(No Model.)

2 Sheets—Sheet 1.

C. J. B. GAUME.

Gas Engine.

No. 240,994. Patented May 3, 1881.

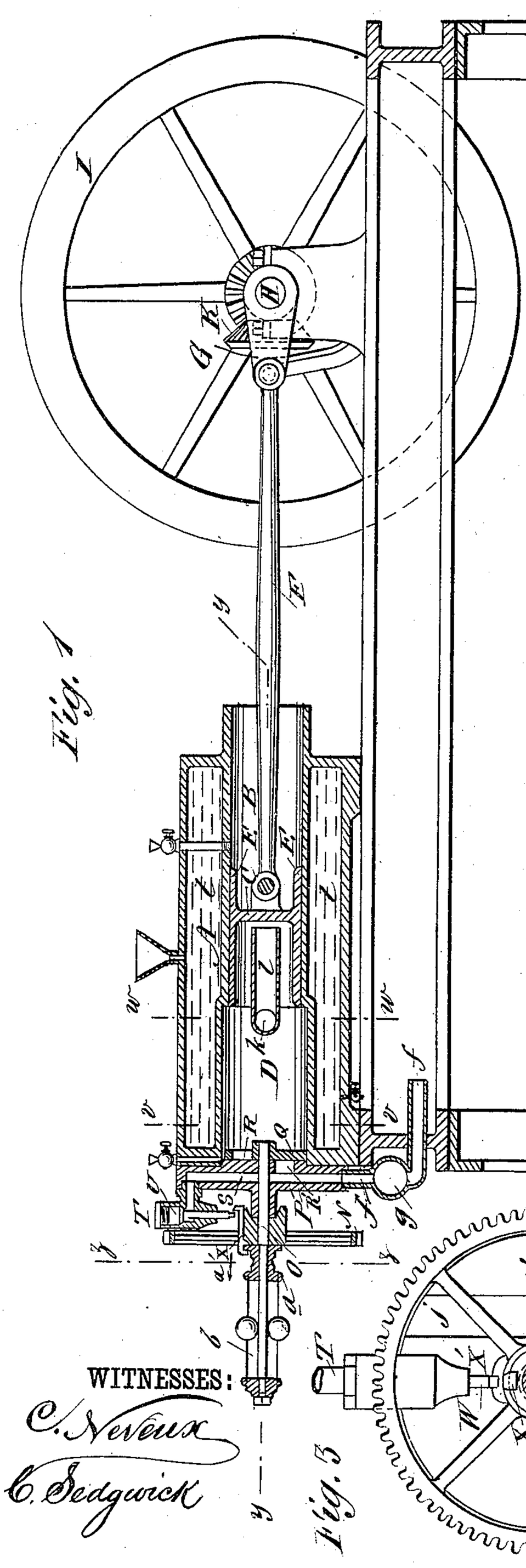

Fig. 1.

