(No Model.)

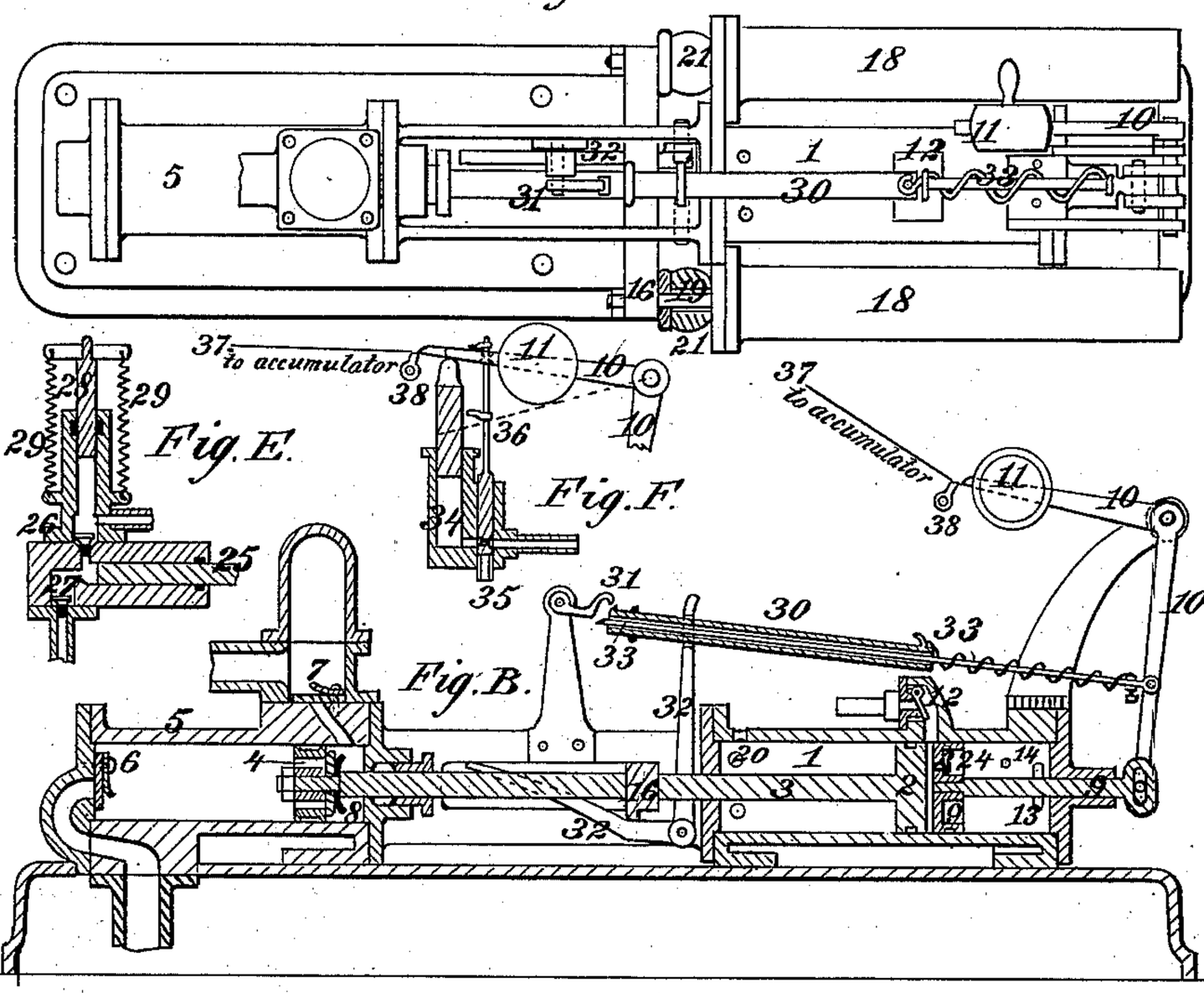
2 Sheets—Sheet 1.

