2 Sheets—Sheet 1.

W. WITTIG & W. HEES.

Gas-Engine.

No. 213,539. Patented Mar. 25, 1879.

Fig. 3.

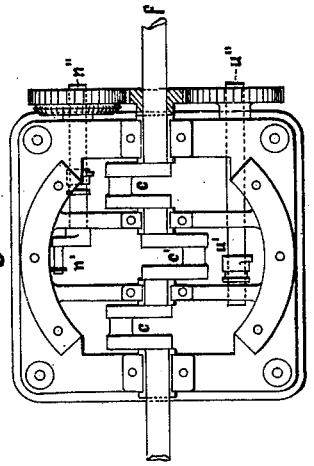


Fig. 4.

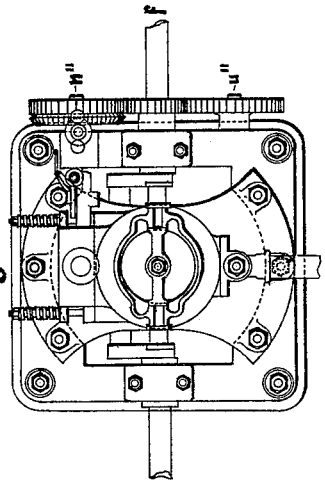


Fig. 2.

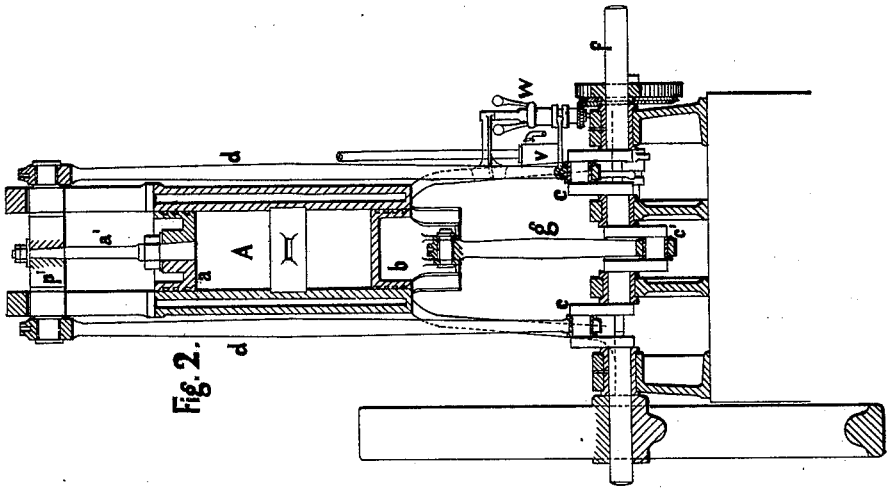
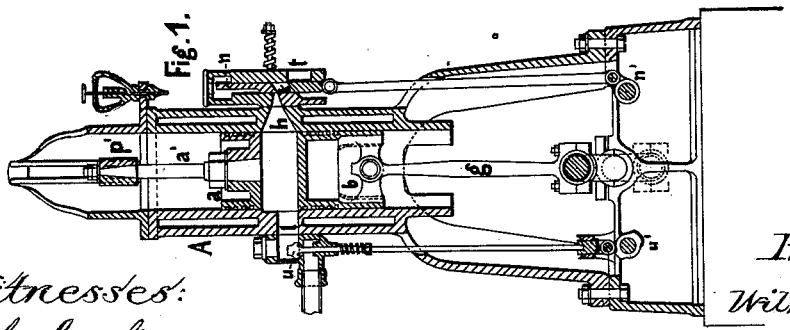


Fig. 1.



Witnesses:
W. C. Corlies
Jno. C. MacGregor

Inventors
Wilhelm Wittig
Wilhelm Hees
By Coburn & Thacher
Attorneys.

2 Sheets—Sheet 2.

W. WITTIG & W. HEES.

Gas-Engine.

No. 213,539. Patented Mar. 25, 1879.

