M. C. WHITE & O. C. DURYEA.

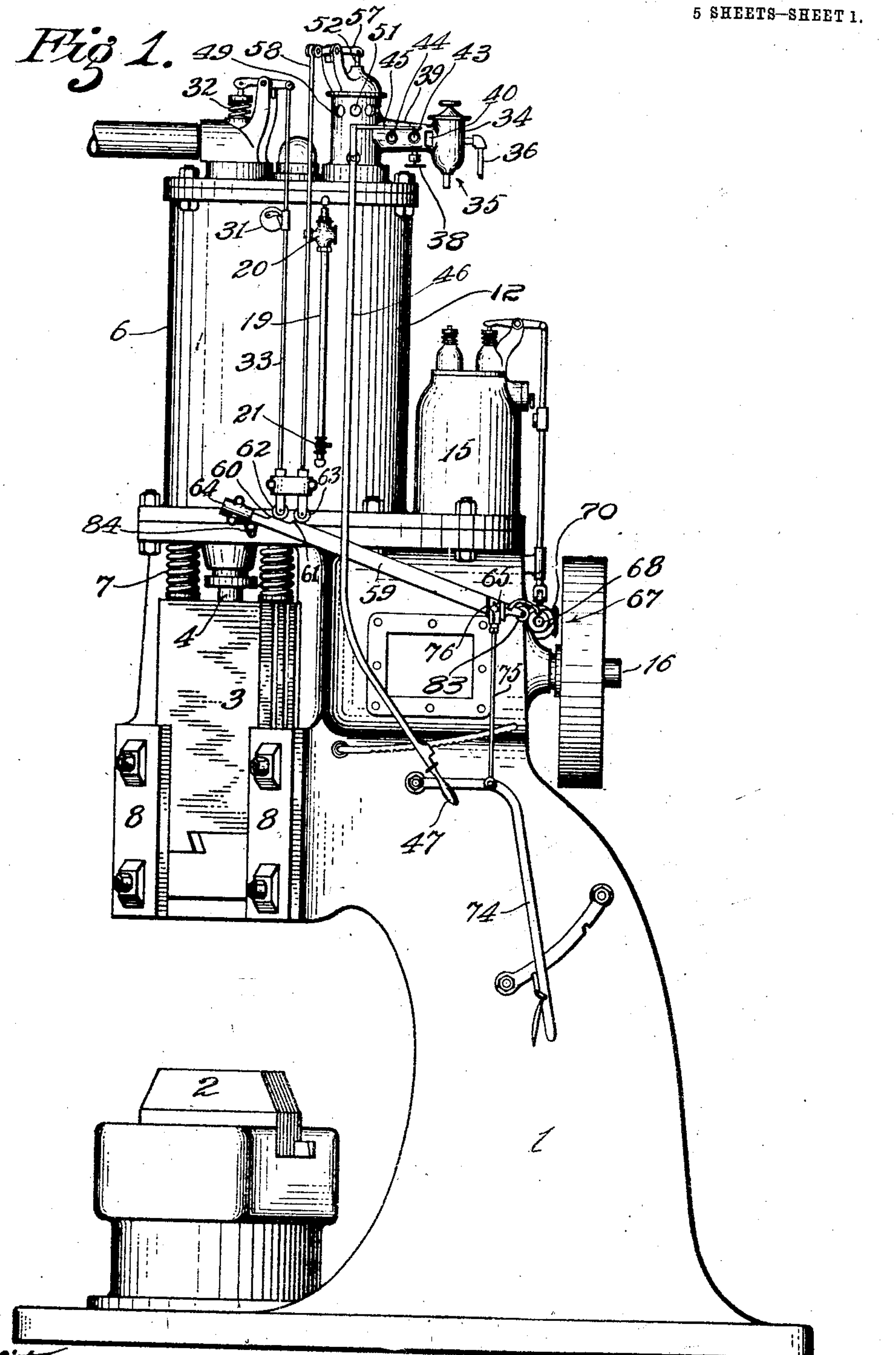
INTERNAL COMBUSTION POWER HAMMER.

APPLICATION FILED APR. 30, 1907.

1,033,503.

Patented July 23, 1912.

5 SHEETS—SHEET 1.



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by James R. Townsend Their Atty.