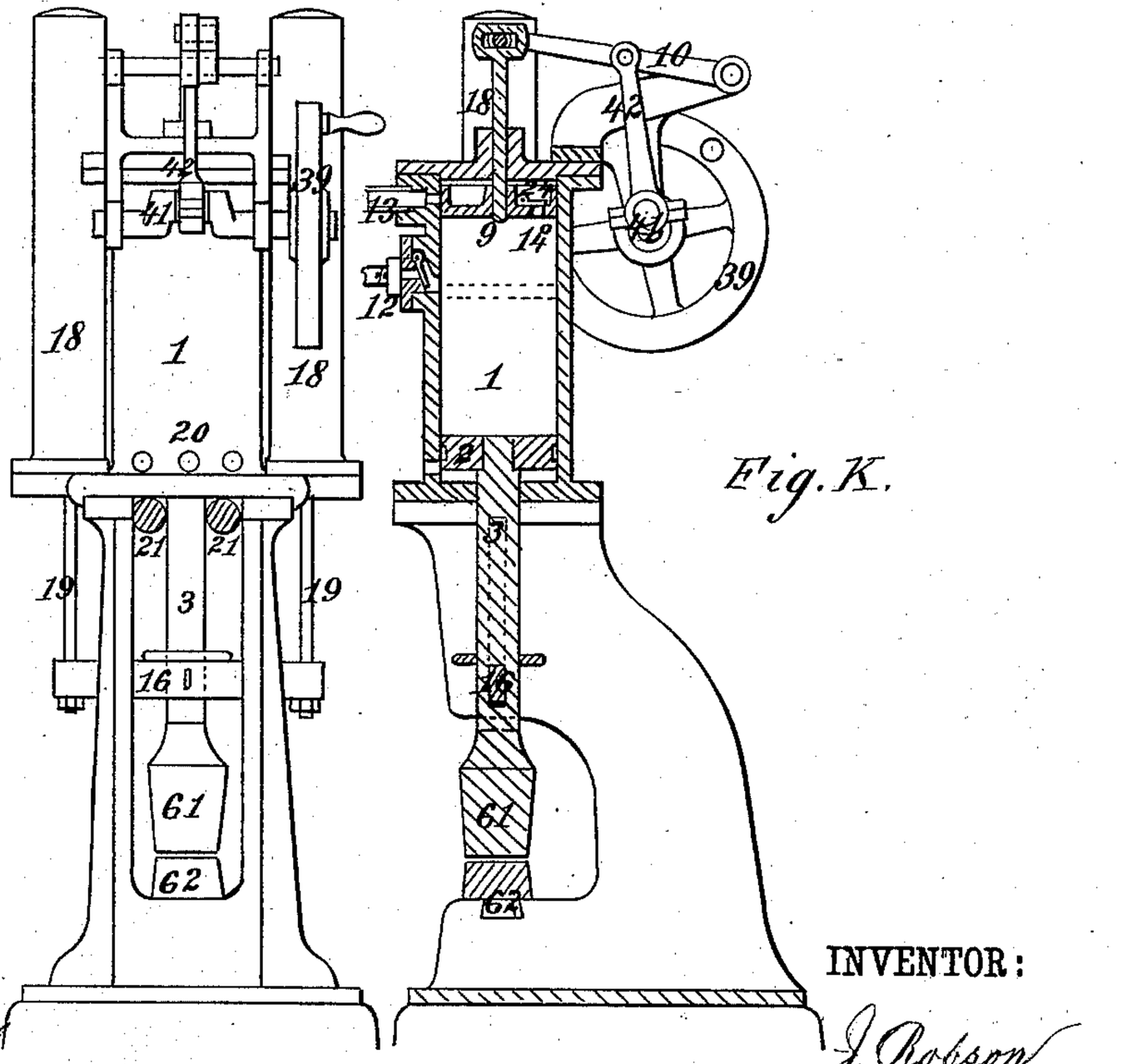
J. ROBSON.

GAS ENGINE.

No. 278,600. Patented May 29, 1883.

Fig. A.





WITNESSES:

Donn Trotchell.

C. Sedgwick

INVENTOR:

J. Robson

BY Munn & Co

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

J. ROBSON.

GAS ENGINE.