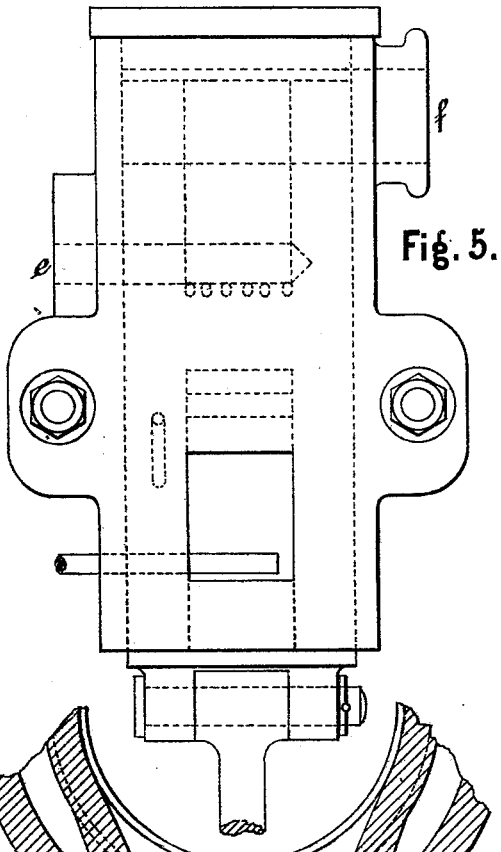


Fig. 5.

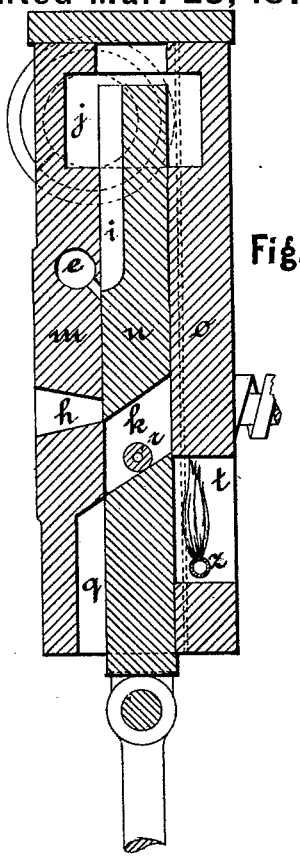


Fig. 7.

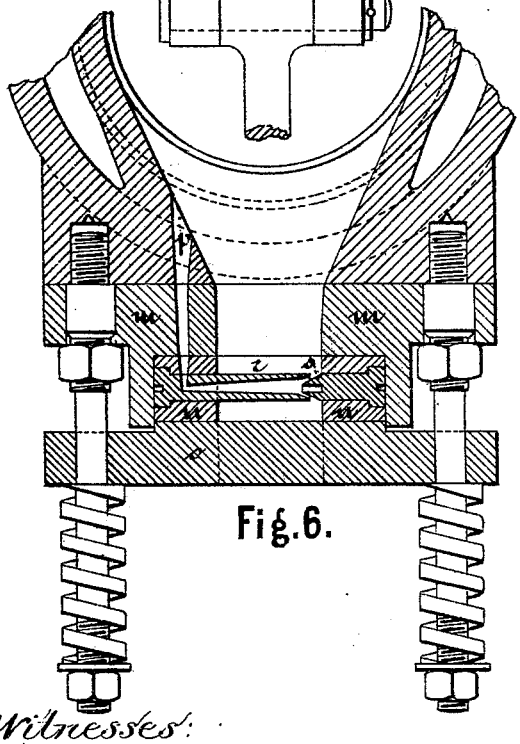


Fig. 6.

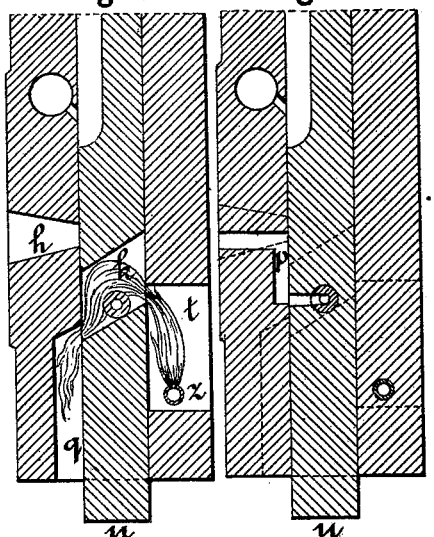


Fig. 8.

Fig. 9.

Witnesses:
W. C. Corlies
Jno. C. MacGregor.

Inventors { Wilhelm Wittig
Wilhelm Hees.
Coburn & Thacher Attys.

UNITED STATES PATENT OFFICE.

WILHELM WITTIG AND WILHELM HEES, OF HANOVER, PRUSSIA.

IMPROVEMENT IN GAS-ENGINES.

Specification forming part of Letters Patent No. **213,539**, dated March 25, 1879; application filed June 13, 1878.

To all whom it may concern:

Be it known that we, WILHELM WITTIG and WILHELM HEES, both of Hanover, in the Kingdom of Prussia, have invented an Improvement in Gas-Engine with Two Pistons, of which the following is a specification:

This invention relates to a gas-engine in which the motive power is produced by causing a mixture of gas and air to explode after the same has been compressed to a certain extent, such compression enhancing the power developed by a given quantity of gas, and consequently increasing the effect of the engine.

