No. 871,380. PATENTED NOV. 19, 1907.

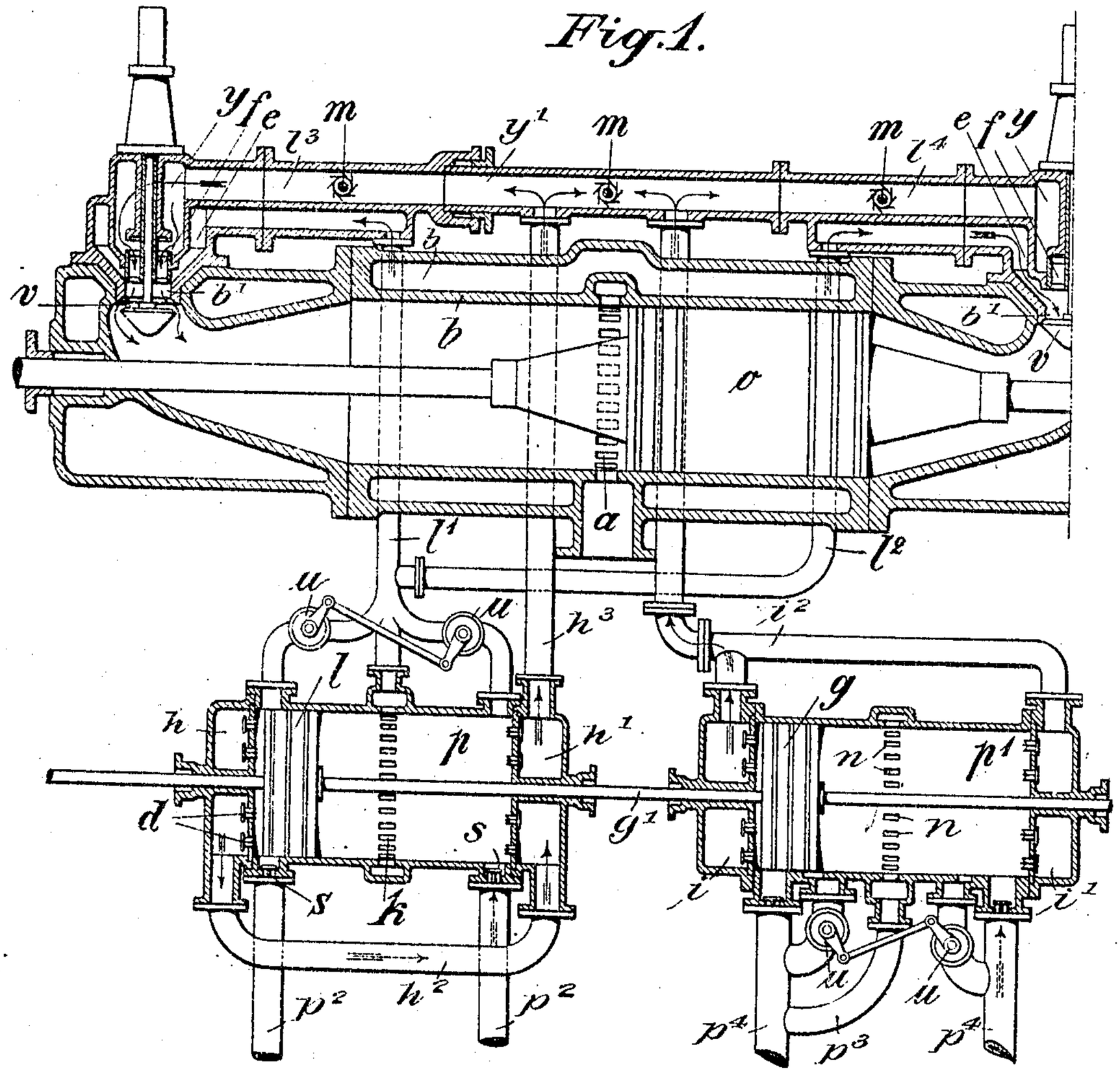
E. TUCKERMANN.

TWO-TIME COMBUSTION ENGINE.