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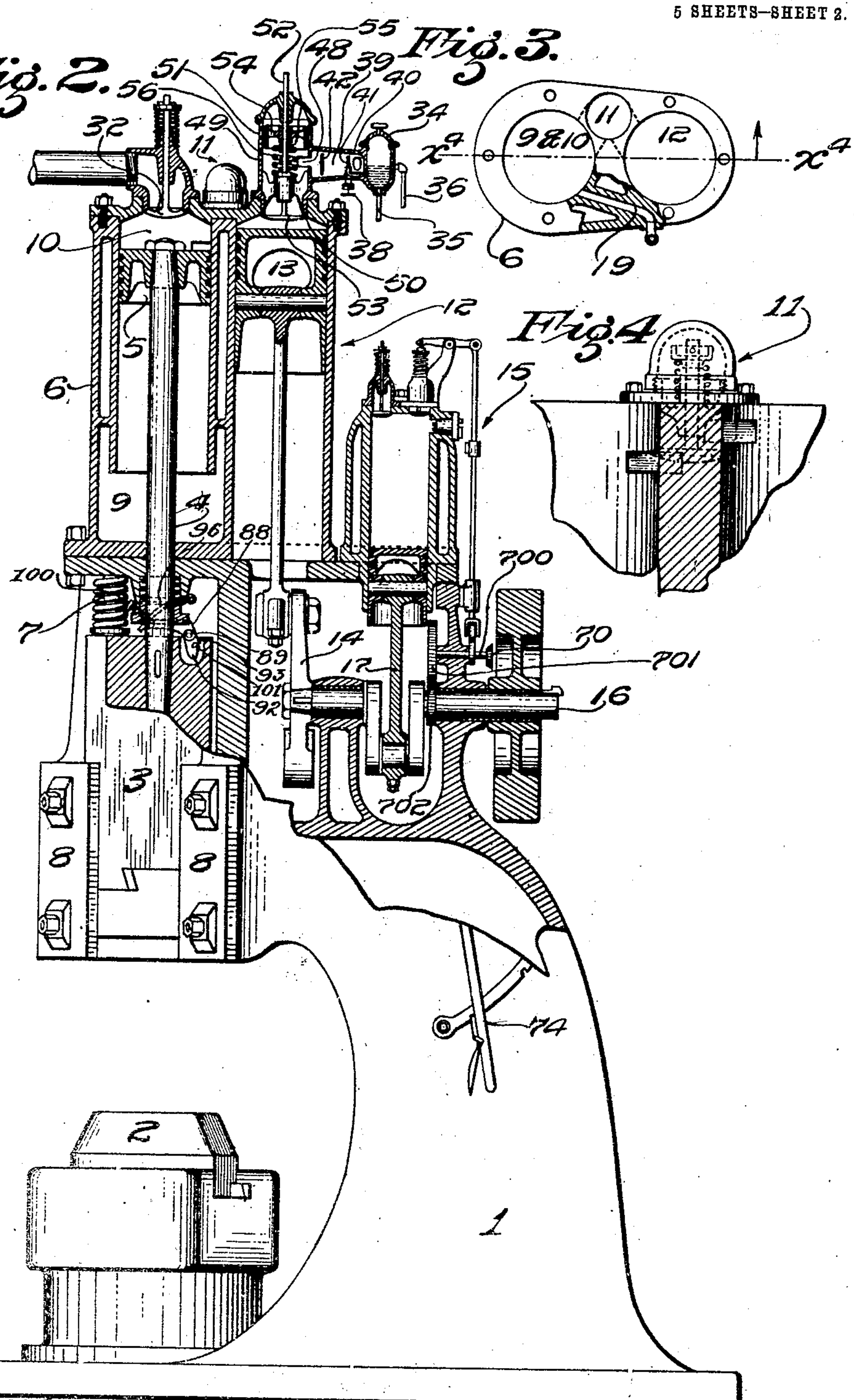
5 SHEETS—SHEET 2.

Fig. 2. Fig. 3. Fig. 4



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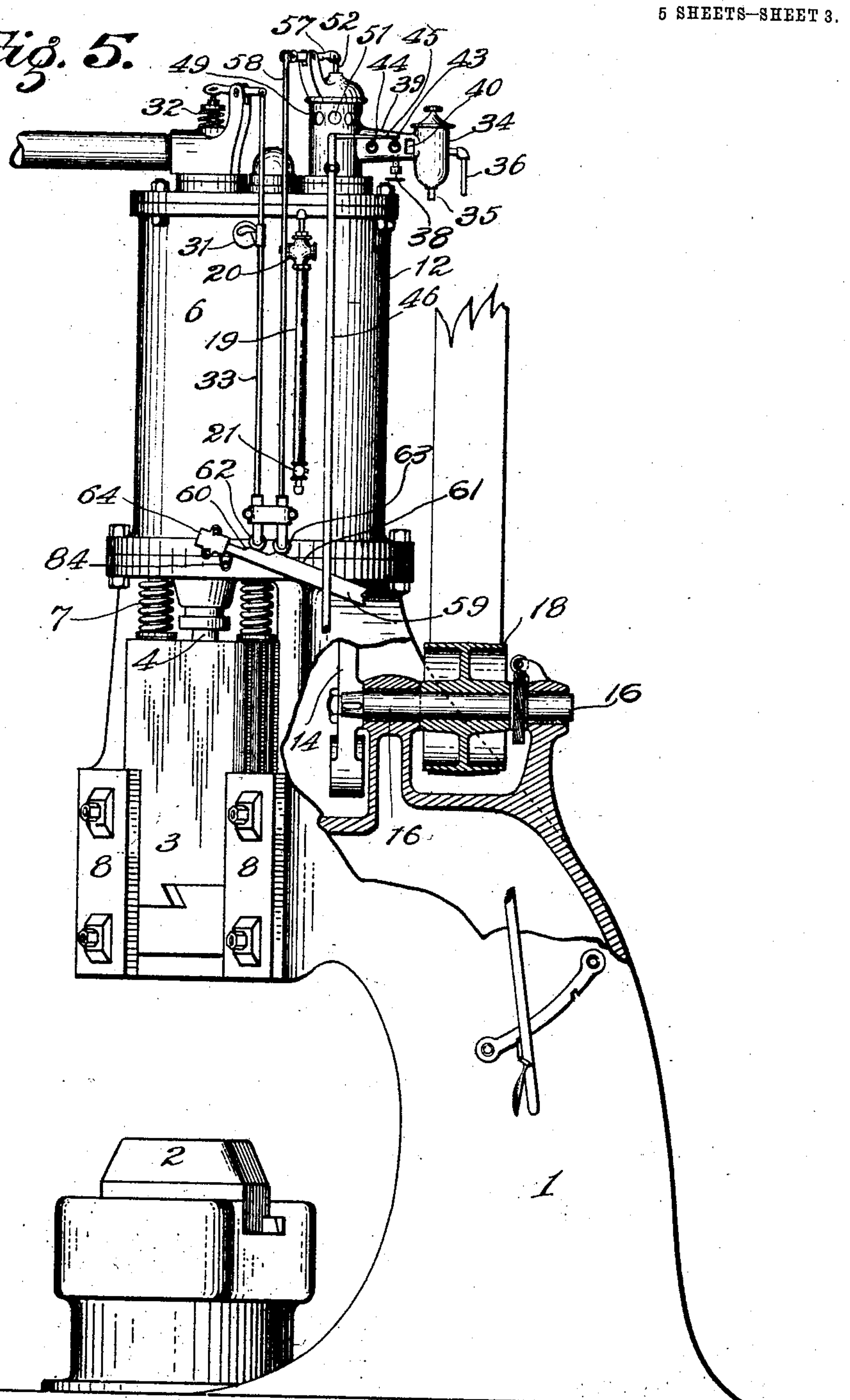
5 SHEETS—SHEET 3.