No. 278,600. Patented May 29, 1883.

Fig. C.

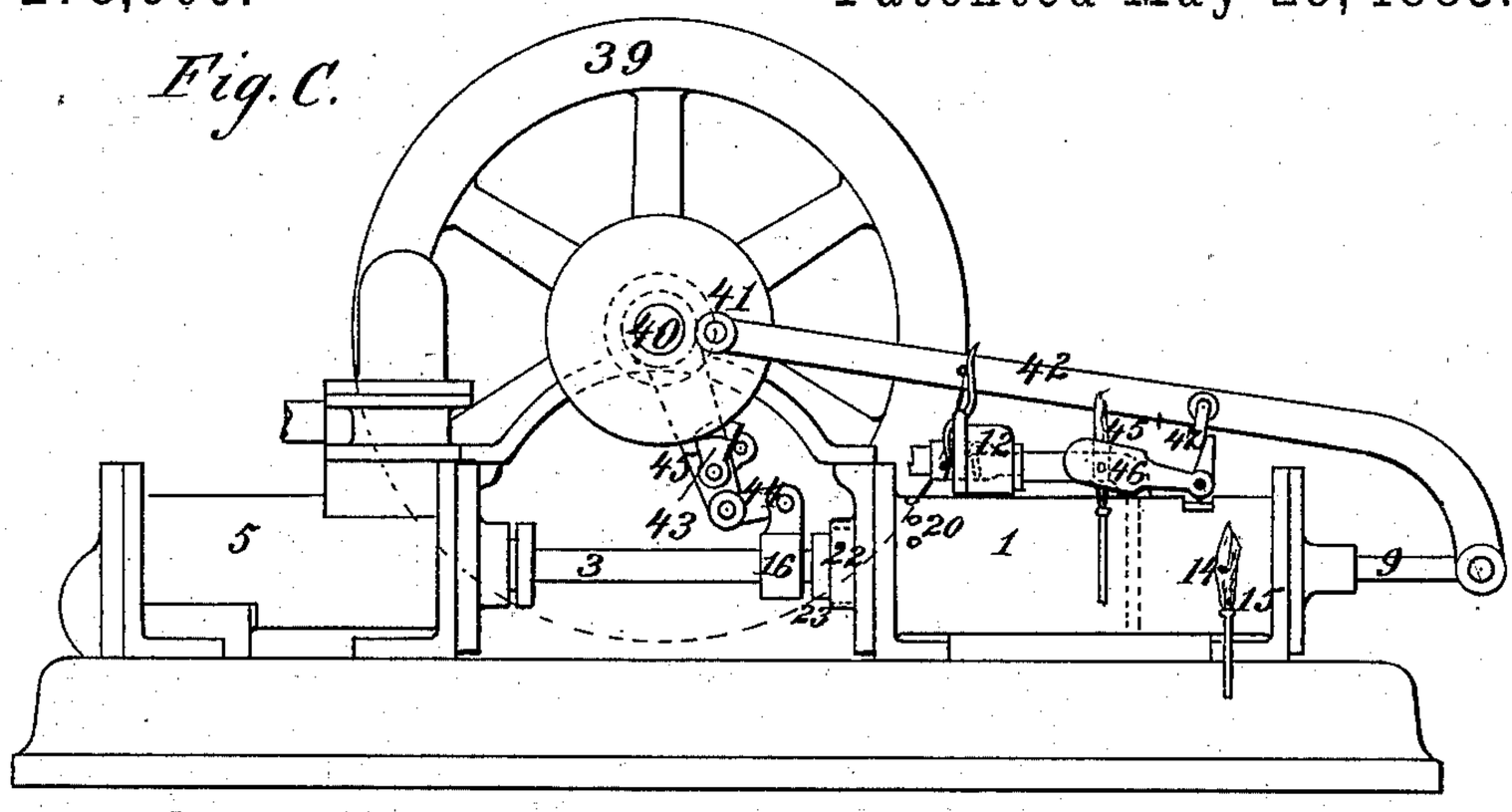


Fig. D.

