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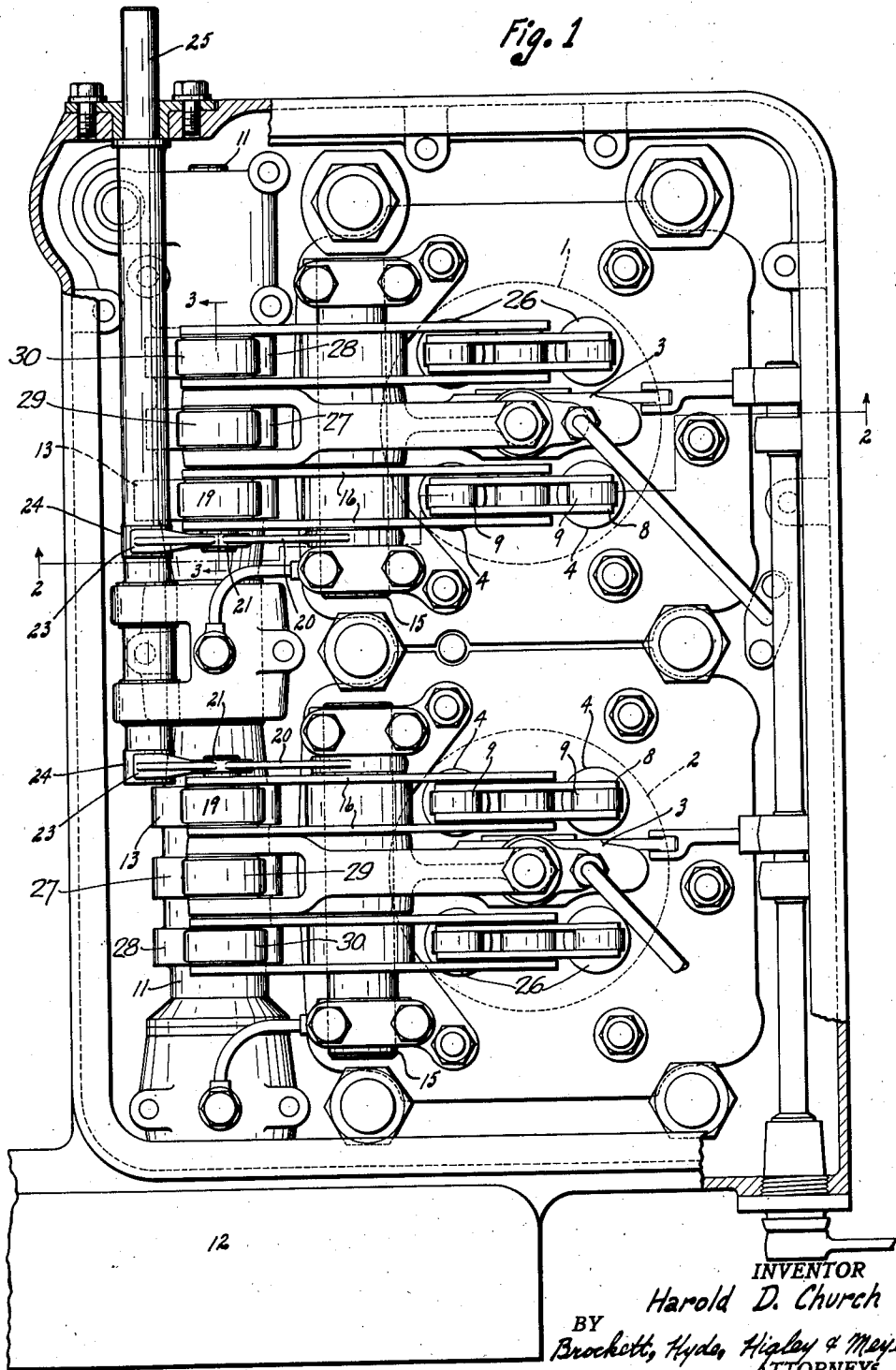
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2,054,928