Fig. 5.



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5 SHEETS—SHEET 4.

Fig. 6.

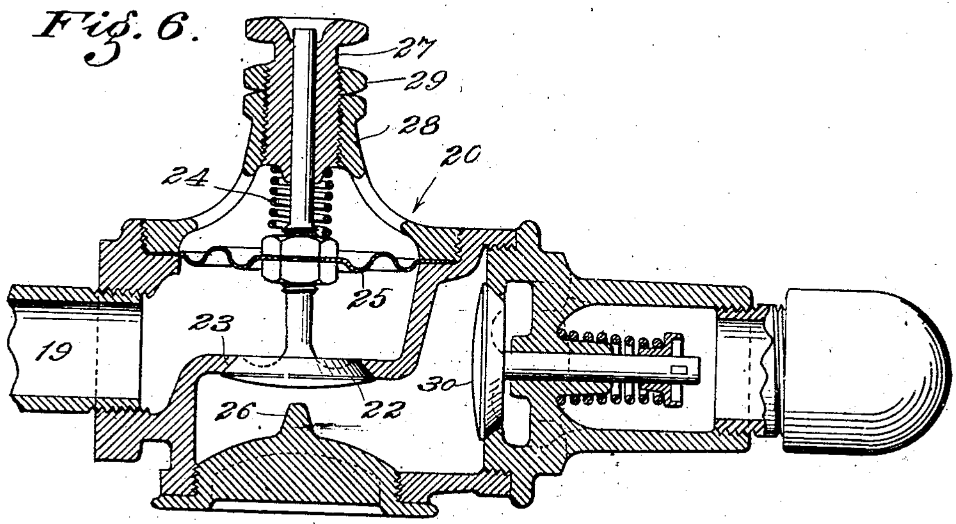

Fig. 7

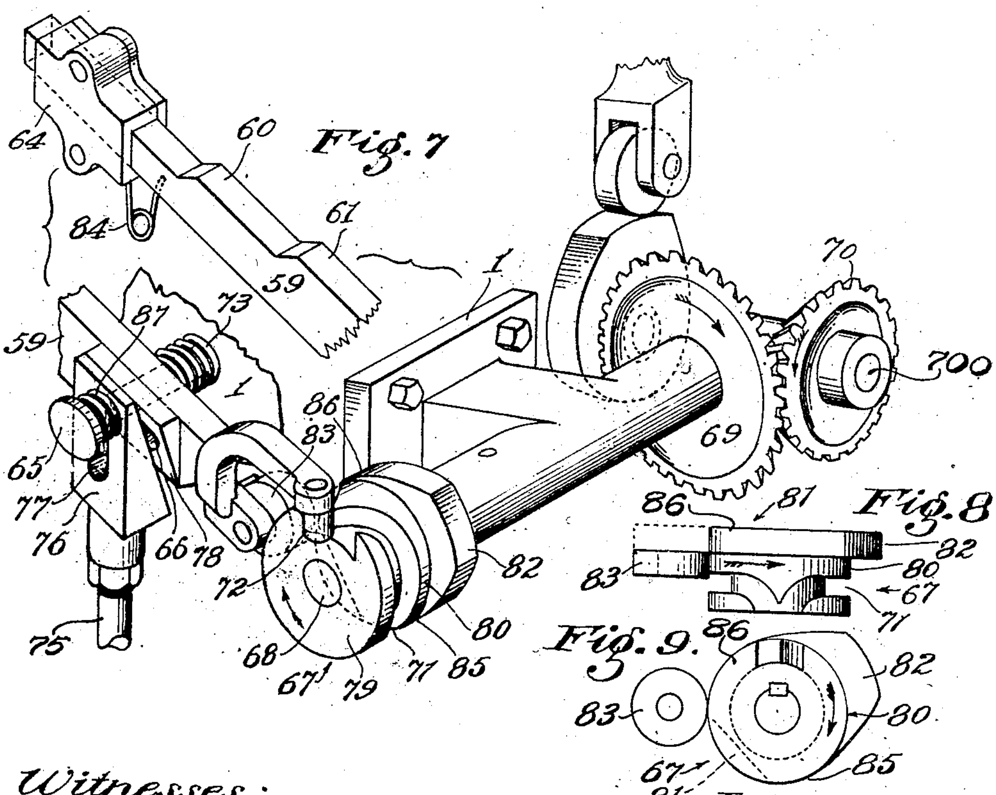

Fig. 8

Fig. 9.

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5 SHEETS—SHEET 5.

Fig. 10.

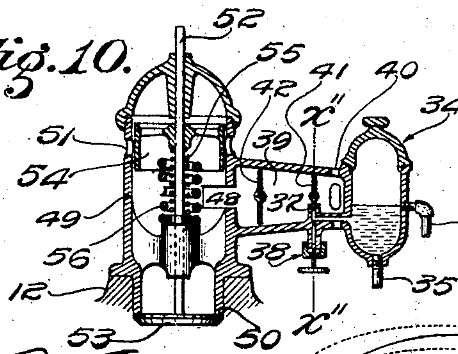


Fig. 11.