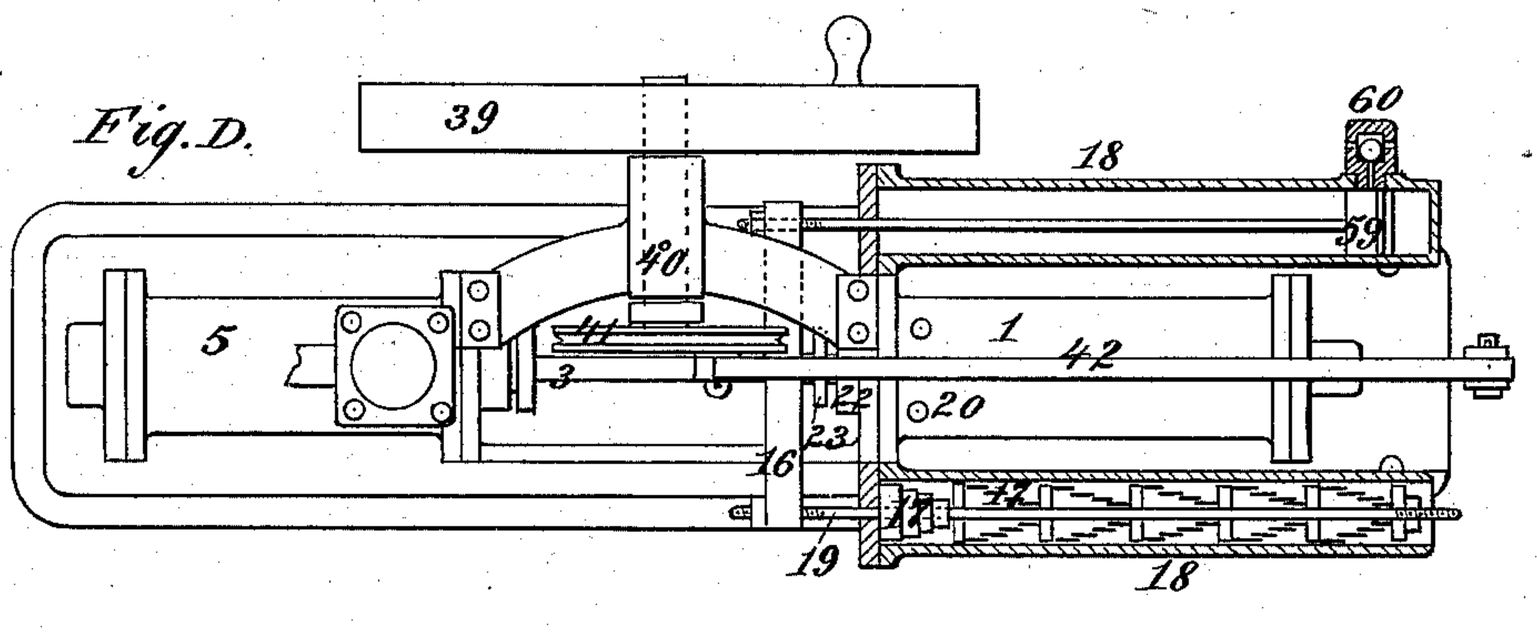
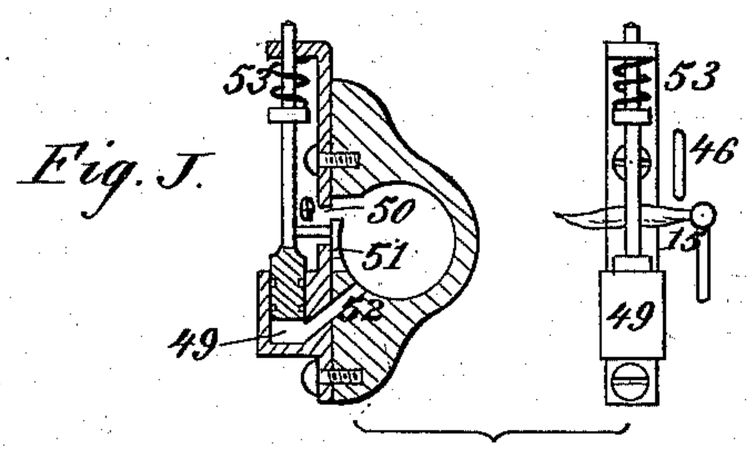


Fig. J.



