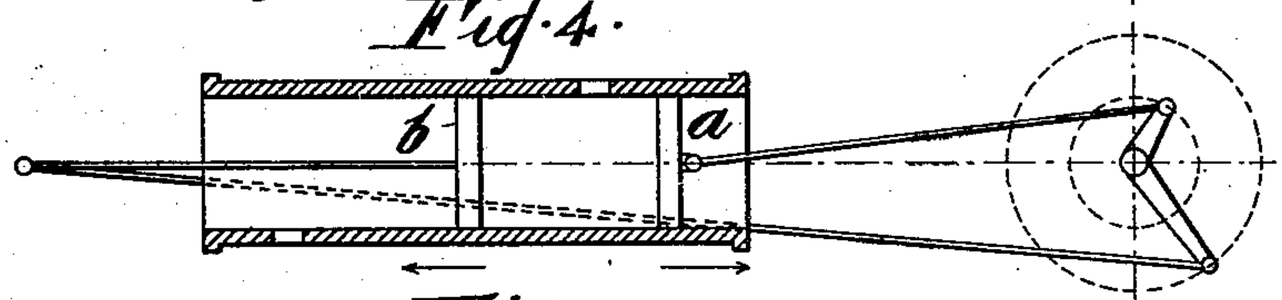


Fig. 5.

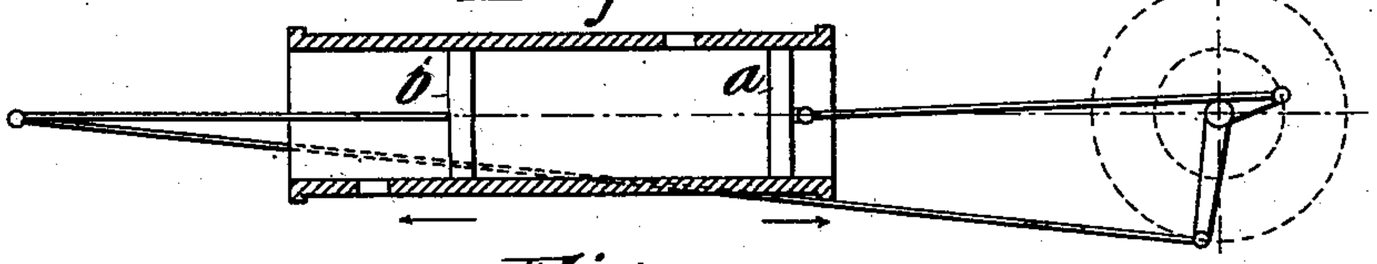


Fig. 6.

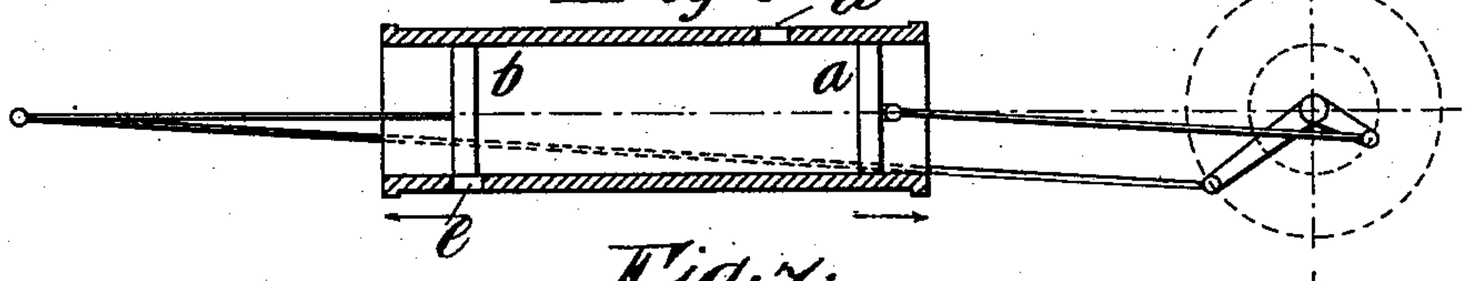


Fig. 7.