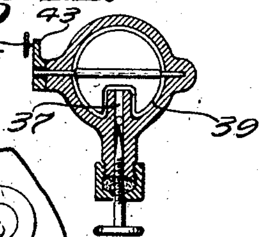


Fig. 12

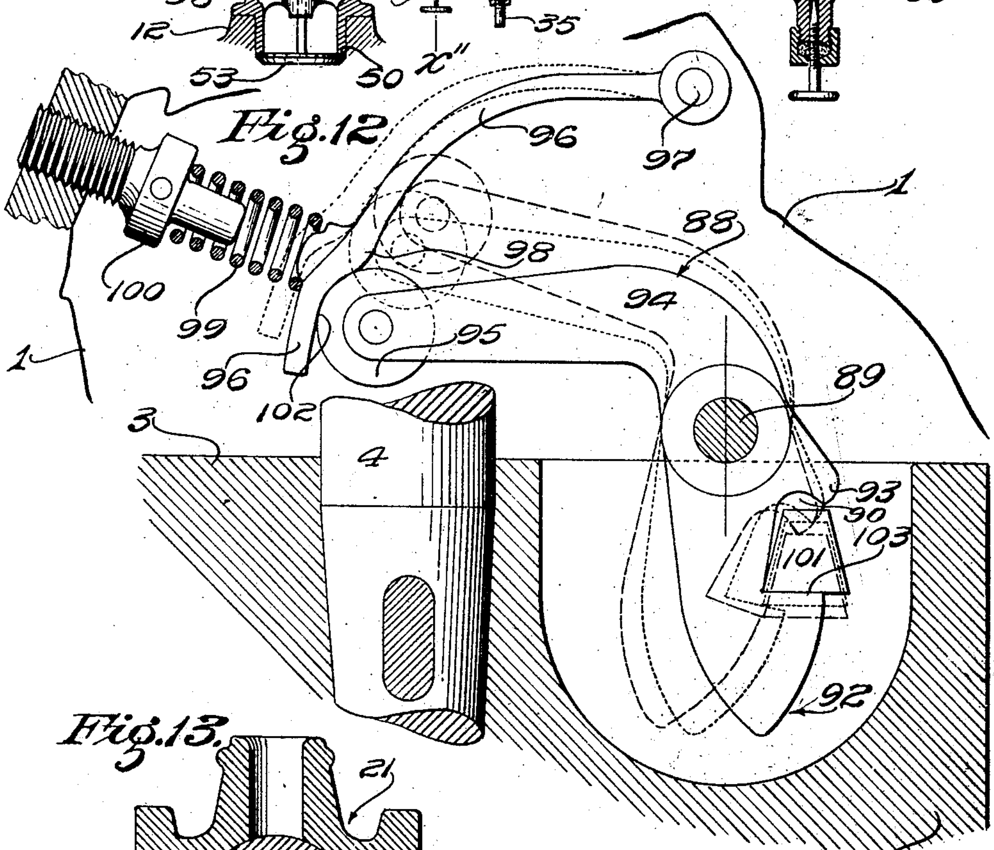
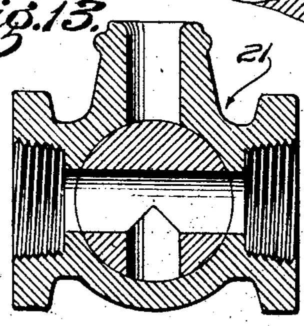


Fig. 13.



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UNITED STATES PATENT OFFICE.

MORRIS C. WHITE AND OTHO C. DURYEA, OF LOS ANGELES, CALIFORNIA.

INTERNAL-COMBUSTION POWER-HAMMER.

1,033,503. Specification of Letters Patent. **Patented July 23, 1912.**

Application filed April 30, 1907. Serial No. 371,190.

To all whom it may concern:

Be it known that we, MORRIS C. WHITE and OTHO C. DURYEA, both citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Internal-Combustion Power-Hammer, of which the following is a specification.

An object of this invention is to provide a practical self-contained power hammer operated by internal combustion, and capable of performing the work now performed by what is known as a steam hammer; that is to say, to strike a blow of any required force and to repeat the blows with any desired rapidity, the hammer being under the control of the operator to the same extent as is now possible with what is known as a steam-hammer.

Other objects relate to simplicity of construction, and economy of manufacture, installation and operation.

It is of the objects of this invention to provide effective and satisfactory means for retracting the hammer to resting position after each blow; to provide effective means for retaining the piston in such resting position and until a charge of fuel is compressed to such pressure as may be desired in the explosion chamber prior to ignition, and for automatically releasing said piston to effect a blow; and to provide adjustable means for automatically releasing said piston only after a determined pressure has been exerted in the explosion chamber.

The invention may be embodied in a self contained unit in which the entire operations of the working parts will be performed by power derived from internal combustion within such unit; or certain parts may be driven by power from an extraneous source as from an electric motor, a gas or steam engine or the like. Such latter arrangement may be desirable in large plants where a plurality of hammers are to be used.

An advantage to be gained by means of this invention in plants already provided with steam power or in which steam or other power is required for other operations, is the economy of producing the blow by power generated only at the instant of use and thereby avoiding the inconvenience and the loss by radiation and otherwise always accompanying the use of steam in steam hammers. Furthermore, by the use of internal combustion for effecting the blow the necessity of large boiler capacity is avoided.

Various objects and advantages in addition to those enumerated may appear from the subjoined detailed description.