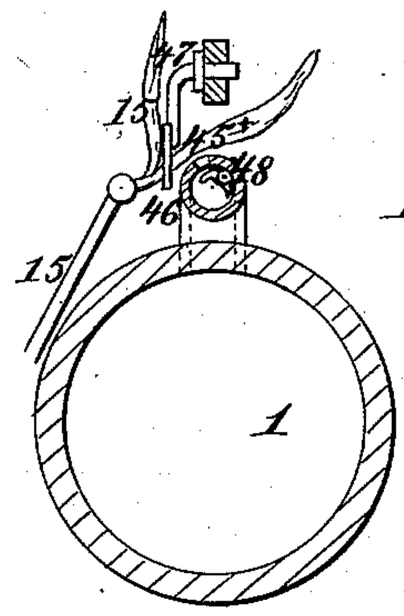


Fig. I.

Fig. G.

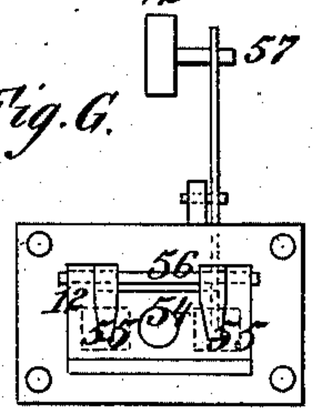
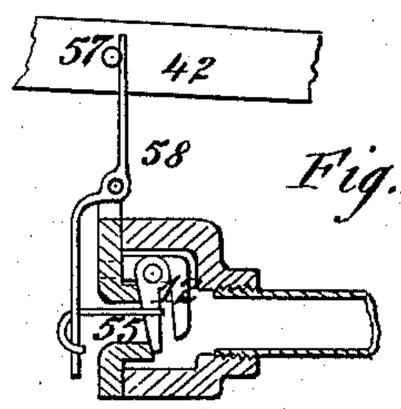


Fig. H.



WITNESSES:

Donn Twitchell.

C. Sedgwick

INVENTOR:

J. Robson

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JAMES ROBSON, OF BIRMINGHAM, COUNTY OF WARWICK, ENGLAND.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 278,600, dated May 29, 1883.

Application filed December 26, 1882. (No model.) Patented in England October 5, 1880, No. 4,050.

To all whom it may concern:

Be it known that I, JAMES ROBSON, of Birmingham, England, have invented Improvements in Obtaining and Applying Motive Power, of which the following is a specification.

My invention of improvements in gas-engines consists in the following application of explosive gases and air for producing motion in various machines, such as pumping water or other liquids or gaseous fluids, hammering or stamping.