On the accompanying two sheets of drawings the arrangement of engine which we have designed for utilizing the power thus produced is represented, Figures 1 and 2 being vertical sections at right angles to each other; Fig. 3, a plan of bed-plate and shaft; Fig. 4, a top view, and Figs. 5 to 9 detail views of slide-valve.

A is a cylinder, open at both ends, and placed, by preference, vertically. Within the same two pistons, *a* and *b*, move in contrary directions. From the upper piston motion is transmitted to two parallel cranks, *c c*, of a fly-wheel shaft, *f*, by means of a piston-rod, *a'*, a cross-head, *p'*, and two connecting-rods, *d d*. The lower piston, *b*, is directly jointed to a single connecting-rod, *g*, acting on a third crank, *c'*, which is arranged on the same shaft *f*, between the two cranks *c c*, but opposite to them. The pistons *a* and *b* therefore recede from and approach each other simultaneously; but when they are at the shortest distance from each other they leave a space for the compressed air and gas between them. (See Fig. 1.) This space communicates by the channel or port *h* with the slide-valve *n*, which admits air and gas, and by the channel *l* with the exhaust-valve *u*.

The pistons at the first stroke outward—*i. e.*, when receding from each other—aspire gas and air, the admission slide-valve *n* being in such a position that its channel *i*, Fig. 7, opens communication between port *h* on the one hand and the gas-supply channel *e* and air-aperture *j* on the other. The aspired gas-mixture having thereupon been compressed by the first inward stroke is caused to be ignited and to explode immediately after the pistons have commenced to recede from each other the second time. This ignition is effected in the following manner: In the slide-valve *n* there is a passage or chamber, *k*, into which a tube, *r*, projects from the side, as shown by Figs. 6 and 7. At a certain point of stroke of the slide—*i. e.*, a few moments before the explosion is to take place—a perforation in the slide corresponding with the bore of the tube *r* enters into communication with the channel *p*, Figs. 6 and 9, leading into the cylinder. At the same time the chamber *k* in the slide-valve is open on the outside toward a gas-flame fed from gas-pipe *z*, and constantly burning in the slot *t* of the valve-cover. (See Fig. 8.) When the valve *n* is in this position the pressure in the cylinder forces a jet of gas and air through channel *p* and tube *r* into the chamber *k* of the slide. By the described tube *r* and a cone, *s*, slightly projecting into the conical bore of the former, this jet is directed in such a manner as to cause a draft through the chamber *k* toward an eduction-channel, *q*, in the slide-face of cylinder. The said gas-flame being thereby sucked into the chamber *k* ignites the gas-mixture in the same. The valve *n* now rising farther transports the burning gas-mixture upward until communication is established between the chamber *k* and the inlet-port *h* of cylinder, whereupon explosion takes place, driving the pistons outward and developing power. At the subsequent instroke the combustion-gases pass out through the exhaust-valve *u*.

The slide-valve *n* is actuated by a crank, n^1, (for which an eccentric may be substituted,) and the exhaust-valve by a cam-disk, u^1. The crank is keyed on a shaft, n^2, and the cam-disk on a shaft, u^2, which are both driven at half the number of rotations of the crank-shaft *f*, as may be seen from Figs. 3 and 4.

The speed of the engine is regulated by a governor, *w*, Fig. 2, acting on a throttle-valve, *v*, in the gas-supply pipe.

The advantages to be attained by this arrangement of gas-engine are the following: First, the explosive power developed by the gas-mixture is greater than otherwise on account of its being compressed before the ignition; secondly, the necessary gas for the intermediate flame which ignites the compressed gas-mixture being supplied from the cylinder,

no special gas-jet is required for this purpose; thirdly, the cylinder being open at both ends its inside walls are cooled by the atmospheric air; consequently less water is required for cooling than in the case of closed cylinders.

We claim as our invention—

1. In combination with the cylinder A and the two pistons *a* and *b*, the slide-valve *n*, having the channel *i* for admitting gas from channel *e* and air from aperture *j*, and actuated by crank n^1, revolving at half the number of revolutions of shaft *f*, substantially as and for the purpose specified.

2. In combination with the cylinder A and the two pistons *a* and *b*, the slide-valve *n*, provided with chamber *k* and tube *r*, moreover the channels *p* and *q*, and finally the gas-pipe *z*, as and for the purpose stated.

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

WILHELM WITTIG.
WILHELM HEES.

Witnesses:
WILLIAMS C. FOX,
JOHS. KRACKE.