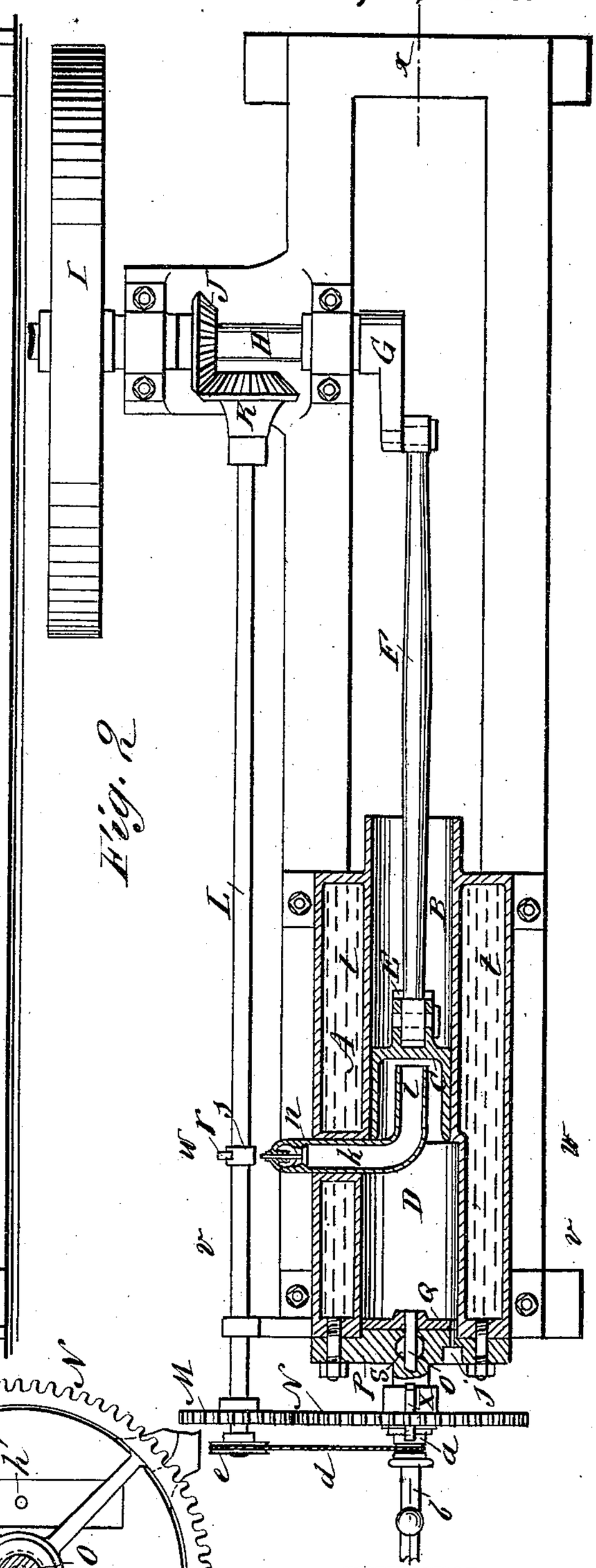

Fig. 2.

Fig. 3.

WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

C. J. B. Gaume

BY Munn & Co

ATTORNEYS.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

2 Sheets—Sheet 2.

C. J. B. GAUME.

Gas Engine.

No. 240,994. Patented May 3, 1881.

