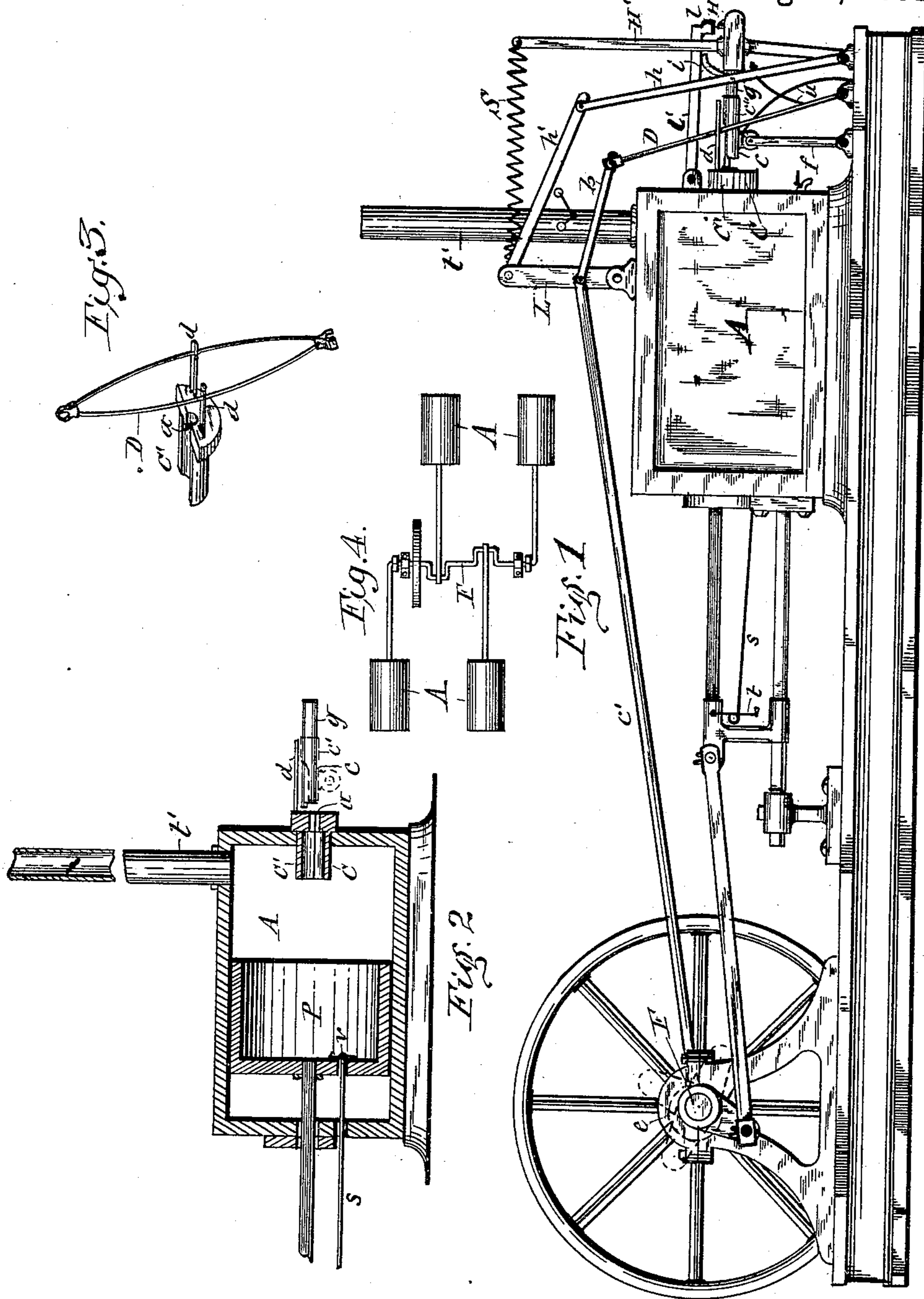


(No Model.)

J. JOYCE.  
EXPLOSIVE ENGINE.

No. 480,019.

Patented Aug. 2, 1892.



WITNESSES:

H. E. Bates.

C. L. Bendixon

INVENTOR:

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# UNITED STATES PATENT OFFICE.

JOHN JOYCE, OF OSWEGO, NEW YORK.