In carrying out my invention as applied to pumping I use a cylinder, which may be water-jacketed, and a piston and rod working therein. In the outer end of this rod is attached a pump bucket or piston working in an ordinary pump-barrel. Also on the rod is a cross-head, to which are attached steel volute or other springs to absorb the energy developed behind the piston by the explosion of a mixture of gas and air. In the exploding-cylinder is another piston and rod, moved either by hand or self-acting gear, so that when this charging-piston is moved away from the main piston it draws in between these pistons a charge of explosive gas or vapor and air through a flap or other shaped valve, covering by its face the gas and air inlets simultaneously. On this piston reaching the end of its stroke it covers an exhaust-port and uncovers a small hole in the cylinder's side or removes a plate away from a hole in the portway and allows a standing flame to be sucked in through the hole and fire the gases. The explosion drives the main piston to the other end of the cylinder and does work in compressing or extending springs, and at the same time compels the water in the pump to pass from one side of its piston to the other and lift the water on its return-stroke by the potential energy now contained in the springs. I prefer to have the springs in an initial state of tension at the beginning of the operation. When used as a ram-plunger or high-pressure pump the main piston on its outstroke drives the ram-plunger into its case and the liquid out into the accumulator or high-lift pipe. To prevent the sudden shock from the quick motion of the explosion, I use a small ram, loaded by similar volute or other springs, between the pump and the accumulator; or an air-vessel might be used to lessen the shock. The main piston and ram are drawn back and its case charged with liquid by springs. The charging-piston is worked by a lever and weight or spring in its charging and firing stroke, and on its inward or exhausting stroke by a spring extended and held on a catch by the motion of the outstroke of the main piston and rod. When it complete its instroke it releases the spring from the catch and allows the weight to make the outstroke; or the weight and lever of the charging-piston may be lifted by a small piston worked in a cylinder on its upstroke by the liquid from the accumulator or cistern and allowed to escape on its descent. It may also be worked by a connecting-rod to a fly-wheel, put in motion by hand or by the motion of the main piston and springs. By attaching a hammer-head to the main piston-rod, instead of a pump, it can be used as a forging-hammer or stamper, the cylinder being vertical, with the hammer attached to its main piston-rod. The piston is driven down by the explosion of the gases between its upper side and the charging-piston, the charging-piston being worked by a hand-lever or hand-wheel, with crank and connections to its rod. The gas and air supply and firing and exhaust being same as the pump, the hammer and main piston are drawn up to the top by springs.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar numerals of reference indicate corresponding parts in all the figures.

Figure A is a plan view of my improvement. Fig. B is a longitudinal sectional elevation of the same. Fig. C is a side elevation of a modification. Fig. D is a plan view of the same, partly in section. Figs. E, F, G, H, I, and J are detail views. Fig. K is a side elevation, partly in section, of my improvement applied to a forging-hammer; and Fig. L is a front elevation of the same.

1 is the cylinder; 2, the main piston, with its rod 3 connected to pump-bucket 4 in its case 5, with ordinary inlet-valve 6, discharge-valve 7, and bucket-valve 8.

9 is the charging-piston, which, when moved back by the lever 10 and weight 11, draws in between the pistons a charge of gas and air through the valve 12, then it covers the exhaust-port 13, and passes the igniting-port 14 and draws in a part of an outside constant

burning flame, 15, which explodes the gases and propels the main piston, its rod cross-head 16 compressing the steel volute or other springs 17 in their cases 18, the springs being connected to the cross-head by rods 19. While the main piston is thus doing work on the springs the pump-bucket is displacing the fluid from one side of it to the other through the valve 8. The springs now draw the main piston and bucket back again, and force the fluid through the outlet-valve 7 and recharge the pump through inlet-valve 6. Holes 20 allow the air to pass in and out of front end of cylinder; but when main piston passes them it cushions air between it and cylinder-cover. I also provide india-rubber buffers 21 to cushion the back-stroke of main piston or an air-cushion, formed by a short cylinder, 22, on main cylinder-cover, into which goes a piston, 23, and cushions on the air in it. The exhaust passes through a lift-valve, 24, as the pistons come together, and is then expelled through the exhaust-port 13 in the backward stroke of the charging-piston. When used as a ram-pump, Fig. E, the plunger 25 is attached to the main piston-rod, which, on its outstroke, drives the plunger into the casing and the liquid out through valve 26 into the accumulator or high lift-pipe, as in ordinary ram-pumps. 27 is suction-valve.

To prevent sudden shocks from the quick motion I use a ram, 28, loaded by volute or other springs 29 between the pump and the accumulator.

The charging-piston 9 may be worked by hand or by a cranked lever, 10, and weight 11 on its out or charging and firing stroke, and on its inward by a spring and tube, 30, extended and held on a catch, 31, by the motion of the main-piston cross-head 16 acting on the bent lever 32. When the charging-piston completes its inward stroke it releases the catch 31 from the tube and spring 30 by a rod, 33, attached to the lever 10, and this allows the weight 11 to draw the charging-piston out and the spring tube and lever 32 back again; or the weight 11 and lever 10 may be lifted by a small piston worked in a cylinder, 34, Fig. F, on its upstroke by the liquid from the accumulator or cistern, an ordinary admission and escape valve, 35, being used, and moved up or down by the lever 10 by projections on the escape-valve rod at 36. When the accumulator is full it slackens a wire, 37, and drops the stop 38 under the lever 10 and arrests the motion of the pump.