The impulses of the hammer may be given from explosions of any form of combustible fluid, as gas, hydrocarbon vapor, and the like. In the accompanying drawings the invention will be illustrated as applied in a hammer adapted to use liquid fuel, but it is to be understood that the invention is not limited to the construction shown, and that various changes may be made within the skill of the constructor to adapt the machine to various situations and to the use of various kinds of fuel, without departing from the spirit of the invention.

The accompanying drawings illustrate the invention.

Figure 1 is a side elevation of a power hammer embodying this invention installed ready for use. Fig. 2 is an elevation, partly in section, illustrating the internal construction of the hammer shown in Fig. 1. Fig. 3 is a plan of the compressor and hammer cylinders, the heads being removed. The cylinders and casing walls are broken to show the lower part of the air passage to the air cushion chamber. The transfer passages between the compressor chamber and the explosion chamber are indicated in dotted lines. Fig. 4 is a vertical section on line x^4, Fig. 3, showing the transfer valve between the compressor and the explosion chambers. Fig. 5 is a view showing a hammer designed for use where it is desired to connect a number of hammers in one plant with a single extraneous source of power, as by a line shaft, not shown, driven by an electric motor or other form of engine. Fig. 6 is a sectional detail of the automatic cushion regulating valve for maintaining appropriate air pressure to retract the hammer. Fig. 7 is a broken perspective detail of the mechanism for operating the intake valve for the compressor chamber, and the igniter and exhaust valve for the explosion chamber. A fragment of the valve operating mechanism for the prime mover of the hammer shown in Figs. 1 and 2 is also shown, a part being broken and displaced from normal position to contract the view. Fig. 8 is a plan view of the operating cam shown in Fig. 7. Fig. 9 is an end view of the same. The operating rod roller is also shown. Fig. 10 is an enlarged sectional detail of the compressor intake valve and carbureter, shown in Fig. 2. Fig. 11 is an enlarged section on line x^{11}, Fig. 10. Fig. 12 is a fragmental sectional detail of the hammer holding and tripping device for retaining the hammer in resting position until a determined pressure is exerted upon the piston. Fig. 13 is a sectional detail of a valve for relieving the pressure of air in the air cushion for retracting the piston.

The invention comprises the combination of a hammer-head, a direct-acting internal combustion engine for operating the same, a supplemental compressor and a carbureter for supplying explosive charges to the hammer explosion chamber, power means for operating the compressor, and manually-controlled automatic means operably connected with the compressor to cause operation in proper succession of the means for supplying, igniting, and exhausting the explosive charges and the products of combustion.

Referring to the drawings, 1 is the base or frame, 2 the anvil, 3 the hammer-head, 4 the piston-rod, 5 the piston-head, 6 the hammer cylinder, 7 the buffer springs for stopping the hammer-head and piston at the close of the retraction stroke, and 8 the hammer-guides; all of which parts are usually found in steam-hammers.

9 is the chamber for an air-cushion affording resilient means to retract the piston-head and attached parts after each blow.

10 is an explosion chamber communicating through a check-valve-controlled passage 11 with the supplemental compressor-cylinder 12 in which the compressor-piston-head 13 may be operated by any suitable power-means as the crank 14, driven by a prime-mover of any desirable character, which may be a unit of each hammer, as the engine 15, or may be a unit, not shown, for a number of hammers, the power being transmitted to the crank-shaft 16 through any suitable means, as by connecting-rod 17 shown in Fig. 2, or by pulley 18 shown in Fig. 5, which may be driven by a belt from an extraneous motor, not shown.

19 designates a valve-regulated air-passage leading from the compressor-cylinder 12 to the air-cushion-chamber 9 and provided at its inlet-end with a pressure-regulating-valve 20, and at its outlet end with a relief-valve 21; the purpose of this connection being to supply within the air-cushion-chamber a determined pressure for retracting the hammer after each blow, this being accomplished by means of the adjustable pressure-regulating valve 20 shown in detail in Fig. 6, where 22 is a stopper to seat on a valve-seat 23 and held open by a spring 24, except when closed by pressure in passage 19 sufficiently in excess of atmospheric pressure to overcome said spring; this being accomplished through the medium of a diaphragm 25, having an area considerably larger than that of the passage through the valve-seat 23, so that when the air pressure between the stopper 22 and the diaphragm 25 is sufficiently in excess of the atmospheric pressure on the opposite side of said diaphragm to overcome the spring 24, the diaphragm operates to hold the stopper seated; but when the pressure on the inner side of the diaphragm does not equal the pressure of the spring 24 the stopper will be forced from its seat.

26 is a stop for the stopper 22, to prevent too much play thereof, and 27 an adjustable screw-threaded bushing screwing through a cage 28 to regulate the tension of the spring 24. The cage admits atmospheric pressure to the outside of the diaphragm.

29 is a jam nut to lock the bushing 27 in adjusted position.

30 is a check valve to prevent escape of air back into the compressor chamber.

The operation of the regulating valve is apparent; that is to say, when the pressure in pipe 19 is not sufficient to overcome the force of the spring 24, said spring will force the stopper 22 from its seat 23, thus allowing air to flow through the valve from the compressor chamber; thereby again increasing the pressure in passage 19 and the air cushion chamber 9. As soon as the pressure in air passage 19 again becomes sufficiently in excess of atmospheric pressure to overcome the spring, the diaphragm will again operate to close the valve. The relief valve 21 may be opened at any time to relieve the pressure in the air cushion chamber 9, thus to allow the piston 5 to be held down by pressure in the hammer-driving explosion chamber 10.