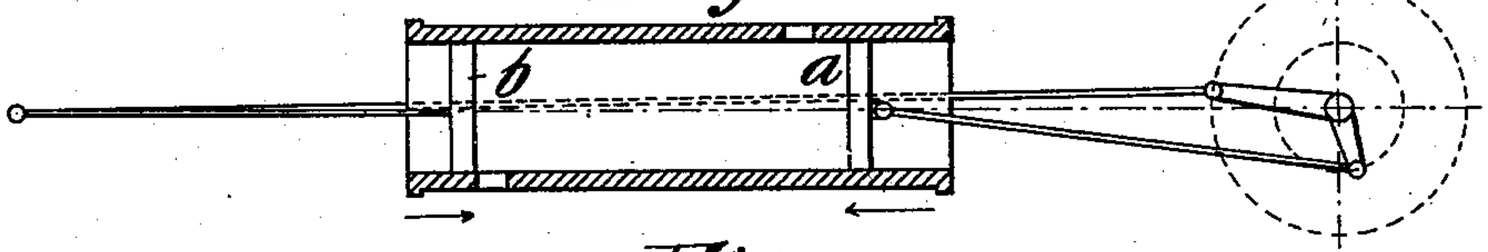


Fig. 8.

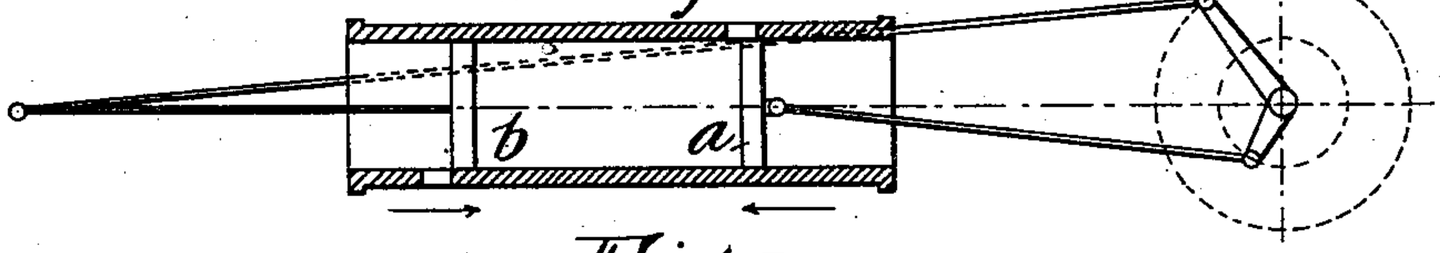


Fig. 9.

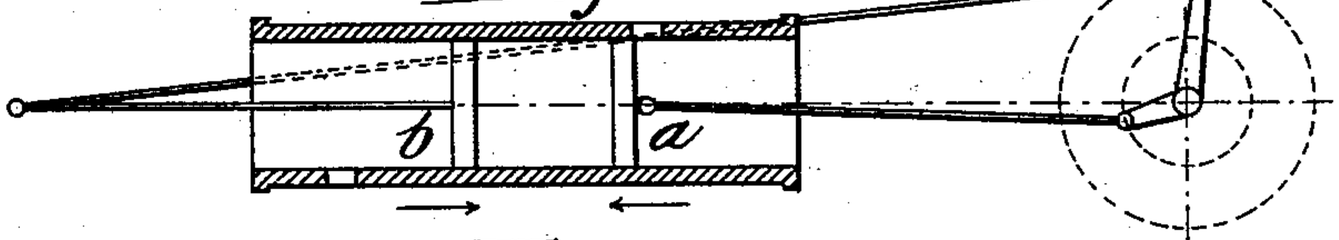
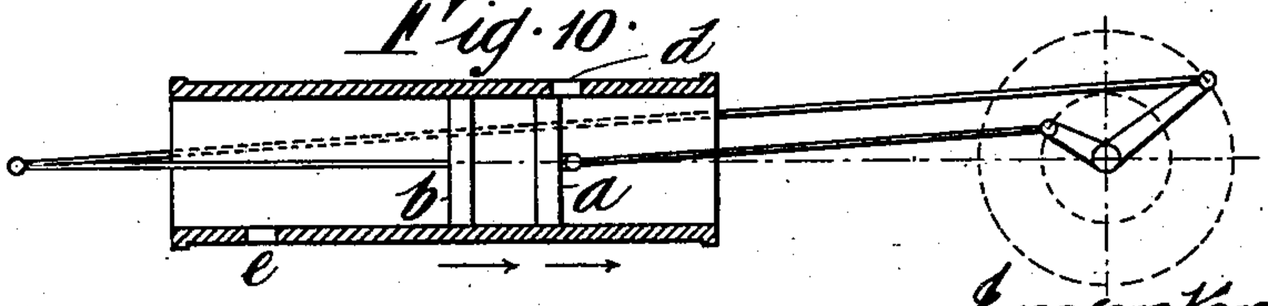


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK PRATT, OF JOLIMONT, VICTORIA, ASSIGNOR OF THREE-FIFTHS TO WILLIAM DUFF, OF CARLTON, NEAR MELBOURNE, VICTORIA, AUSTRALIA.