COMPRESSION RELEASE MECHANISM

Filed Sept. 11, 1933

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

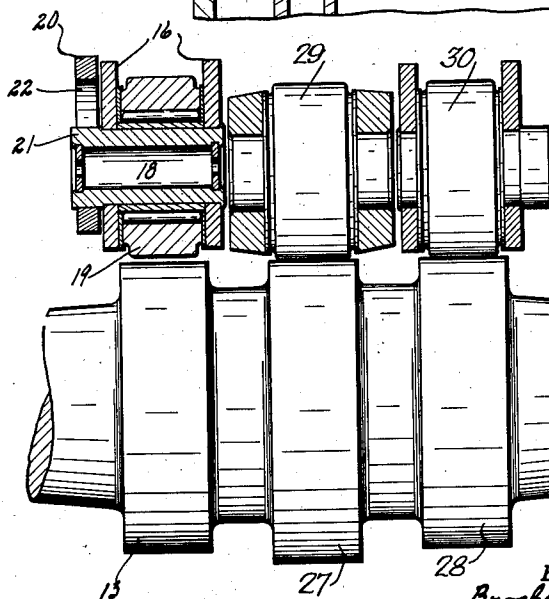
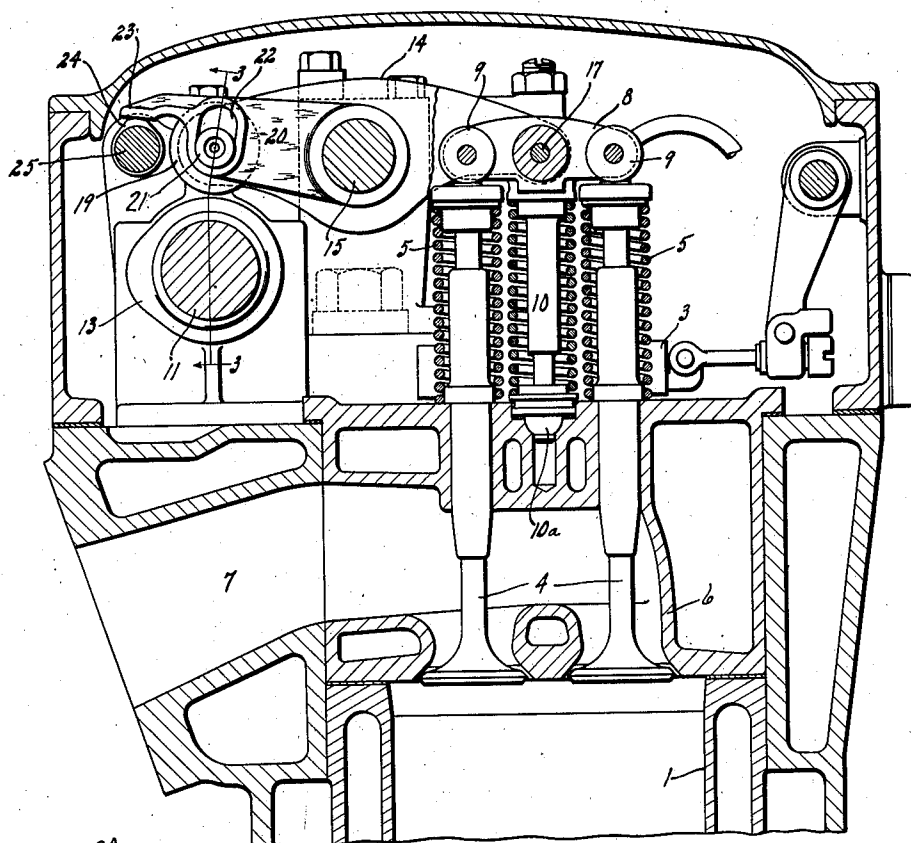


Fig. 2

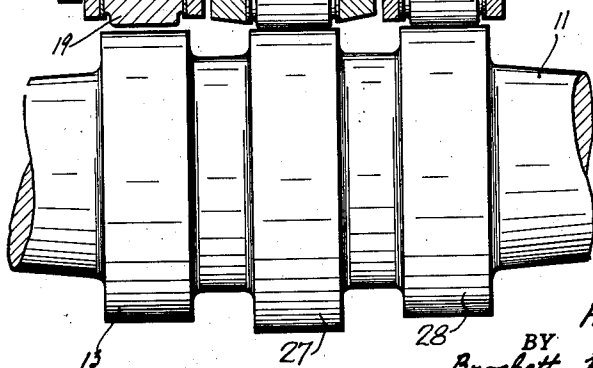


Fig. 3

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UNITED STATES PATENT OFFICE

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COMPRESSION RELEASE MECHANISM

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5 Claims. (Cl. 123—182)

This invention relates to internal combustion engines, and particularly to novel means for temporarily relieving the compression in the cylinders of such an engine, thus lightening the load on the engine starter.

More specifically the engine contemplated is one having poppet valves, spring-seated and having associated actuating gear for timed actuation of the valves during running of the engine, and the compression release means contemplated is one wherein one or more valves of each cylinder of the engine may be simultaneously "cracked open", at the will of the operator.

The object of this invention is to provide novel means for accomplishing this purpose.