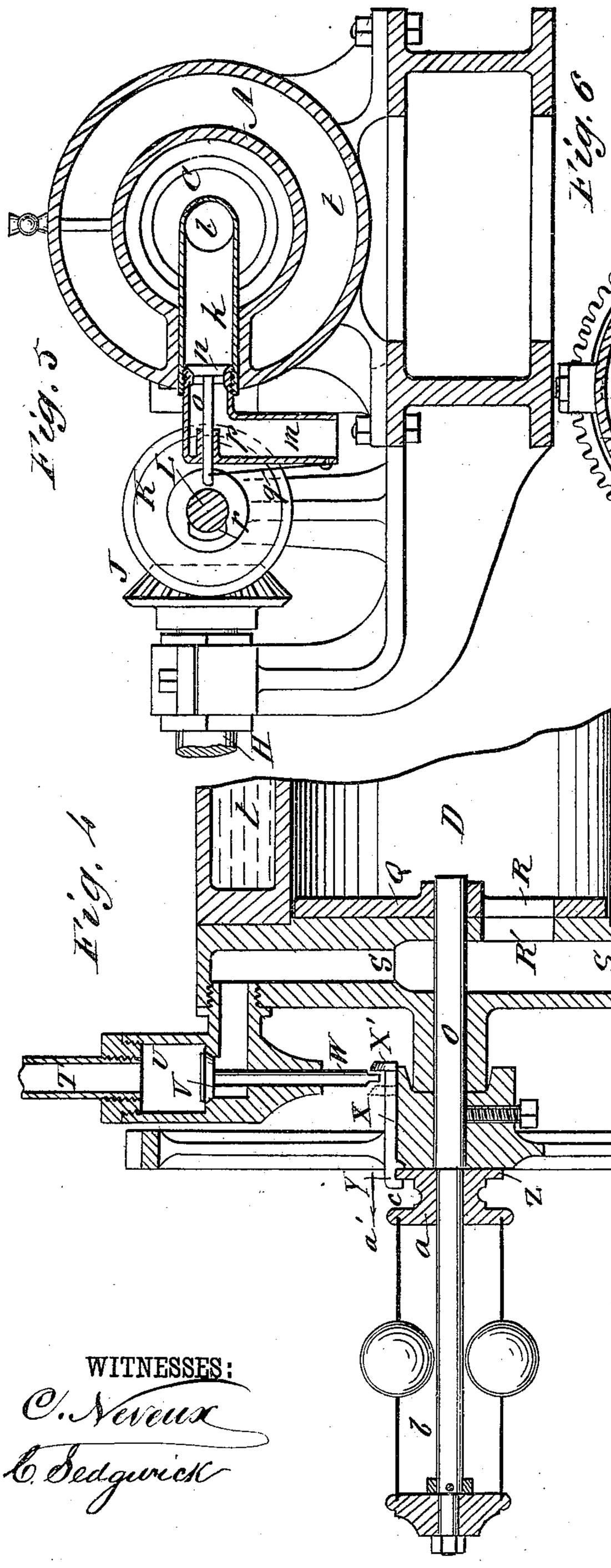

Fig. 5.

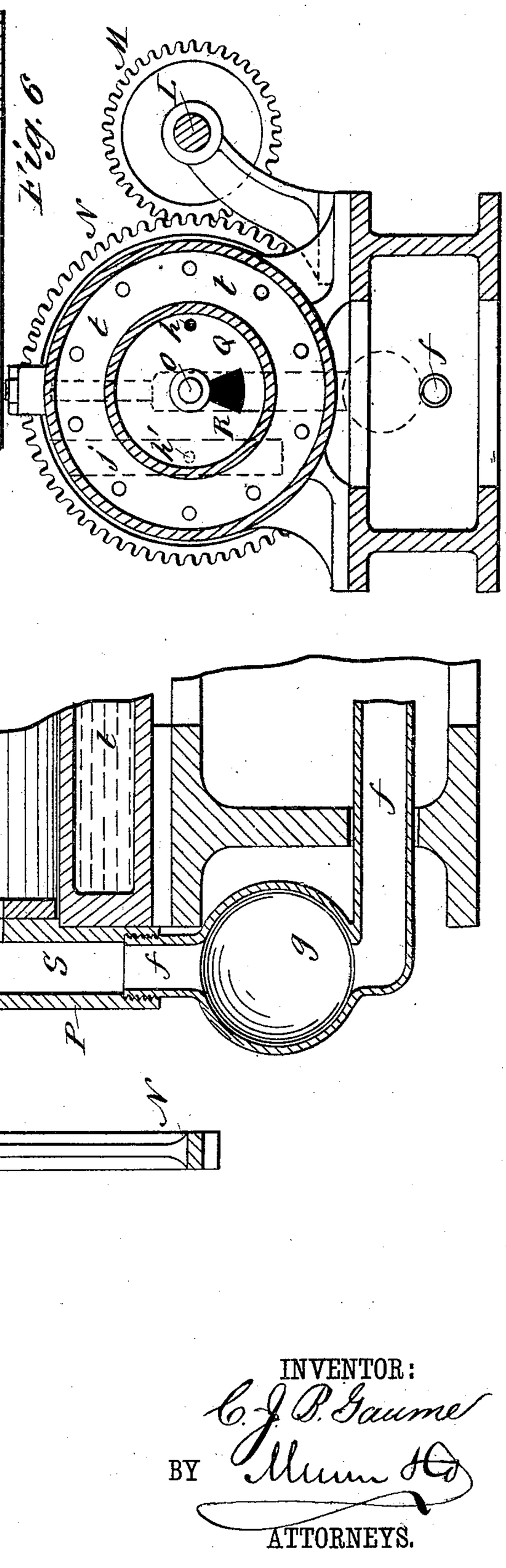

Fig. 6.