## EXPLOSIVE ENGINE.

SPECIFICATION forming part of Letters Patent No. 480,019, dated August 2, 1892.

Application filed November 21, 1891. Serial No. 412,605. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN JOYCE, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Explosive Engines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to an engine designed to be operated by the force of explosives direct against the piston of the engine; and it consists in a novel construction and combination of the component parts of the engine, as hereinafter fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a side elevation of an engine embodying my invention. Fig. 2 is a vertical longitudinal section of the piston with its inclosing chamber and showing, also, the plunger or firing-pin. Fig. 3 is a detached perspective view of the cartridge-ejector in an inverted position and with the rock-arm connected thereto, and Fig. 4 is a plan view showing the arrangement of four cylinders with four cranks on the driving-shaft of the engine.

Similar letters of reference indicate corresponding parts.

A represents the chamber which incloses the piston P. This piston is of the form of a cup presenting its mouth toward the rear end of the aforesaid chamber and arranged to reciprocate lengthwise therein. The rear end wall of the chamber is provided with an orifice in which are inserted the cartridge-holder C and cartridge-ejector C', consisting of two elongated blocks disposed one upon the other and provided in their adjacent sides with coinciding grooves and formed at their outer ends with heads which form shoulders on the exterior of the block, by which shoulders they abut against the exterior of the chamber A. The lower block or cartridge-holder C is secured stationary to the chamber A and the upper block or ejector C' is mounted longitudinally movable on the lower block. In the center of the adjacent sides of the heads of the blocks C C' is a port *a* for the reception of the cartridge. The port is of a size to closely fit to the body of the cartridge and allow the rim or flange thereof to rest against the exterior of the aforesaid

heads of the blocks C C'. The inner end of the cartridge is surrounded by the cylindrical portions of the blocks C C', which thus direct the force of the explosive toward the piston P.

Back of the chamber A is a rock-arm D, which receives motion from an eccentric *e* on the main shaft F of the engine, as indicated by dotted lines in Fig. 1 of the drawings. The eccentric-rod *c'* extends rearward and is connected to a lever L, and a rod *b* is connected at one end to said lever and at the opposite end to the free end of the rock-arm D. I preferably form said rock-arm of two rods united at the ends and spread apart at the center, where they pass through two elongated loops *d d* rigidly to the upper block C' and extending rearward therefrom. Back of the chamber A is also a pivoted post *f*, to the upper end of which is hinged a cartridge-carrier consisting of the trough *c*, which is in range with the port *a* and terminates with a cylinder *c''* at its rear end. This trough is supported at said end by the plunger *g*, which is inserted in the cylinder *c''* and is connected at its rear end to a lever *h*, which is pivoted at one end to a suitable support at the base of the engine and has its upper end connected to the lever L by a rod *h'*, the latter connection being made at a point farther from the fulcrum of the lever L than the attachment of the rod *b* and eccentric-rod *e'* to impart a greater stroke to the lever *h* than to the rock-arm D. A spring *u* connects the upper or free end of the post *f* to the lever *h*, so as to cause said post to be drawn back with the lever and allow the lever to swing forward and push the cartridge into the port *a* after the movement of the post has been arrested by the contact of the carrier *c* with the rear of the chamber A.

H denotes a hammer, which is secured to the upper end of a pivoted post and adapted to strike the rear end of the plunger *g* and is overbalanced, so as to be inclined rearward. An arm H' extends vertically from the hammer and is connected to the lever L by a spiral spring S. The hammer is provided with a shoulder *l*, and to the rear of the chamber A is hinged an arm *l'*, which is adapted to engage the shoulder *l* and hold the hammer remote from the plunger *g*. To the lever *h*

is attached a cam *i*, which lifts the arm *l'* out of engagement with the shoulder *l* when said lever is swung forward to push the cartridge into the port *a* by the plunger *g*.

5 I have shown only one crank on the main shaft and only one engine; but I really apply two or four cranks to the shaft, set quartering, as indicated by dotted lines in Fig. 1 of the drawings, and connect to said cranks a corresponding number of engines.

