

No. 805,878.

PATENTED NOV. 28, 1905.

F. C. OSBORN.
CRANK SHAFT.

APPLICATION FILED AUG. 25, 1903.

2 SHEETS—SHEET 1.

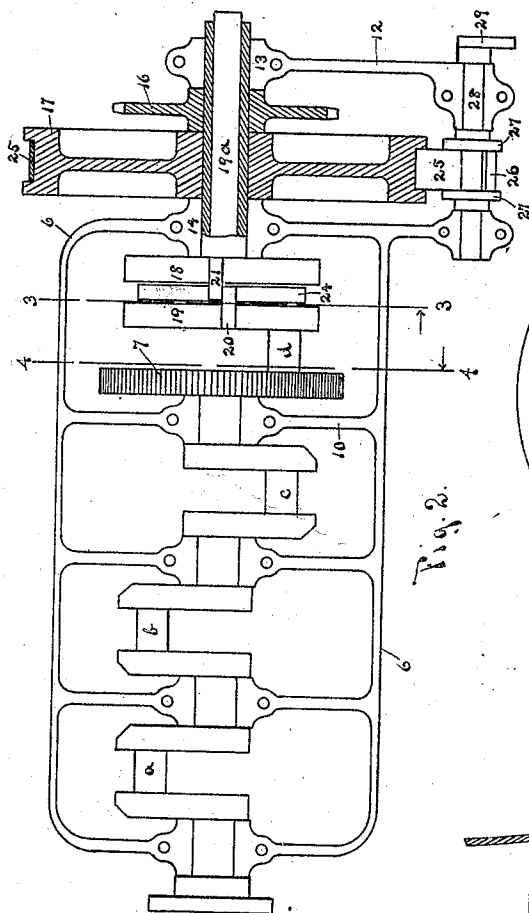


Fig. 2.

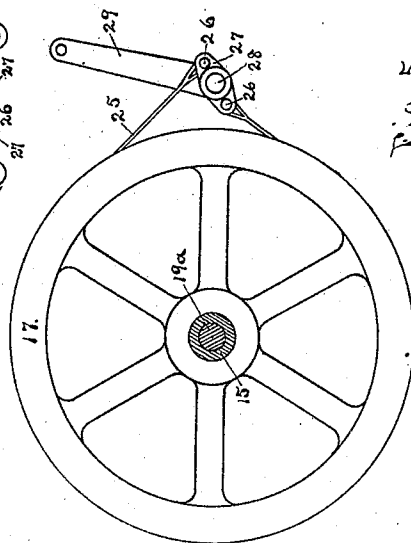


Fig. 5.

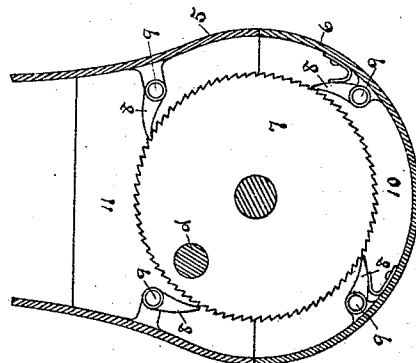


Fig. 7.

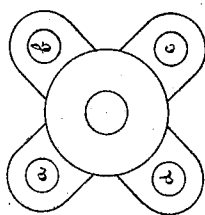


Fig. 1.

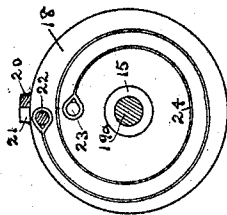


Fig. 3.

Witnesses.
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Geo. W. Barnes

Inventor
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his Attorney.

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2 SHEETS—SHEET 2.

