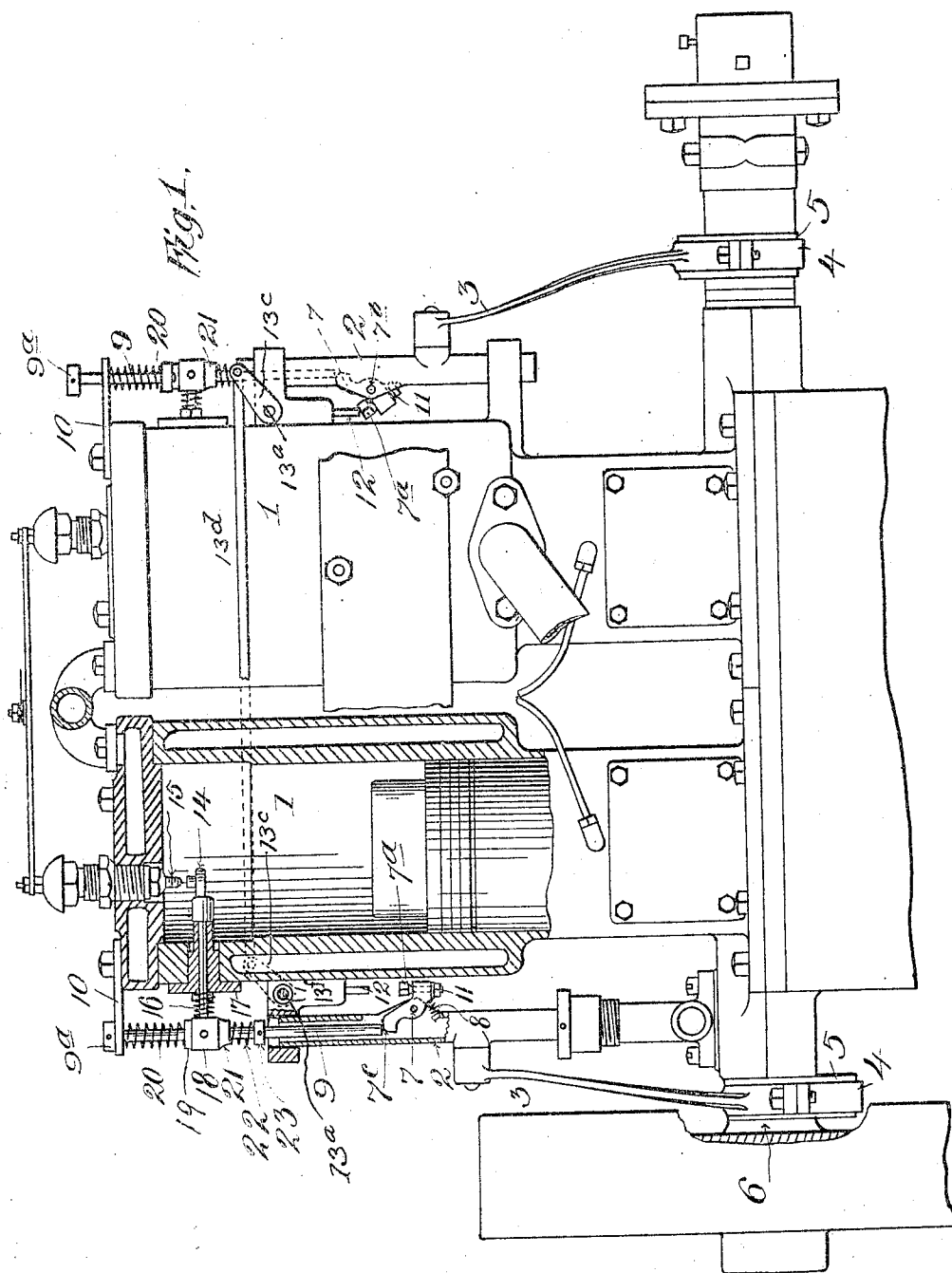


H. O. CRAM.
IGNITION DEVICE FOR INTERNAL COMBUSTION ENGINES.
APPLICATION FILED NOV. 4, 1911.

Patented Apr. 29, 1913.

2 SHEETS-SHEET 1.

1,060,231.