Fig. 4.

Fig. 7.

WITNESSES:

C. Neveux

E. Sedgwick

INVENTOR:

C. J. B. Gaume

BY Munn & Co

ATTORNEYS.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

CHARLES J. B. GAUME, OF BROOKLYN, NEW YORK.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 240,994, dated May 3, 1881.

Application filed January 19, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. B. GAUME, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Gas-Engine, of which the following is a specification.

The object of my invention is to simplify the construction of gas-engines and to utilize the power produced by the explosion of the mixture of gas and air to greater advantage.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of my improved gas-engine. Fig. 2 is a plan view of the same, the cylinder being shown in horizontal section. Fig. 3 is a rear-end elevation of the same. Fig. 4 is a detail longitudinal sectional elevation of the rear end of the cylinder. Fig. 5 is a detail cross-sectional elevation of the same on the line *w w*, Figs. 1 and 2. Fig. 6 is a detail cross-sectional elevation of the same on the line *v v*, Figs. 1 and 2, looking toward the rear of the cylinder.

Similar letters of reference indicate corresponding parts.

The cylinder A of the gas-engine is constructed with a front bar, B, of exactly the same diameter as the piston C, which slides therein and is guided thereby, and of a rear part, D, which has a greater diameter than that of the piston C. This piston C is cup-shaped, the cup extending toward the rear of the cylinder, whereas the guide-lugs E E extend toward the front of the cylinder. A connecting-rod, F, is pivoted to the outer side of the piston C and to a crank, G, of the main shaft H, having a fly-wheel, I, and a beveled cog-wheel, J, mounted thereon. This cog-wheel J engages with a beveled cog-wheel, K, of like size, and mounted on a shaft, L, resting in suitable bearings, and arranged parallel to the cylinder. A cog-wheel, M, is mounted on the rear end of this shaft L, and the teeth of this wheel M engage with those of a cog-wheel, N, of double the diameter of the wheel M, and mounted on a shaft, O, which passes through the center of the rear end plate, P, of the cylinder and extends outward from the same in a direction parallel to the cylinder.

A circular plate, Q, of exactly the same diameter as the enlarged part D of the cylinder is mounted on the inner end of the shaft O, and rests closely against the inner surface of the rear end plate, P, of the cylinder. This circular plate is provided with an aperture, R, the width of which is equal to one-eighth of the circle and increases proportionately from the center to the circumference, for the purpose of admitting the gas and air into the cylinder, which aperture corresponds in size and position with a like aperture, R′, forming a communication between the cylinder and a channel, S, passing vertically through the middle of the rear end plate, P, of the cylinder. The upper end of this channel S is connected with the gas-supply pipe T by a tubular knee-piece, U, which forms a seat for the valve V, by means of which the communication between the channel S and the gas-supply pipe T can be closed. A rod, W, the lower end of which is beveled from two sides toward the middle, is attached to the under side of this valve V.

A slide, X, on the hub of the cog-wheel N, is provided on the inner end with a short projection or cam, X′, projecting upward from the hub, beveled in the direction from the rear toward the front of the cylinder, and having its edge beveled and rounded, as shown in Fig. 3, whereas the other end of this slide is provided with a recess or transverse groove, Y, into which a flange, Z, of the inner loose disk, *a*, of the governor *b* fits. This governor is loosely mounted on the shaft O; but its outer end is held to prevent it from moving longitudinally on the shaft, whereas the inner end disk, *a*, can move longitudinally on this shaft O. This disk *a* is provided with a groove, *c*, for a belt, *d*, which passes over a grooved pulley, *e*, mounted on the outer end of the shaft L, behind the cog-wheel M.

The lower end of the channel S is in communication with the air-supply pipe *f*, in which a receptacle or vessel, *g*, of any desired shape or size is interposed to catch the surplus gas that passes through the channel S, but is not admitted into the cylinder.