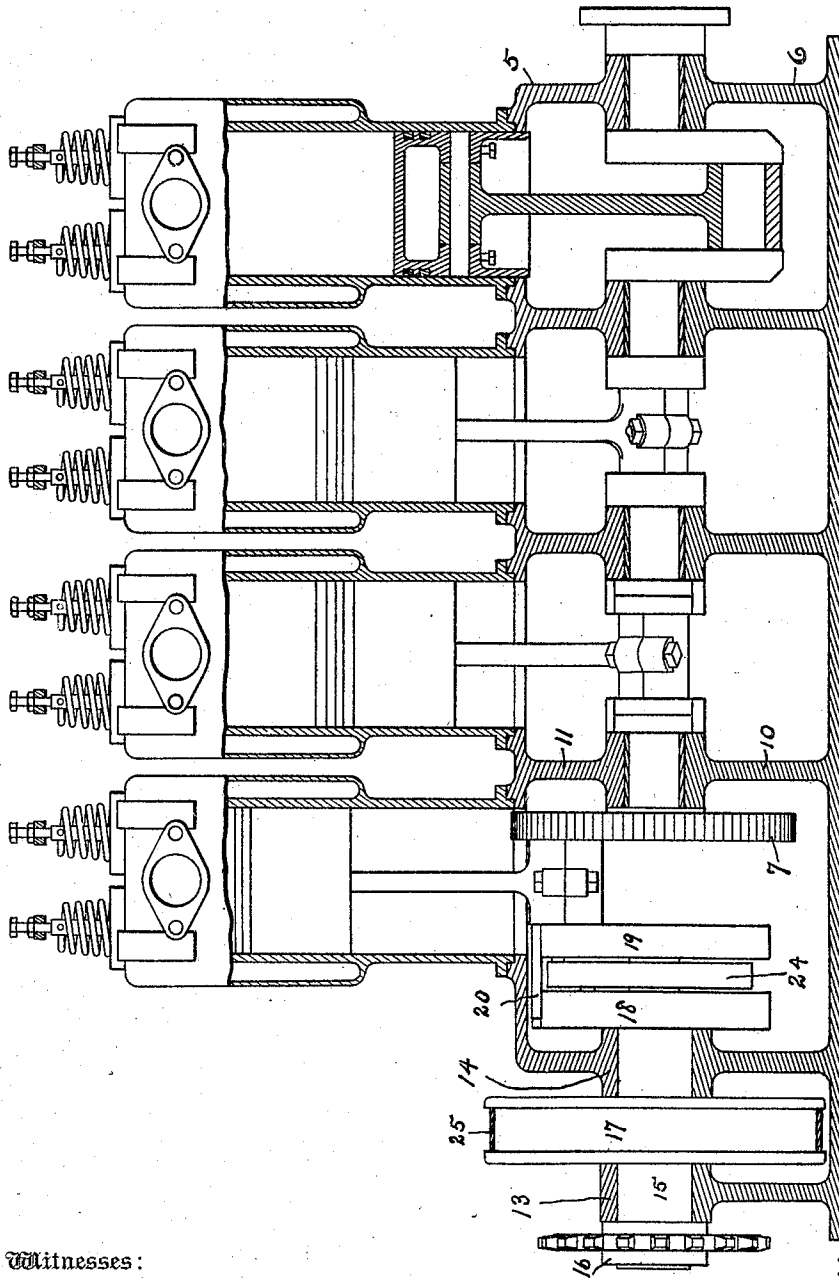


Fig. 6.

Witnesses:

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By his Attorney

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Inventor

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UNITED STATES PATENT OFFICE.

FRANCIS C. OSBORN, OF DETROIT, MICHIGAN.

CRANK-SHAFT.

No. 805,878.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed August 25, 1903. Serial No. 170,741.

To all whom it may concern:

Be it known that I, FRANCIS C. OSBORN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Crank-Shaft, of which the following is a specification.

My invention relates to crank-shafts for explosive-engines; and the objects of my improvements are to reduce the vibrations of the engine-frame to a minimum, to increase the efficiency of the engine, and to provide means to assist in starting the engine. I attain these objects by the construction shown in the accompanying drawings, in which—

Figure 1 is an end view of the crank-shaft. Fig. 2 is a plan of the lower part of the engine-casing, showing the shaft and fly-wheel. Fig. 3 is a view of the spring connecting the crank-shaft and the hollow shaft carrying the fly-wheel. Fig. 4 shows the means to prevent reflex movement of the crank-shaft. Fig. 5 shows the fly-wheel with a band-brake attachment; and Fig. 6 shows a four-cylinder engine, partly in section, provided with my improved crank-shaft.

Similar reference characters specify like parts throughout the drawings.