APPLICATION FILED AUG. 17, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



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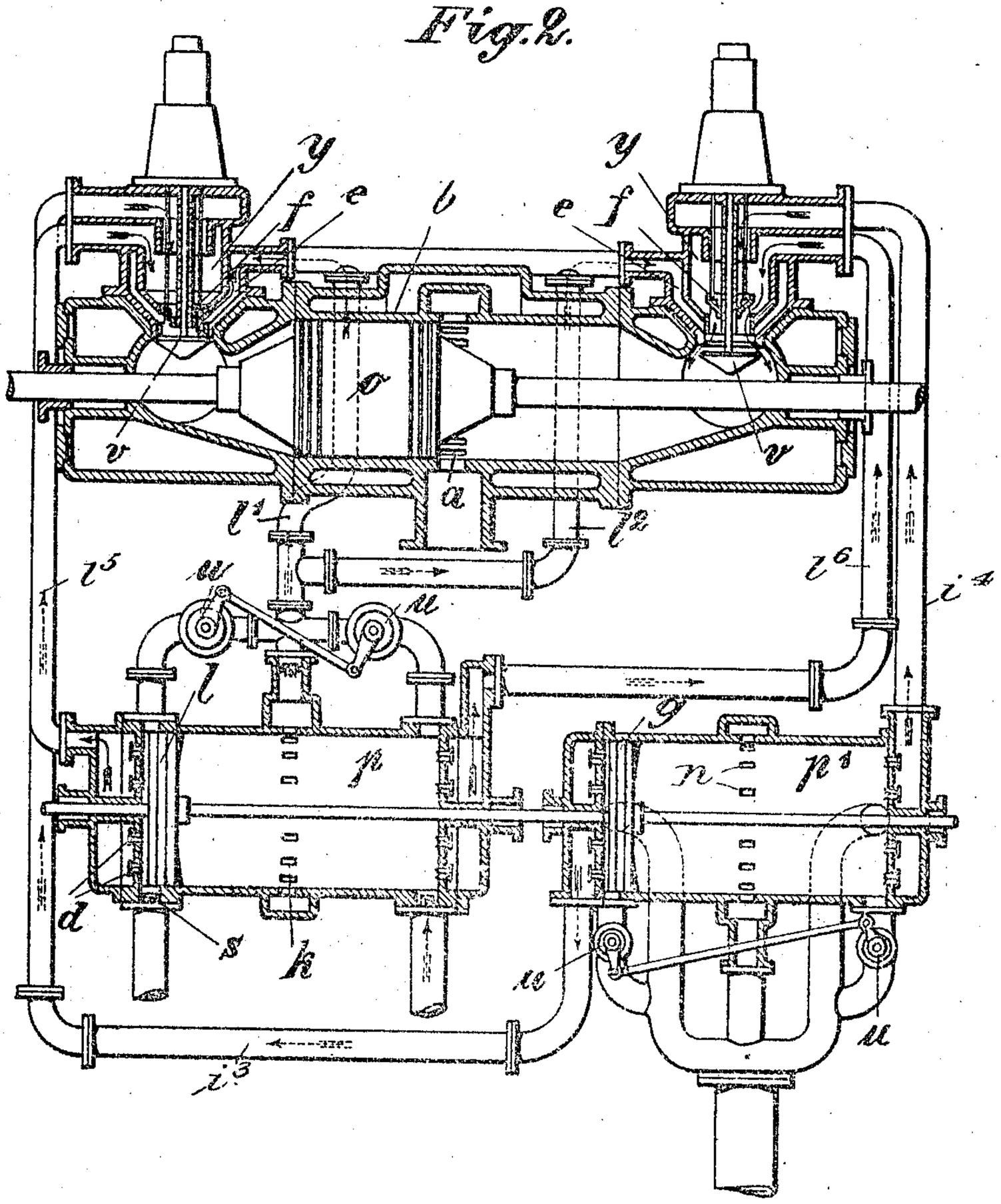
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

ERNST TUCKERMANN, OF RATH, NEAR DUSSELDORF, GERMANY.

TWO-TIME COMBUSTION-ENGINE.

No. 871,380. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed August 17, 1906. Serial No. 330,944.

To all whom it may concern:

Be it known that I, ERNST TUCKERMANN, a subject of the German Emperor, residing at Rath, near Dusseldorf, Germany, have invented new and useful Improvements in Two-Time Combustion-Engines, of which the following is a specification.

This invention relates to a two-cycle gas engine, which is so constructed that the waste gases are effectively expelled before the new charge is admitted to the cylinder. For this purpose separate means are provided for supplying the scavenging air and the charge air in such a manner, that the former is admitted at low pressure, while the latter is admitted at high pressure. Owing to the low pressure of the cleaning air, all whirling of the waste gases is avoided, thus reducing the required quantity of cleaning air to a minimum.

In the accompanying drawings: Figure 1 is a longitudinal section of my improved two-cycle explosive engine, and Fig. 2 a similar section through a modification thereof.