The circular plate Q is also provided with a small aperture, *h*, corresponding in size and position with an aperture, *h′*, which is located near the circumference of the cylinder, and connects the interior of the cylinder with a re-

cess, *j*, in the rear end plate, P, of the cylinder, in which recess a small gas-jet is continually burning directly in front of the aperture *h'*. The gas for this jet is taken from the gas-supply pipe T in some suitable manner.

The exhaust-pipe *k* passes into the cylinder A at the forward end of the enlarged part D of the same, as is shown, and the inner arm, *l*, of this pipe *k* extends into the narrow front part, B, of the cylinder, the front edge of this arm being about one inch from the inner surface of the piston when the same has passed into the cylinder to its greatest extent, as is shown in Fig. 1, the inner edge of the cup of the piston never passing beyond the inner edge of the narrow or guide part B of the cylinder. The outer arm, *m*, of this pipe *k* extends downward, as shown in Fig. 5.

A valve-seat for a valve, *n*, opening toward the inner end of the pipe *k*, is arranged near the outer end of the same, and the rod or stem *o* of this valve passes through a suitable guide, *p*, and is drawn against its seat by a spring, *q*. A cam, *r*, is fastened to a collar, *s*, on the shaft L, directly opposite the outer end of the valve rod or stem *o*, which must be of sufficient length to admit the cam *r* to strike it.

The cylinder *a* is surrounded by a water-jacket, *t*, which is provided with suitable devices for conducting water to and from this jacket.

The operation is as follows: The several parts of the engine being in the position shown in Fig. 1, the rear or enlarged part, D, of the cylinder is filled with a mixture of gas and air. The plate Q has rotated to such an extent that the apertures R and R' do not correspond in position and the rear end plate of the cylinder is closed; but the apertures *h h'* are in communication, and the gas-jet in the recess *j* can ignite the mixture of gas and air in the cylinder. By the explosion of this mixture gases are produced which have the tendency to liberate themselves, and thereby force the piston C forward, and as this piston is connected with the crank G of the shaft H this shaft is rotated. If the explosion-chamber of a gas-engine does not have a greater diameter than the piston, the latter will receive a short sudden shock after the explosion, and will move but a very short distance; but if the explosion-chamber has a greater diameter than the piston the duration of the pressure of the gases of explosion upon the cylinder will be augmented—that is, the power obtained will not act upon the piston suddenly but gradually, whereby the same is under the action of the power forcing it forward for a greater time than it would be if the cylinder had the same diameter throughout. As stated, the piston has been pushed forward by the explosion and the crank G has made a half-revolution; but the impetus of the fly-wheel I carries the crank around, and the piston moves backward until it is in the position shown in Fig. 1 again; but this revolution of the shaft H has also caused a revolution of the shaft L, and during the time that the piston C has been moving backward the cam *r* has pressed against the end of the valve-rod *o*, thereby opening the valve *n* and permitting the waste gases to escape as they are forced out by the receding piston; but by the time that the piston arrives in the position shown in Fig. 1 the cam *r* has passed the end of valve-rod *o*, and the spring *q* closes the valve *n*. The fly-wheel shaft has made one revolution, and the shaft O and the circular plate Q have made half of a revolution, as the diameters of the wheels J and K are alike, but the diameter of the wheel M is only equal to one-half of the diameter of the wheel N; but by this half-revolution of the plate Q the apertures R and R' have been brought to correspond in position, and the gas and air can enter into the cylinder. The impetus of the fly-wheel carries the shaft H and the crank G around, and the piston is drawn forward and forms a vacuum behind the piston, and the mixture of gas and air rush in to fill the same. When the piston returns the aperture R' has been closed, the valve *n* has been opened, and the remainder of light waste gas that remains in the cylinder is forced out through the exhaust-pipe N, as the enlarged part of the cylinder is filled with the heavier mixture of gas and air; but by the time the piston has arrived in the position shown in Fig. 1 the apertures *h* and *h'* are in corresponding positions again, the mixture of gas and air is ignited, and the entire operation described above repeats itself. There is one explosion for every four strokes of the piston, and the waste gas is removed in two operations—that is, at each backward stroke of the piston.