Witnesses:
W. B. Bingham
Marion J. Hainwright

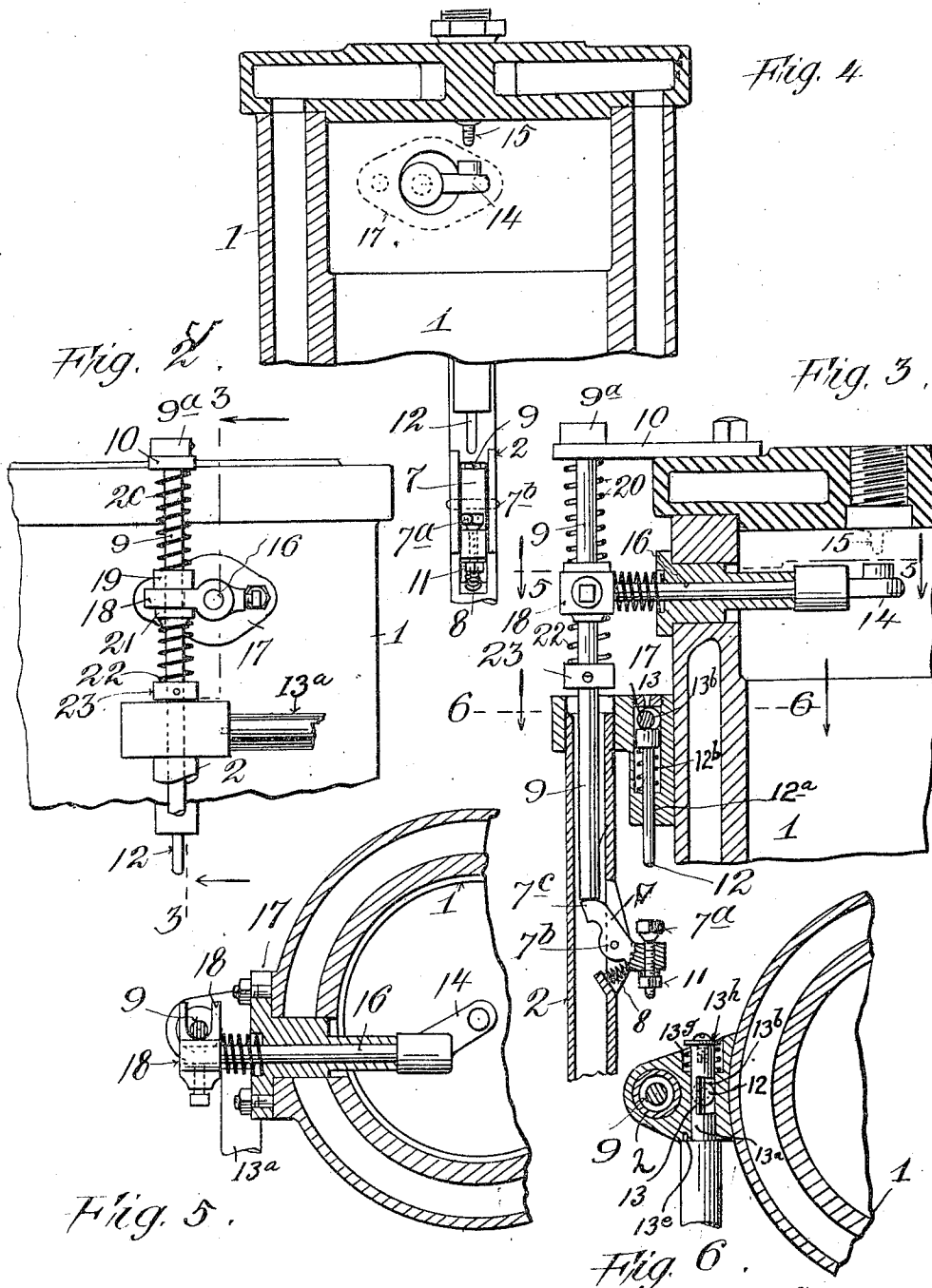
Inventor
H. O. Cram
By his Attorney *P. F. Bourne*

H. O. CRAM.
IGNITION DEVICE FOR INTERNAL COMBUSTION ENGINES.
APPLICATION FILED NOV. 4, 1911.

Patented Apr. 29, 1913.

2 SHEETS-SHEET 2.

1,060,231.



Witnesses:
C. M. Benjamin
Mar. 2. 1913.

Inventor
H. O. Cram.
By his Attorney
T. F. Brown

UNITED STATES PATENT OFFICE.

HARRY OSBORN CRAM, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE BRIDGEPORT MOTOR CO., INC., OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF CONNECTICUT.