DIRECT-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 689,745, dated December 24, 1901.

Application filed May 21, 1901. Serial No. 61,274. (No model.)

To all whom it may concern:

Be it known that I, FRANK PRATT, engineer, a subject of the King of Great Britain, residing at No. 153 Wellington Parade, Jolimont, near Melbourne, in the State of Victoria and Commonwealth of Australia, have invented an Improved Direct-Acting Steam-Engine, of which the following is a specification.

The object of this invention is to provide a steam-engine having a high efficiency combined with economy in first cost.

Its essential feature consists in the employment of a single cylinder fitted with two pistons which work independently of each other and one of which has a longer stroke than the other and serves the purpose of an expansion-piston. In order, however, that the invention may be clearly understood, it will be described by reference to the accompanying drawings, in which—

Figure 1 is a vertical central section, and Fig. 2 a horizontal section, of a steam-engine constructed according to this invention. Figs. 3 to 10 are diagrammatic views illustrating the operation of my improved steam-engine.

The same letters of reference indicate the same parts in all the figures.

a represents a high-pressure or short-stroke piston, and *b* a low-pressure or long-stroke piston, both being arranged to work within a cylinder *c*, having inlet-port *d* and exhaust-ports *e*. The high-pressure piston *a* is connected by a rod *f* to a short crank *g* upon a crank-shaft *h*, formed with crank-disks *i*. The low-pressure piston *b* has a piston-rod *j* and cross-head *k*, on the ends of which are pivotally connected a pair of long connecting-rods *l*, extending back to crank-pins *m*, projecting from the crank-disks *i*. The throw of these crank-pins *m* is greater than the throw of the crank *g*, and the two cranks or sets of cranks are arranged at various angles from twenty to one hundred and seventy degrees to each other, while their lengths can be varied, say, up to three to one. The steam admission can be arranged to take place at or near the half-stroke of the piston *a*, the arrangement of pistons allowing of the cut-off being regulated to take place at any portion of the stroke desired. It will be evident that with this construction the pistons *a* and *b* will overlap each other's path of travel during part of the stroke, and they will be traveling in opposite directions for part of the stroke, following each other for another part, and approaching each other during another portion of their stroke, while owing to the piston *b* acting upon a greater leverage it will answer the same purpose as the expansion-cylinder in an expansion-engine and will therefore utilize the full pressure of the steam in an efficient and economical manner.

Steam at the full boiler-pressure is admitted into the cylinder *c* through the inlet-port *d* at or near the half-stroke of the piston *a*—that is, when said piston and its crank are about in the positions illustrated in Fig. 3. The steam is then almost immediately cut off. The piston *a*, being acted upon by the full pressure of the steam while its crank is in its best position for the effective transmission of power, utilizes the full force of the steam until it approaches the end of its stroke, as in Fig. 5, the piston *b* in the meanwhile moving in the opposite direction, at first slowly, owing to its crank being near the dead-center, and later with increased velocity as its crank nears its half-stroke, when it will be in the most favorable position for utilizing the expansive force of the steam. The piston *a* follows the piston *b* from this point, as illustrated by the arrows in Fig. 6, until piston *b* reaches the end of its stroke, when the ports *e* are thereby automatically uncovered and the cylinder is exhausted. The momentum of the crank-disks or fly-wheel of the engine carries the cranks around, so that the two pistons approach each other, as illustrated in Figs. 8 and 9, until piston *a* has passed the dead-point, as illustrated in Fig. 10, steam being admitted when said piston arrives at or near its half-stroke in order to commence a fresh cycle of operations.

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

1. In a steam-engine, a cylinder, a pair of pistons operating therein, a crank connected to one of said pistons at the forward end of said cylinder, a pair of cranks connected to

the other of said pistons at the rear end of said cylinder, said cranks of greater length than the first-mentioned crank, and crank-disks for the said pair of cranks.

2. In a steam-engine, a cylinder, crank-disks, a pair of pistons operating in said cylinder, a crank connected with one of the pistons at the forward end of the cylinder, rods connected with the other of the said pistons at the rear of the cylinder, and crank-pins connected with the said disks, arranged at different angles and attached to the said rods.

FRANK PRATT.

Witnesses:
EDWARD WATERS,
PERCY THOMAS HEDGES.