As has been stated, the governor *b* is rotated from the pulley *e* by the belt *d*. If the engine has its ordinary speed, the balls of the governor will be slightly distended, and the projection or cam X' will strike the lower end of the rod U at each revolution, and will thus open the valve V and permit the gas to pass from the pipe T into the channel S; but if the speed of the engine is increased the slide X will be drawn in the direction of the arrow *a'* a greater distance, and the bottom of the rod W will rest on the bevel of the projection or cam X'. It is evident that the valve V will be raised a trifle less if the lower end of the rod W rests on the bevel of the cam X' than if rested on the edge of the same, and as the number of rotations of the governor increases the slide X is drawn out farther and the valve V is raised less at each revolution of the wheel N, one of which takes place for each two strokes of the piston. If, finally, the speed is still increased, the cam X' will be drawn beyond reach of the rod W, and the gas-supply will be shut off altogether, as shown in dotted lines in Fig. 4, as the cam X' cannot raise the valve-rod W until the speed of the engine has been decreased.

. Any kind of governor may be used in place of the steel bands and the balls shown.

The advantages of having the exhaust-tube in the forward end of the enlarged part of the

cylinder and extending it into the cup of the piston as much as possible are considerable, for the gases of combustion need not and cannot be mixed with the fresh gas and air, and the gas and air that enter into the cylinder assist in expelling these products of combustion.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In a gas-engine, the combination, with the cylinder having an increased diameter behind that part in which the piston slides, of an exhaust-tube entering into the cylinder in the forward end of the part with the increased diameter, substantially as herein shown and described, and for the purpose set forth.

2. In a gas-engine, the exhaust-tube R, constructed as herein shown and described, with an arm, *l*, extending into the forward part, B, of the cylinder, having a smaller diameter than the rear part, D, as set forth.

3. In a gas-engine, the combination, with the cylinder A, having an enlarged rear part, D, of the piston C and the exhaust-pipe *k*, having an inner arm, *l*, substantially as herein shown and described, and for the purpose set forth.

4. In a gas-engine, the combination, with the exhaust-tube *k*, of the valve *n*, the valve-rod *o*, the spring *q*, the cam *r*, and the shaft L, substantially as herein shown and described, and for the purpose set forth.

5. In a gas-engine, the combination, with the cylinder, of a shaft passing through the center of the rear end plate of the same, and of a valve-plate mounted on or near the inner end of this shaft, substantially as herein shown and described, and for the purpose set forth.

6. In a gas-engine, the rear end plate, P, of the cylinder, constructed substantially as herein shown and described, with the channel S, connected with the gas and air supply pipes T and *f*, and with the apertures R′ and *h*′, which connect the interior of the cylinder with the channel S and with the outer air, as set forth.

7. In a gas-engine, the combination, with the air-supply pipe *f*, of a gas-trap, *g*, consisting of a vessel interposed in the air-pipe, substantially as herein shown and described, and for the purpose set forth.

8. In a gas-engine, the combination, with the shaft O, of the circular valve-plate Q, the cog-wheel N, the cog-wheel M, having one-half of the diameter of the wheel N, the shaft L, the bevel cog-wheels J and K, and the main shaft H, substantially as herein shown and described, and for the purpose set forth.

9. In a gas-engine, the combination, with the shaft passing through the middle of the rear end plate of the cylinder in the direction of the length of the cylinder, of a governor mounted on this shaft and of a valve in the gas-supply pipe, which valve is acted upon by the governor, substantially as herein shown and described, and for the purpose set forth.

10. In a gas-engine, the combination, with the shaft O, of the governor *b*, the slide X, provided with a beveled cam, X′, of the valve V and the valve-rod U, beveled at the lower end, substantially as herein shown and described, and for the purpose set forth.

11. In a gas-engine, the slide X, constructed substantially as herein shown and described, with a cam or projection, X′, beveled in the direction from the rear toward the front of the cylinder and rounded or beveled at the ends, as set forth.

CHARLES J. B. GAUME.

Witnesses:
OSCAR F. GUNZ,
C. SEDGWICK.