31 is an igniter of any suitable construction for igniting charges in the explosion chamber 10, and 32 is an exhaust-valve for said explosion chamber. 33 designates a tappet rod for operating said igniter and exhaust in proper succession. The tappet rod 33 is pivotally connected at its upper end with the horizontal lever shown. Said lever is pivoted between its ends and merely contacts with the stem of the valve 32.

34 designates a carbureter for supplying explosive mixture for operating the hammer. Said carbureter is supplied with liquid fuel through a pipe 35; an overflow passage 36 being provided to carry away any excess of fuel and to maintain a permanent level of the fluid just below the opening of the nozzle 37 which is controlled by a needle valve 38 and opens within a vaporizing passage 39 supplied with fuel through the nozzle 37 and with air through openings

40. The supply of explosive mixture of air and fuel vapor or gas through the passage 39 may be regulated by any suitable means, as by dampers 41, 42, simultaneously controlled by cranks 43, 44, operated by a link 45 manually controlled by a lever 46 having a handle 47 within reach of the operator. The purpose of the dampers 41 and 42 is to provide a throttle to enable the operator to control the force of the blow by regulating the amount of explosive charge admitted to the compressor chamber and thence to the explosion chamber 10. The passage 39 opens through a port 48 into a housing 49 that is provided on one side of the port 48 with the intake-port 50 of the compressor-cylinder 12, and on the other side of the port 48 with one or more atmospheric ports 51.

52 is a valve-stem in the housing 49 carrying at one end the intake-valve 53, and at the other end a charge intermitting valve 54; the latter valve 54 being arranged relative to the intake-valve 53 and the ports 48 and 51 to close the atmospheric ports 51 and open the fuel-supply port 48 when the intake-valve 53 is open to a limited extent or fully closed, and to open the atmospheric ports 51 and close the fuel-supply port 48 when the intake-port 50 and its valve 53 are widely open; the purpose being to allow charges of fuel to be drawn into the compressor cylinder 12 at each outstroke of the compressor-piston while the atmospheric ports are closed, and to allow free charges of atmospheric air to be drawn into and forced out of the compressor cylinder at each reciprocation of the compressor piston when the intake-valve 53 is fully open. By this arrangement the moving parts of the compressor may have a constant speed or be constantly in operation, while the delivery of explosive charges during such operation may be intermitted by simply moving the valve-stem 52 far enough inward to open the atmospheric ports 51.

55 is a light spring to normally hold valves 53 and 54 in position to close the intake port 50 and the atmospheric ports 51, and to allow the intake-valve to open responsively to the suction of the compressor-piston so as to admit charges of fuel fed through port 48.

A stiff spring 56 is arranged to normally intercept the intermitting valve 54 to prevent the suction of the compressor from operating the valve 53 sufficiently to cause the valve 54 to open the atmospheric ports 51; and said spring is adapted to allow said valves to be moved inward sufficiently to close the port 48 and open the atmospheric ports 51 when sufficient external pressure to effect that result is applied to the valve-stem 52. 57 is an arm operated by a tappet 58 to depress the valve-stem for this purpose as will hereinafter be more fully explained.

59 is a longitudinally and laterally adjustable tappet-operating-bar for synchronizing the supply, ignition and exhaust, the same being provided with shoulders or steps 60 and 61 to act upon the antifriction rollers 62, 63, of the tappet-rods 33 and 58 to shift said rods endwise as the bar 59 is shifted endwise. Said bar is slidably mounted at one end in a guide 64, and at the other end by means of a pin 65 extending through a longitudinal slot 66 in said bar. The parts are so constructed that when the bar is slid endwise in one direction into the position shown in Fig. 1, both of the tappet-rods 33 and 58 will be elevated to depress the valve-stem 52 sufficiently to open the atmospheric ports 51 and close the fuel-port 48, thereby to allow the compressor to run idle, and at the same time actuate the sparker without, however, opening the exhaust-valve 32 of the hammer-cylinder 10. When the bar 59 is in this position, the compressor may run continuously without charging the hammer-cylinder. Further movement of the bar 59, toward the left from the position shown in Fig. 1, will cause the shoulder 61 to raise the rod 33 sufficiently to open the cylinder-exhaust valve 32. On a reverse movement of the bar to the right in Fig. 1, both tappet-rods will be depressed by gravity and by force of the springs of the exhaust and supply-valves, thus allowing the exhaust-valve 32 to close and also allowing the intake-valve 53 to close under action of the spring 55, while at the same time the valve 54 closes the atmospheric-ports 51, and the intake-valve 53 is unrestrained except by the light intake-valve-spring 55 which allows said valve 53 to open and close in response to the action of the compressor-piston 13. The endwise movement of the bar 59 is effected by a continuously-rotating cam-device 67 on a shaft 68 journaled to the frame 1 and driven by a constant speed rotator, as the shaft 16, through gearing 69 and 70, shaft 700 and gears 701, 702. Said cam 67 is provided with a race 71 for a roller 72 which is carried by the bar 59 and is adapted to engage the race 71 when the bar 59 is shifted laterally against the pressure of spring 73 mounted on the pin 65. Such lateral shifting of the bar 59 may be accomplished by a hand-lever 74, a connecting-rod 75 and a spring-pressed wedge 76, the latter being provided with a vertical slot 77 and carried by pin 65 which extends through said slot. The wedge 76 is adapted to engage an oblique face 78 on the bar 59 so that when the wedge is raised the bar is shifted to bring the roller 72 into the race 71 which moves the end of the bar laterally while the shaft 68 makes one rotation. Both ends of the race terminate at the outer end surface 79 of the cam 67 so that in one rotation of the shaft the roller

72 is drawn into the race and ejected therefrom.