The exact nature of this invention together with further objects and advantages thereof will be apparent from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a plan view of an engine embodying the invention, certain parts being broken away to show details of construction, and the valve gear cover plate being removed to show the valve gear; Fig. 2 is a typical transverse sectional elevation through pertinent parts at the head end of the same, taken as in the planes of line 2—2, Fig. 1; and Fig. 3 is an enlarged detail view, partly in section, taken as in the planes of lines 3—3, Figs. 1 and 2.

With reference now to the drawings, the engine illustrated is indicated as having but two cylinders 1 and 2, arranged "in line", although it will be appreciated that usually a multiple of two cylinders, such as six or eight, arranged in line, would actually be employed in practice.

The engine illustrated is of the solid fuel injection type having, for each cylinder, an injection nozzle generally indicated at 3.

Each cylinder is shown as provided with four valves including a pair of inlet valves 26 and a pair of exhaust valves 4. The exhaust valves 4 are spring-seated, as by the compression springs 5, whereby they are yieldably maintained seated to close their ports in the cylinder head 6, such ports controlling communication between the cylinder 1 and the exhaust passage 7.

The pair of exhaust valves are arranged for coincidental operation by a cradle 8 having rollers 9 disposed to be effective upon the valve stems, the cradle 8 including a plunger 10 by which its angularity is maintained, so that upon depression of the cradle 8 both valves 4 will be unseated, and upon release of the cradle 8 both valves will be reseated by their springs; this being the usual functioning of the valves during the operation of the engine.

Gear is provided for each pair of valves, including the pairs of exhaust valves, for their timed actuation, this gear including a cam shaft 11 driven by suitable timing gears (not shown)

in the gear case 12. The cam shaft 11 extends the length of the engine and has, for each cylinder, three cams, including one 27 acting upon a roller 29 for actuating the injection device, one 28 acting upon a roller 30 for actuating the inlet valves, and one, 13, for actuating the exhaust valves 4, it being understood that the cams are properly indexed on the cam shaft, and the cam shaft properly timed by its driving gearing, with relation to the crank shaft of the engine.

The cam 13 is made effective upon the cradle 8 to control the exhaust valves 4, by a rocker 14 mounted upon a rocker shaft 15 suitably mounted on the engine, between the cam shaft 11 and the cradle 8. The rocker here shown comprises a pair of members 16 spaced to include between them, at one end, the cradle 8 with which the rocker has pivotal connection by the pin 17; and carrying between them, at their opposite end, a pin 18, upon which is mounted, between the members 16, a roller 19. The roller 19 is arranged in the plane of the cam 13, to cooperate therewith as the cam follower, whereby timed rotation of the cam shaft 11 will cause timed rocking motion of the rocker 14 and consequently timed operation of the valves 4. The cradle 8, being carried by the rocker 14, during motion of the rocker the rollers 9 will have slight transverse motion relative to the valve stems. This is permitted by a suitable swinging mounting indicated generally at 10a at the base of the plunger 10.

What has thus far been described is not new in the art and will be recognized as generally typical thereof, and it will be appreciated that all of the valves of each cylinder of the engine, including fuel injection, inlet, and exhaust valves, for each cylinder, will have timed actuation from the cam shaft 11 by means and in a manner corresponding to that herein specifically described for the pair of exhaust valves 4 under consideration.

According to this invention, for each pair of exhaust valves of the engine, I provide, adjacent the corresponding rocker 14, a lever 20 pivotally mounted upon the rocker shaft 15, and located alongside the rocker preferably on the side removed from the next adjacent rocker. The lever 20 extends toward the cam follower roller 19 of the rocker and therebeyond. The pin 18 upon which the cam follower roller 19 is mounted, is extended beyond the rocker 14, into the plane of the lever 20, as at 21, and the lever is provided with a slot 22 into which the pin extends. The lever 20 also extends beyond the pin 18, as at 23, where it rests upon a cam 24 on a rock shaft 25.

It will be appreciated that a similar arrangement, including a lever and cooperative parts, is provided for each pair of exhaust valves, and the

rock shaft 25 extends lengthwise of the engine having a cam, such as at 24, for each lever 20.

The proportion and arrangement of the parts, and particularly the relation of the slot 22 and the rock shaft, is such that when the rock shaft 25 is adjusted to drop the lever 20 to its lowermost position, the cam follower roller 19 will rest upon its cam 13 and the slot 22 will permit actuation of the rocker 14 by the cam 13; whereas if the rock shaft 25 be adjusted to the position indicated in the drawings, it will slightly raise the lever 20 so as to engage the projecting end 21 of the pin 18, and move the rocker 14 slightly clockwise to its position in Fig. 2, thereby "cracking" or slightly unseating the exhaust valves as shown, the roller 19 being lifted slightly from its cam 13 as indicated in Figs. 2 and 3. All of the cams 24 are similarly indexed on the rock shaft 25, so that all of the exhaust valves will be controlled coincidentally.