IGNITION DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,060,231.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed November 4, 1911. Serial No. 658,494.

To all whom it may concern:

Be it known that I, HARRY OSBORN CRAM, a citizen of the United States, and resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Ignition Devices for Internal-Combustion Engines, of which the following is a specification.

My invention has reference to the class of ignition systems comprising make and break devices for producing the electric spark, and has for its object to provide improved means to regulate the time at which the circuit shall be broken at the make and break contacts, my invention being particularly useful in multi-cylinder engines to enable the sparks to be timed accurately for the different cylinders.

My invention comprises novel details of improvement and combinations of parts that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1 is a partly sectional face view of an internal combustion engine equipped with my improvements; Fig. 2 is a detail side view looking from the left in Fig. 1; Fig. 3 is a section on the line 3—3, in Fig. 2; Fig. 4 is a vertical section through a cylinder; Fig. 5 is a section on the line 5, 5, in Fig. 3; and Fig. 6 is a section on the line 6, 6, in Fig. 3.

Similar numerals of reference indicate corresponding parts in the several views.

Adjacent the cylinders 1 tubes 2 are fitted to slide in suitable guides in any well known manner, which tubes are shown pivotally connected with rods 3 having straps 4 to be operated by eccentrics 5 on the crank shaft 6, whereby tubes 2 will be reciprocated alternately in opposite directions. The tubes 2 are pivotally connected with trippers 7, the upper ends of which are normally maintained within the tubes by springs 8. Said trippers are adapted on their up-strokes to engage rods 9, the lower ends of which enter tubes 2 and the upper ends of which are guided by suitable guides 10. The trippers 7 are provided with adjustable screws or stops 7^a shown located on the sides of the pivots 7^b opposite the ends 7^c that enter tubes

2 and engage rods 9. Screws or stops 7^a are held firmly in adjusted positions by nuts 11. The screws or stops 7^a are adapted, when raised the proper distance, to engage abutments 12 carried by the engine, so that at the proper moment during the rising of tubes 2 and trippers 7 the latter will be turned on their pivots to release the rods 9. The abutments 12 are shown in the form of headed pins slidably mounted in bearings 12^a and normally pressed upwardly by springs 12^b (Fig. 3). The heads of pins 12 bear against cams 13, shown in the form of rods or shafts 13^a suitably cut away at 13^b to form said cams, and journaled to rock in suitable bearings on the engine. The rod or shaft 13^a of each cylinder is provided with a crank arm 13^c. Said arms are respectively pivotally connected with a rod 13^d, whereby said cams may be operated in unison. One of the rods or shafts 13^a is longitudinally slidable and provided with a pin 13^e (Fig. 6) adapted to enter any one of several holes 13^f in the casting (Fig. 1) to retain the cams in set positions. A spring 13^g bearing against the casting and against a head or stop 13^h on the rod 13^a having the pin 13^e (Fig. 6) serves to retain said pin in a hole 13^f to maintain both cams in set positions. The rods 9 operate the movable contacts or members 14 of the make and break devices of the electric ignition circuit which coast with the stationary contacts 15. The movable contact or member 14 is shown carried by shaft 16 journaled in plug 17 fitted in the engine cylinder, shaft 16 having a fork 18 embracing rod 9. In the example illustrated, rod 9 has a collar 19 resting upon fork 18 and pressed by a spring 20 that bears against guide 10, the head 9^a of rod 9 coacting with guide 10 to limit the downward movement of said rod. A collar 21 loose on rod 9 bears against the under side of fork 18 and is pressed upwardly by a spring 22 bearing against a collar 23 secured upon rod 9, as by a pin.

When a tube 2 is raised during the in-stroke of the corresponding piston, its tripper 7 at the proper time will engage the lower end of the corresponding rod 9 and raise the latter, which, through the medium of spring 22, will cause fork 18 to rock and cause contact 14 to engage contact 15,

and when stop 7^a engages abutment 12 and tube 2 rises to the proper height the upper end 7^c of tripper 7 will be tilted away from beneath rod 9, whereupon the latter will be released, and, by reason of the downward pressure of spring 20, contact 14 will be caused to suddenly leave contact 15 and produce a spark therebetween, and the downward stroke of fork 18 will be cushioned by spring 22. When tube 2 has descended the proper distance the tripper 7 will pass under rod 9 to be ready for the next operation. By means of the stop 7^a timing of the spark, or the moment at which tripper 7 is operated to release rod 9 to produce the spark, may be regulated by making required adjustment of stop 7^a in a vertical direction. In a two cylinder engine, such as illustrated, where the tubes 2 reciprocate in alternate directions, and thereby the corresponding trippers 7 operate the corresponding contacts 14 alternately, fine adjustment of the timing, or the moments of production of the sparks in the corresponding cylinders, may be made by adjusting the stops 7^a with respect to their corresponding abutments 12, whereby the explosions in the two cylinders may be accurately timed for alternation.