The cam 67 has a cylindrical track 80, and also a notch 81, a projecting tooth or lug 82, and two segmental tracks 85 and 86 all at one side of the track 80; the tracks 85 and 86 being in effect merely lateral continuations of the track 80, extending between the notch 81 and projection 82. So long as the race-roller is outside the cam 67 the bar-shifting-roller 83 will ride on the cylindrical track 80, being held in engagement therewith by the bar-retracting-spring 84. In this position the tappet-rollers 62 and 63 rest on the shoulders 60 and 61, respectively, and in this position the valve 32 remains closed, and the supply-valve-stem 52 is fully depressed, thus fully opening the intake-port 50 and the atmospheric ports 51, and fully closing the fuel-port 48. When the wedge 76 is operated to shift the bar 59, the race-roller 72 enters the race and is acted upon, thereby to shift the bar-operating roller 83 into the path of the notch 81, the track-segments 85, cam-projection 82 and track-segment 86. When the wedge 76 is operated to shift the bar to bring the race-roller 72 into the race 71, the race shifts the bar to bring the roller 83 off of the cylindrical track 80 and into the initial end of the notch 81 of the rotating-cam, thus allowing the bar 59 to move to the right in Fig. 1, withdrawing the shoulders 60 and 61 from the tappet-rollers 62 and 63, allowing the tappets to fall for an instant, thus bringing the igniter-dog into position for engagement, and allowing the fuel-port 48 to open, and the intake-valve and the atmospheric-valve to close, allowing the compressor to take in a charge of fuel through the port 48 and to compress the same into the hammer-explosion chamber 10. On further rotation of the cam, the roller 83 is lifted out of the notch by the short track 85, thereby shifting the bar into the initial position, and in this operation lifting the tappet 33 and thereby causing the igniter-dog to move upward and operate the sparker, and also lifting the tappet 58, thus opening the intake-ports 51 to atmospheric pressure and closing the fuel-port 48. The roller 83 is now in engagement with the cylindrical track segment 85 of the same radius as the cylindrical track 80, and this track is of sufficient length to allow the hammer to descend under the force of the explosion of the compressed charge, and immediately thereafter the lug or tooth 82 engages the roller 83 and thus shifts the tappet-operating-bar 59 still farther to the left in Fig. 1, thereby bringing the tappet-roller 62 as well as tappet-roller 63, onto the tappet-shoulder 61, thereby raising the tappet 33 a further step and opening the exhaust-valve and holding it open while the hammer is retracted, the tappet 58 remaining, meanwhile, in the position thereof, last-described. When the lug 82 escapes the roller 83, said roller reaches the segmental cylindrical track 86 corresponding to the track 85, and thereupon the bar 59 and the tappets and valves again come to initial position, being brought thereto by pressure of spring 84. The continued rotation of the cam-device 67 will cause repetition of the operation just described, so long as the wedge 76 is held in wedging position, the spring 87 yielding to allow the bar to shift laterally responsive to the action of the race upon the roller 72. The parts are so timed with relation to each other that when the wedge 76 is raised to cause the roller 72 to enter the race 71, the roller 83 meets the initial end of the notch 81 to bring about closure of the atmospheric ports 51 and opening of the port 48 just as the piston 13 starts upon a suction stroke, and the roller 83 leaves the notch 81 at about the time said suction stroke is completed. When the wedge 76 is again lowered, the spring 73 returns the bar to normal position, where the race-roller 72 is free from the cam, and the bar-shifting roller 83 runs on the cylindrical track 80, thus leaving the parts in initial position with the exhaust closed and the atmospheric valve-ports 51 open, and the fuel-port 48 closed.

88 (Fig. 12) is a latch pivoted to the frame 1 beneath the cylinder 6 and provided on one side of its pivot 89 with a recess 90 and bevel point 92 below said recess and a projecting lug 93 above the said recess. Said latch is provided on the opposite side of the pivot with an operating arm 94 provided at the end with an antifriction roller 95.

96 is a latch-retainer pivoted by a pivot 97 to the frame 1 and provided with an irregular face 98 extending into the path of the roller 95 to hold said roller in two positions; namely, in the active and in the inactive positions as hereinafter explained.

99 is a spring to yieldingly hold the latch-retainer 96 against the antifriction roller 95, said spring being adjustable by means of a set-screw 100.

101 is a keeper in the form of a lug or bar connected with the hammer-head 3 to engage the latch 88 as the head reaches the upper limit of its stroke, and adapted to be held by the latch to sustain a considerable pressure.

It is to be understood that the hammer, as is usual with steam-hammers, moves in a vertical path, and it will be seen from referring to Fig. 12, that when the latch is in position for retaining the lug or bar 101 the antifriction roller 95 is in a cavity 102 in the latch-retainer 96, and that the irregular or hump face 98 of said latch-retainer is, in that position, nearer the pivot 89 than is the periphery of the roller 95 at the point of its engagement with said retainer; and that in order to release the lug or bar 101 and the hammer-head, it will be necessary for the retainer 96 to be forced backward against the pressure of the spring 99, and consequently considerable force will be required to unlatch the detent 103 of the latch from the bar or lug 101. By means of the adjusting-screw 100, the tension of the spring 99 may be adjusted so that the latch will be held in latching position to resist a very heavy pressure upon the head 5 of the hammer-piston; the object being to allow a comparatively high compression, say sixty pounds to the square inch,—more or less,—to be given to the fuel charge in the explosion-chamber 10 without unlatching the piston-head, so that said piston-head can be held in that position until the charge has been fully compressed into the chamber and has been fired.