The letter p, denotes the cylinder of an air-pump which contains piston l. At its center cylinder p, is provided with a series of circumferential openings k, which, by pipes l', l^2, and ducts l^3, l^4, communicate with a pair of annular scavenging air chambers e. The latter are adapted to communicate with the cylinder b, of the gas engine, by openings b', controlled by valves v. Cylinder p, receives its charge through a pair of pipes p^2, entering the cylinder near its ends and controlled by check valves s. Adjoining cylinder p, there are arranged a pair of air chambers h, h', communication between such chambers and cylinder p, being controlled by outwardly opening check-valves d. Chamber h, communicates with chamber h', by pipe h^2, while chamber h', is connected to mixing chamber y, by pipe h^3, and mixing duct y'. Cylinder p', of the gas pump contains piston g, which is secured to piston rod g', which also carries piston l. Cylinder p', is provided with a central row of circumferential openings n, communicating by pipe p^3, with one of the gas supply pipes p^4. A pair of gas chambers i, i', arranged at both ends of cylinder p', are by pipe i^2, connected to duct y'. In the latter, gas and air are mixed by means of fans m, that receive rotary movement in suitable manner. Between chambers e, and y, there is interposed a valve f. Cylinder b, of the gas engine contains piston o, and is further provided with the usual exhaust ports a.

The operation of the gas engine is as follows: It may be assumed that the different parts are in the position shown in Fig. 1, *i. e.*, piston o, is in its right hand terminal position, after an explosion has taken place. In order to admit the scavenging air, left hand valve f, is raised by suitable means, (not shown), to close chamber y, against chamber e, and valve v, is opened to establish communication between chamber e, and cylinder b. Piston l, will now start on its travel towards the right, thereby causing part of the air contained in cylinder p, to flow through openings k, pipe l', duct l^3, and chamber e, into cylinder b. Openings k, should be so dimensioned that the scavenging air is admitted into cylinder b, during the motion of piston l, with a small but continuously increasing pressure. After piston l, has covered openings k, the inflow of the scavenging air into cylinder b, will cease, as the further forward movement will press the air through pipe h^3, into the mixing chamber y'. As the piston g, of the gas pump participates in the movement of piston l, a quantity of gas contained in cylinder p', corresponding to the quantity of the scavenging air discharged from cylinder p, is returned into supply pipe p^4, through return pipe p^3. After piston g, has covered openings n, the gas will flow through pipe i^2, into the mixing chamber y'. In this way a uniform composition of the explosive charge is insured. After valve f, has been opened by suitable means, (not shown), the mixture will enter cylinder b, whereupon compression, explosion and discharge of the waste gases will take place, as usual with two cycle gas engines.

The above described operation will be repeated on the other side of working piston o, as pumps p, and p', are double acting.

By altering the size of openings k, and by changing the mechanism for operating the inlet valves, the relation between scavenging air and charge air may be adjusted.

It is obvious that the construction of my improved gas engine may be changed without departing from the spirit of my invention, so for instance, the action of the air piston may be reversed, so that during the first part of its stroke, charge air is admitted to the engine, while during the latter part of

the stroke, scavenging air may be passed to the engine.

In Fig. 2, a modification of my improved gas engine is shown, in which the mixing chamber y', of Fig. 1, is dispensed with, while separate pipes l^5, l^6, i^3, i^4, lead from the air pump and gas pump respectively, to the gas engine.

I claim:

1. In a two cycle explosive engine, a working cylinder, an air pump separate therefrom, and a piston within said pump, combined with means for delivering low-pressure scavenging air from the pump to the working cylinder during the initial part of the pump piston stroke, and means for delivering charge air from the pump to the working cylinder during the final part of said stroke, substantially as specified.

2. In a two cycle explosive engine, a working cylinder, a scavenging air chamber and a mixing chamber, combined with an air pump separate from the working cylinder and having peripheral air openings, means for connecting said openings with the scavenging air chamber, and means for connecting the pump cylinder ends with the mixing chamber, substantially as specified.

3. In a two-cycle explosive engine, a scavenging air chamber and a mixing chamber, combined with an air pump cylinder having peripheral air openings, a gas pump cylinder having peripheral gas openings and a gas supply pipe, means for connecting the air-openings with a scavenging air chamber, means for connecting the gas openings with the gas supply pipe, and means for connecting the ends of the air and gas cylinders with the mixing chamber, substantially as specified.

Signed by me at Dusseldorf, Germany, this twenty-seventh day of July 1906.

ERNST TUCKERMANN.

Witnesses:

WILLIAM ESSENWEIN,

ALFRED POHLMEYER.