10 In the operation of my described engine the cartridge is placed in the trough *c* while the lever *h* is inclined rearward and holds the plunger *g* retracted from the trough and the hammer *H* is held remote from the plunger. Then by turning the main shaft of the engine sufficiently to draw the lever *h* forward and cause the same to throw the arm *l'* off from the shoulder *l* by the cam *i* the hammer *H* is caused to strike the plunger *g* by force of the spring *S*, said plunger striking the cartridge held in the port *a* and discharging the same into the chamber *A*, the force of the explosion being directed into the open end of the piston *P*, which is thereby driven forward. The return movement of the piston is produced by the successive action of the companion engines connected to a corresponding number of cranks on the main shaft, as hereinbefore stated. In the return movement of the piston the rock-arm *D* draws out the upper block *C'*, which carries out with it the exploded cartridge, and thus ejects the same. The head or solid front of the piston *P* is provided with a suitable valve *v*, which opens inward to permit air to enter the piston as it approaches the front portion of the chamber *A*. The piston is thus relieved of the pressure of the air in front of it and the smoke and gas is driven out of the piston. To insure the opening of the valve *v* at the proper time, I insert through the front head of the chamber *A* a stem *s*, the inner end of which is in line with the valve *v*, so as to push the same open as the piston *P* approaches the front end of the case *A*. The outer end of said stem is connected to a lever *t*, which is pivoted to the cross-head *T*, so that by swinging said lever forward the stem *s* being drawn forward with it is thus set to strike the valve when the piston is near the end of the chamber *A*.

A pipe *t'* is connected to the chamber *A* for the escape of the smoke and gas from said chamber. This pipe is provided with a suitable valve or damper by which to control the exit.

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

60 1. An explosive engine comprising a chamber, a piston in said chamber, a cartridge-holder in the end wall of said chamber, a cartridge-ejector movably connected to the cartridge-holder, a cartridge-carrier movable toward and from said holder, and a plunger in said carrier, as set forth.

2. In an explosive engine, the combination

of a chamber, a piston in said chamber, a cartridge-holder in the end wall of the chamber, a cartridge-carrier movable toward and from the holder, a plunger in said carrier, a lever connected to said plunger, a hammer back of the plunger, a spring drawing the hammer to the plunger, an arm adapted to hold the hammer remote from the plunger, a cam on the aforesaid lever adapted to throw the arm out of engagement with the hammer, and connections between said levers and main shaft of the engine to operate said levers, as set forth.

3. An explosive engine comprising a chamber, a piston in said chamber, a cartridge-holder in the end wall of the chamber, a cartridge-ejector movably connected to the cartridge-holder, and a lever connected to said ejector and actuated by the main shaft of the engine, as set forth.

4. The combination, with the chamber *A* and piston *P*, of the block *C*, seated stationary in the rear wall of said chamber, the block *C'*, seated movable longitudinally on the block *C*, and the port *a* in the adjacent sides of said blocks, the loops *d d*, extending rearward from the movable block *C'*, and the rock-arm *D*, consisting of two rods united at the ends and spread apart at the center and passing through the aforesaid loops, as and for the purpose set forth.

5. In combination with the chamber *A* and piston *P*, the cartridge-holder *C C'*, pivoted post *f*, cartridge-carriers *c c'*, pivotally connected at the front end to said post, the lever *h*, and the plunger *g*, connected to said lever and supporting the rear end of the plunger, substantially as described and shown.

6. In combination with the chamber *A*, provided with the cartridge-holder in its end wall, the cup-shaped piston *P*, disposed with its mouth toward the cartridge-holder, and the valve *v*, connected to the solid end of the cup and arranged to open inward, substantially as and for the purpose set forth.

7. In combination with the case *A* and cross-head *T*, the piston *P*, formed cup-shaped and having its closed end toward the front and provided with the valve *v*, and the stem *s*, adjustably connected to the cross-head and having its inner end in line with said valve, as and for the purpose set forth.

8. In combination with the case *A* and piston *P*, the cartridge-holder *C C'*, cartridge-carrier *c c'*, plunger *g*, lever *h*, connected to said plunger and actuated by the main shaft of the engine, the cam *i*, attached to said lever, the hammer *H*, provided with the shoulder *l*, the arm *l'*, adapted to engage said shoulder, and the spring *S*, drawing the hammer toward the plunger, substantially as set forth.

In testimony whereof I have hereunto signed my name this 9th day of November, 1891.

JOHN JOYCE. [L. S.]

Witnesses:

ALEXANDER SKILLIN,  
JOHN GRIFFIN.