It is to be noted from Fig. 12 that the detent or shoulder 103 of the latch is wholly on one side of a vertical line drawn from the axis of the pivot 89, and that the antifriction roller 95 is on the other side of said line, so that the lug 101 has some leverage for the purpose of moving the roller 95 along the face 98, to a point slightly beyond the apex of said face, permitting the spring 99 to move it farther along to the dotted position thereof shown in Fig. 12, thereby bringing the detent 103 into the position indicated by the dotted position farthest to the left. Thus the final movement is performed by the spring 99, which saves wear upon the point of the detent. This allows the hammer to descend under the force of the explosion, but the roller 95 will now be retained in the uppermost dotted position shown in Fig. 12 until the hammer is returned by the action of the air-cushion in the chamber below the hammer-piston 5. When the hammer is thus returned, it passes the detent-tooth 103 freely, and strikes the lug 93, which at that time is in the uppermost dotted position thereof shown in Fig. 12, and thus knocks the latch back into the latching position shown in solid lines, whereupon the hammer will again be held until released by another explosion.

The operation of the hammer will be understood from the foregoing; the successive strokes being controlled by the attendant by simply operating the lever 74 and the force of each blow being regulated by moving the throttle-lever 47 to admit larger or smaller explosive charges as may be required for the work in hand.

What we claim is:—

1. A hammer head, a piston connected therewith, a cylinder for said piston, means to retract the piston in the cylinder, igniting and exhaust means for the cylinder, means for intermittently compressing explosive charges into said cylinder, and a pressure-releasable catch to hold the piston against said compressed charge and release it under the force of the exploded charge.

2. A hammer head, a piston connected therewith, a cylinder for the piston, igniting and exhaust means for the cylinder, a pressure-releasable catch for the piston, and means to compress a fuel charge against the piston.

3. A power-hammer comprising a cylinder, a piston in the cylinder, a hammer-head fixed to the piston, igniting and exhaust means for the cylinder, a carbureter, a compressor to force charges into the cylinder, and means for connecting the compressor with the carbureter and with the atmosphere alternately.

4. An internal combustion cylinder, igniting and exhaust means therefor, a piston in the cylinder, a compressor cylinder connected with the combustion cylinder, a piston therefor, an inlet port for the compressor cylinder, a passage leading to said port and provided with an atmospheric port and with a fuel port between the atmospheric port and the inlet port, a carbureter communicating with the fuel port, a valve for the inlet port, a valve common to the atmospheric and fuel ports, and means for simultaneously operating said valves to simultaneously close the atmospheric port and open the fuel port at one position of the valves, and to simultaneously close the fuel port and open the inlet and atmospheric ports at another position of the valves.

5. The combination with an internal combustion cylinder, piston therein and igniter and exhaust valve therefor, of a supplemental compressor cylinder communicating with the combustion cylinder, a compressor piston in the compressor cylinder for forcing the compressed explosive mixture into the combustion cylinder, an explosive mixture supplier, a passage extending from said supplier to the compressor cylinder, a charge-intermitting valve interposed in said passage, and means timed with the compressor piston to move the charge-intermitting valve to close said passage when the compressor piston is approximately at the end of a compressing stroke.

6. The combination with an internal combustion cylinder, piston therein and igniter and exhaust valve therefor, of a supplemental compressor cylinder communicating with the combustion cylinder, a compressor piston in the compressor cylinder for forcing compressed explosive mixture into the combustion cylinder, an explosive mixture supplier, a passage extending from said supplier to the compressor cylinder, a charge-intermitting valve interposed in said passage, and means timed with the compressor

piston to first close said exhaust valve and then move the charge-intermitting valve to close said passage when the compressor piston is approximately at the end of a compressing stroke.

7. A cylinder, a piston in the cylinder, an explosion chamber being on one side of the piston and a fluid cushion chamber on the other side of the piston, a hammer connected with the piston, a compressor for supplying compressed charges to the explosion chamber, and means for supplying compressed fluid from the compressor to the cushion chamber.

8. A cylinder, a piston in the cylinder, an explosion chamber being on one side of the piston and a fluid cushion chamber on the other side of the piston, a hammer connected with the piston, a compressor for supplying compressed charges to the explosion chamber, a passage connecting the compressor with the cushion chamber, and a pressure regulating valve to control the pressure in said cushion chamber.

9. A frame, upright cylinders on said frame, a hammer piston in one cylinder, a hammer head connected with the hammer piston, a valved passage establishing communication between said cylinder and another cylinder, a piston in said other cylinder, means for supplying fuel to said other cylinder for the first-named cylinder, a shaft on said frame, a crank on said shaft, a connecting rod connecting said last-named piston with said crank, a piston in a third cylinder, means for supplying explosive charges to said third cylinder, a connecting rod connecting said last-named piston with said crank shaft to drive the same, and means for causing successive operation of the first-two-mentioned pistons.

10. A frame, a hammer-head, a cylinder, a piston in the cylinder connected with the hammer-head, a keeper connected with the hammer head, a latch pivoted to the frame and provided on one side of the pivot with a detent to engage the keeper and on the other side of the pivot with an arm, means to yieldingly retain the arm to hold the detent in latched and unlatched position said latch being arranged to engage the keeper at the close of the retracting stroke of the piston, and means for compressing and firing a charge against the piston to impel the hammer, said retaining means being adapted to release the hammer under the force of the explosion.

11. The combination of a cylinder, a piston therein, a hammer-head connected with the piston, a compressor, an internal combustion engine for operating the compressor, a carbureter, and means for alternately connecting the compressor with the carbureter and with the atmosphere, said compressor being connected with said cylinder to supply explosive charges thereto.

In testimony whereof, we have hereunto set our hands at Los Angeles, Cal., this 13th and 15th days of April, 1907.

MORRIS C. WHITE.
OTHO C. DURYEA.

In presence of—
JAMES R. TOWNSEND,
M. BEULAH TOWNSEND.