Figs. C and D show another method of working the charging-piston. A fly-wheel, 39, fixed on a shaft, 40, having a disk-crank, 41, moves a connecting-rod, 42, and charging piston and rod 9. The fly-wheel can be kept in motion by hand or by a V eccentric friction-gripper, 43, working in a V-nick on the rim of the crank-disk. When the main piston is propelled out it moves with it a connecting-rod, 44, and lever 45, on which the gripper moves. The gripper in the outstroke slides round the disk, but by its eccentricity grips the disk in the instroke and gives motion to the disk and fly-wheel. By detaching the pump this last arrangement may be used as an ordinary motor for giving motion to anything else. At 14 and 15, Fig. C, is the flame and firing-hole in the cylinder's side; but sometimes I put the firing-hole in the tubular portway from the gas and air feed valve 12, as at 45. The standing flame 15 is prevented from entering the firing-hole by a plate, 46, until the charging-piston is at the back of its stroke, when a stop, 47, on the connecting-rod 42 moves the plate 46 away and allows the flame to go over and into the firing-hole, as better seen in Fig. I. At the explosion a small valve, 48, closes the firing-hole; or the firing-hole may be closed as at Fig. J. 49 is a small cylinder and piston. 50 is the firing-hole in main cylinder or portway; 51, a sliding plate fixed to small piston-rod. When the flame 15 explodes the gases in the main cylinder the pressure communicates through the port 52 under the small piston and drives it out, and the plate 51 closes the firing-hole 50. A spring, 53, pushes the piston back.

Figs. G and H are views of the feed-valve, 54 being the gas entrance and 55 the air-way, the valve 12 moving on a pin, 56, and closing gas and air at same time. The feed-valve 12 may be closed just before explosion by a pin, 57, on connecting-rod 42 moving a hinged lever, 58. The energy of the explosion may be absorbed by pistons 59, attached to the cross-head and working in the spring-cases 18 to form a vacuum instead of springs. 60 is an outward "sniffing" valve for forcing out any air leakage.

Figs. K and L show the application to forging-hammers. 61 is the hammer on end of piston-rod; 62, the anvil. The explosion-cylinder is the same as in the pump, the charging-piston being worked by the hand-wheel 39, the springs in cases 18 just being sufficient to raise the hammer to the top.

I claim—

1. The combination, with the cylinder in which the main piston works, provided with a charging-valve and igniting-orifice, of a charging-piston in the rear of the main piston, and means for operating the said charging-piston, substantially as herein shown and described.

2. The combination, with a cylinder provided with a charging-valve and igniting-orifice, and the main piston, of a spring for retracting the said main piston, a charging-piston in the rear of the main piston, and means for operating the said charging-piston, substantially as herein shown and described.

3. The combination, with the cylinder 1, provided with the charging-valve 12, the exhaust-port 13, the igniting-orifice 14, and the piston 2, of the charging-piston 9, provided with valve 24, and means for operating said piston, substantially as herein shown and described.

4. The combination, with the cylinder 1 and

the piston 2, having the cross-head 16 on its piston-rod, of the charging-piston 9, the weighted lever 10, the spring and tube 30, catch 31, rod 33, and bent lever 32, substantially as herein shown and described.

5. The combination, with the cylinder 1, having a firing-orifice, 50, and port 52, of the cylinder 49, containing a piston, the slide 51, connected to the piston-rod, and the spring 53 on the upper end of the piston-rod, substantially as herein shown and described.

6. The combination, with the cylinder 1, provided with the pivoted inlet-valve 12, of the connecting-rod 42, provided with the pin 57 and the lever 58, substantially as herein shown and described.

The above specification signed by me this 18th day of September, 1882.

JAMES ROBSON. [L. S.]

Witnesses:
T. MORGAN,
21 *Cockspur Street, London, S. W.*
W. DRAYSON,
Clerk to Messrs. Comerford & Co., 7 Tokenhouse Yard, London, E. C.