The arrangement is particularly useful in providing for adjustment against wear of the parts which would tend to delay the time of explosion in one cylinder with respect to the explosion in another cylinder. By pulling on the rod or shaft 13^a having the pin 13^b both shafts 13^a may be appropriately rocked to cause cams 13 to depress abutments 12 or permit them to rise to advance or retard the sparks in both cylinders correspondingly, and by releasing such rod or shaft the cams will be retained in set positions. If the sparking gets out of time in either cylinder, by reason of wear at the end of either abutment 12 or the cam that operates it, the fault can be corrected by adjusting the corresponding stop 7^a toward its opposed abutment 12 to restore the proper timing of the sparks or the make and break at the corresponding contacts 14, 15, which then will follow in proper alternation or order in any position to which the abutments 12 may be adjusted by the cams 13. My improvements, therefore, enable the production of steady running of the engine with respect to the rhythmical explosions desired in the corresponding cylinders, since, as the tubes 2 and their corresponding trippers 7 are normally set for constant and corresponding operation, any variation of timing of the explosions in the cylinders that would otherwise occur may be readily counteracted by means of the adjustable stops 7^a.

While I have illustrated my improvements as applied in a two cylinder engine of the two-cycle type, it will be understood that

the same may be installed in an engine having any desired number of cylinders.

Having now described my invention what I claim is:—

1. The combination of a cylinder, a crank shaft, a reciprocative member, a tripper carried by said member and provided with an adjustable stop, means to operate said member by said crank shaft, make and break devices having a member to coact with said tripper, an abutment to coact with said stop, a cam to adjust said abutment toward said stop, a spring normally pressing said abutment against said cam, and means to retain the cam in set position.

2. The combination of a cylinder, a crank shaft, a reciprocative tube, a tripper carried by said tube and having one end entering the tube, an adjustable stop carried by the tripper without the tube, means for reciprocating said tube by the crank shaft, a rod entering the tube to coact with the tripper, make and break devices, means operated by said rod to actuate the make and break devices, an abutment to coact with said stop to release the tripper from said rod, a cam to adjust said abutment toward said stop, a spring normally pressing said abutment against said cam, and means to retain the cam in set position.

3. The combination of a plurality of cylinders, a crank shaft for said cylinders, a plurality of reciprocative members each being provided with a tripper, each tripper having an adjustable stop, an abutment for each of said stops, means to reciprocate said members in opposite directions by the crank shaft, make and break devices for each cylinder, each make and break device having a member to coact with the corresponding tripper, a cam co-acting with each abutment, and means connecting said cams to operate them in unison.

4. The combination of a plurality of cylinders, a crank shaft for said cylinders, a plurality of reciprocative tubes each provided with a tripper having one end entering the corresponding tube, the outer end of each tripper being provided with an adjustable stop, an abutment to coact with each of said stops, means to reciprocate said tubes in opposite directions by the crank shaft, a rod entering each tube to coact with the tripper therein, make and break devices for each cylinder, means for operating each make and break device by the corresponding rod, a cam co-acting with each abutment, means connecting said cams to operate them in unison, and means to retain said cams in set positions.

5. The combination of a plurality of cylinders, a crank shaft for said cylinders, a reciprocative member associated with each cylinder, each member being provided with a tripper, each tripper having an adjustable

stop, means to reciprocate said members in
opposite directions by the crank shaft, make
and break devices for each cylinder, each
make and break device having a member to
5 coact with the corresponding tripper, an
abutment above each of said stops, a cam
above each abutment, a spring for each abut-
ment normally pressing it toward the corre-
sponding cam, an arm connected with each

cam, a rod connecting said arms, and means 10
to retain the cams in set positions.

Signed at Bridgeport, in the county of
Fairfield, and State of Connecticut, this 25th
day of October, A. D. 1911.

HARRY OSBORN CRAM.

Witnesses:

H. M. BIEGER,
E. K. NIELSEN.