Suitable means are provided upon the end of the rock shaft 25, for effecting its described adjustment at the will of the operator, but such means are not shown here as their exact nature is immaterial.

The operation of the mechanism will be apparent. When the rock shaft 25 is in its starting position, as shown, all of the exhaust valves 4 of the engine will be slightly unseated so as to relieve the compression pressure in all of the engine cylinders. Thus the engine crankshaft may be rotated for starting, with much less effort than otherwise. Of course when the engine is being started the cam shaft 11 will be caused to rotate and will actuate the valves as in the normal running of the engine, except that the exhaust valves, when they would otherwise be permitted to fully seat by their cams 13, will instead remain slightly open by engagement of the pins 18 with their compression release levers 20.

Once the engine has commenced firing, the rock shaft 25 is adjusted to lower the compression release levers 20, releasing the rollers 19 to exactly follow their cams 13, and permitting the exhaust valves to fully seat between their opening periods. The slot 22 of each lever 20 is sufficiently long that, when the lever is in lowered or running position, the lever does not engage the pin 18, and the rocker is free to move wholly under the correlated influence of the valve springs and corresponding cam.

What I claim is:

1. In an engine having a spring-seated poppet valve and actuating gear therefor including a timed cam shaft having a cam thereupon, and a rocker interposed between said cam shaft and said valve, said rocker being mounted upon a shaft and having a cam follower part cooperating with said cam, compression release gear comprising a lever pivoted on said rocker shaft, said lever and said rocker having parts which cooperate with one another to thereby lift said rocker from said cam, and control means associated with said lever for adjusting the latter between a running position, wherein said rocker is free to follow said cam, whereby the valve will have timed actuation, and a starting position, wherein the rocker will be lifted from said cam, whereby the valve will be cracked open.

2. In an engine having a spring-seated poppet valve and actuating gear therefor including a timed cam shaft having a cam thereupon, and a

rocker interposed between said cam shaft and said valve, said rocker being mounted upon a shaft and carrying a pin, said pin having a cam follower part and a part projecting from said rocker, compression release gear comprising a lever pivoted on said rocker shaft, said lever having a part engageable with said projecting pin part for lifting said follower from said cam, and control means associated with said lever for adjusting the latter between a running position, wherein said roller is free to follow said cam, whereby the valve will have timed actuation, and a starting position wherein the roller will be lifted from said cam, whereby said valve will be cracked open.

3. In an engine having a spring-seated poppet valve and actuating gear therefor including a timed cam shaft having a cam thereupon, and a rocker mounted upon a shaft and interposed between said cam shaft and said valve, said rocker carrying a pin having a roller cam follower mounted thereon and projecting from said rocker, compression release gear comprising a lever pivoted on said rocker shaft alongside said rocker, said lever having a part engageable with the projecting part of said pin for lifting said roller from said cam, and having a slot to clear said pin in the running operation of the engine, and control means associated with said lever for adjusting the latter between a running position wherein said roller is free to follow said cam and said pin is free to move in said slot, and a starting position wherein said roller will be lifted from said cam.

4. In an engine having a spring-seated poppet valve and actuating gear therefor including a timed cam shaft having a cam thereupon, and a rocker interposed between said cam shaft and said valve, said rocker being mounted upon a shaft and carrying a pin, said pin having a roller cam follower mounted thereon and a part projecting from said rocker, compression release gear comprising a lever pivoted on said rocker shaft, said lever having a part engageable with said pin for lifting said roller from said cam, and control means associated with said lever for adjusting the latter between a running position, wherein said roller is free to follow said cam, and a starting position, wherein said roller will be lifted from said cam.

5. In an engine having a spring-seated poppet valve and actuating gear therefor including a timed cam shaft and a cam thereupon, and a rocker interposed between said cam shaft and said valve, said rocker being mounted upon a shaft and carrying a pin having a roller cam follower mounted thereon, compression release gear comprising a lever pivoted on said rocker shaft, said lever having a part engageable with said pin for lifting said roller from said cam, and control means associated with said lever for adjusting the latter between a running position, wherein said roller is free to follow said cam, and a starting position wherein said roller will be lifted from said cam, said control means comprising a rock shaft having a cam, said rock shaft being located beyond said cam shaft with respect to said rocker shaft, and said lever having a cooperative extension beyond said pin and which extension is engaged by the cam upon said last mentioned rock shaft.

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