In explosive-engines at the instant of the explosion high pressure and high temperature occur in the cylinder. As the explosion occurs at a time when the crank-pin has just passed the center and the piston has a comparatively slow movement, the heat of the burned gases is largely absorbed by the walls of the cylinder. The explosion also acts like a blow against the piston and connected parts, which blow is dissipated in heat to a large extent. If the crank-shaft were permitted to jump forward at the time of the explosion, and thus permit a natural expansion of the hot gases, while the heat dissipated through the walls of the cylinder during the same length of time would not be reduced, still the effective work done during this expansion would be increased, because of the distance the piston travels under the high pressure. The heat generated by the blow would be largely obviated, for the piston would yield more readily than when connected directly to the heavy fly-wheel and the load. To accomplish this result, I provide a spiral-spring connection between the crank-shaft and the fly-wheel and load in a construction I shall now explain.

A crank-shaft with four crank-pins *a b c d*

is supported in bearings in the two-part casing 5 6, which casing is joined at a plane at right angles to the line of the cylinders and passing through the center line of the shaft. On this shaft is secured the ratchet-wheel 7, which is engaged by the pawls 8 on the pins 9, which pins are secured to the walls 10 11 of the casing. This construction prevents the backward movement of the shaft. Beyond the casing supported by the bracket 12 is a bearing 13, in which and in the end bearing 14 of the casing is journaled a hollow shaft or sleeve 15, to which are secured the sprocket-wheel 16, the fly-wheel 17, and the disk 18. In this hollow shaft is journaled the reduced end 19^a of the crank-shaft. The fly-wheel being carried by the hollow shaft, its weight causes no friction between the crank-shaft and hollow shaft. On the crank-shaft is secured the disk 19, having a lug 20, which projects across into the path of the lug 21 on the disk 18. The pin 22 on disk 19 is connected to pin 23 on disk 18 by the spiral spring 24.

When an explosion occurs in a cylinder, the shaft will be turned at an increased speed, winding up the spring until the stress on the same will overcome the load on the hollow shaft, composed of the inertia of the fly-wheel and the pull on the sprocket-chain. When the force of the explosion has been expended, the crank-shaft will stop. As the gases cool rapidly the pressure will drop and the pull of the spring would have a tendency to reverse the movement of the crank-shaft were such reversal not prevented by the ratchet-wheel and pawls. It will be noticed that these pawls are so spaced as to divide the length of a ratchet-tooth, so insuring complete and immediate stoppage. When the fly-wheel has caught up with the crank-shaft, owing to the pull of the spring, its momentum will carry it forward, and the lug 21 will contact with lug 20, thus causing the fly-wheel to carry the crank-shaft, and with it the engine, through the remainder of the cycle, the amount of revolution of the shaft under the power of the fly-wheel depending upon the type of engine.

When it is desired to stop an explosion-engine attached to an automobile, the brake is applied and fuel is cut off. I have shown a band-brake of usual construction, the ends of which engage pins 26, held between cranks 27 on the shaft 28 and operated by lever 29. When the fuel-supply is cut off, a sufficient amount generally remains in the pipes to give several explosions which serve to revolve the crank

until the pull of the spring stops the engine. With this construction the fly-wheel will be stopped, as usual, but the force of the last explosion will be stored in the spring, which stress of the spring will serve to start the fly-wheel when it is released, and thus start the engine, doing away with the necessity of turning the crank by hand until an explosion is obtained.

By means of the yielding connection the blow of the explosion is reduced to a minimum and the disagreeable vibrations noticed in automobiles and launches practically done away with.

Having now explained my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In an engine, the combination of a hollow shaft, a disk secured to the same, a lug on said disk, a crank-shaft revoluble within the hollow shaft, a disk secured to said crank-shaft, means to prevent backward rotation of said shaft, a lug on said second disk, and a spring whereby the crank-shaft may drive the hollow shaft said lugs enabling the hollow shaft to turn the crank-shaft.

2. In an engine, the combination of a hollow shaft, a disk secured to the same, a lug on said disk, a crank-shaft revoluble within the hollow shaft, a disk secured to said crank-shaft, a lug on said second disk, a spring whereby the crank-shaft may drive the hollow shaft, and a ratchet mechanism to prevent the reverse movement of the crank-shaft, said lugs enabling the hollow shaft to turn the crank-shaft.

3. In an explosive-engine, the combination of a crank-shaft having a plurality of crank-pins, means to prevent backward rotation of said shaft, a disk on said shaft, a second shaft, a disk and a brake-wheel secured to said second shaft, a brake for said wheel and a spring forming a resilient connection between said disks.

4. In an explosive-engine, the combination of a crank-shaft, a disk on said shaft, a second shaft, means to prevent backward rotation of said shaft, a disk and a brake-wheel secured to said second shaft, a brake for said wheel, a spring forming a resilient connection between said disks, and a lug on each disk, said lugs moving in the same path.

5. In an explosive-engine, the combination of a crank-shaft, a disk on said shaft, a second shaft, a disk and a brake-wheel secured to said second shaft, a brake for said wheel, a spring forming a resilient connection between said disks, a lug on each disk, said lugs moving in the same path, and a ratchet mechanism to prevent the reverse movement of the crank-shaft.

6. In an explosive-engine, the combination of the frame of said engine, a crank-shaft journaled in said frame, a disk on said crank-shaft, a lug on the outside of said disk, a second

shaft, a disk on said second shaft, a lug on the outside of said second disk, and a spring connecting said disks, the said lugs traveling in the same path.

7. In an explosive-engine, the combination of a shaft, a fly-wheel on said shaft, a disk secured to said shaft, a lug on said disk, a crank-shaft for said explosive-engine, a disk secured to said crank-shaft, a lug on said second disk, a ratchet-stop mechanism for said crank-shaft, and a spring whereby the explosions of the engine will drive said first shaft, said lugs preventing an excess of relative rotation between said shafts and permitting the fly-wheel to drive the crank-shaft, the ratchet mechanism preventing the spring from reversing the motion of said crank-shaft.

8. In an explosive-engine, the combination of a shaft, a brake-wheel on said shaft, a crank-shaft for said explosive-engine, a spring connecting said shafts, a brake for said wheel, and ratchet mechanism for preventing the spring from rotating said shaft in the reverse direction, said brake serving to stop said brake-wheel while the crank-shaft moves under the force of an explosion and said ratchet mechanism holding said shaft so that said spring may start said wheel and first shaft and thereby cause said crank-shaft to revolve.

9. In an explosive-engine, an explosive-cylinder and piston therefor, a revolving shaft, means to prevent backward rotation of said shaft, a rod and crank connection between the piston and revolving shaft, a wheel on said shaft, a brake coacting with said wheel, means to limit the relative angular movement between the crank and shaft, whereby the shaft may drive said crank, a spring connecting the crank and shaft whereby the crank may drive said shaft, and means for preventing backward movement of the crank.

10. In an explosive-engine, an explosion-cylinder and piston therefor, a revolving shaft, a rod and crank connection between the piston and the revolving shaft, a resilient connection between the crank and shaft, and means for preventing backward movement of the crank.

11. In an explosive-engine, explosion-cylinders and pistons therefor, a revolving shaft, a fly-wheel on said shaft, a crank, a resilient flexible connection between the crank and shaft, and means to prevent backward movement of the crank.

12. In an explosive-engine, explosion-cylinders and pistons therefor, a crank having a plurality of crank-pins equally spaced circumferentially, rods between the pins and pistons, a revolving shaft, a resilient connection between the crank and shaft, and means to prevent backward movement of the crank.

13. In an explosive-engine, an explosion-cylinder and piston therefor, a revolving shaft, a rod and crank connection between the piston and the revolving shaft, means to limit the relative angular movement between the crank

and shaft, a spring connecting the crank and shaft, and means for preventing backward movement of the crank.

14. In an explosive-engine, the combination
5 of the explosive-cylinder and piston therefor,
a revolving shaft, a rod and crank connection
between the piston and revolving shaft, means
to limit the relative angular movement be-
tween the crank and shaft whereby the shaft
10 may drive said crank, a spring connecting
the crank and shaft whereby the crank may
drive the shaft, and means for preventing
backward movement of the crank.

15. In an explosive-engine, the combination
15 of a plurality of explosive-cylinders and pis-
tons therefor, a revolving shaft, a rod and

crank connection between each piston and the
revolving shaft, means to limit the relative
angular movement between the cranks and
shaft whereby the shaft may drive said cranks, 20
resilient flexible connecting means between
the cranks and shaft whereby the cranks may
drive the shaft, and means for preventing
backward movement of the cranks.

In testimony of which I have subscribed my 25
name to this specification in the presence of
two subscribing witnesses.

FRANCIS C. OSBORN.

Witnesses:

EDWARD N. PAGELSEN,
GEO. W. BARRUS.