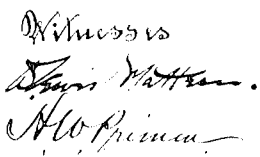


1,064,109.

3 SHEETS—SHEET 1.



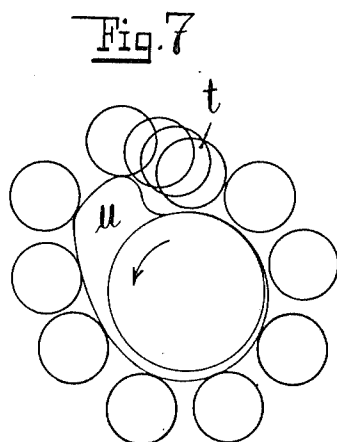
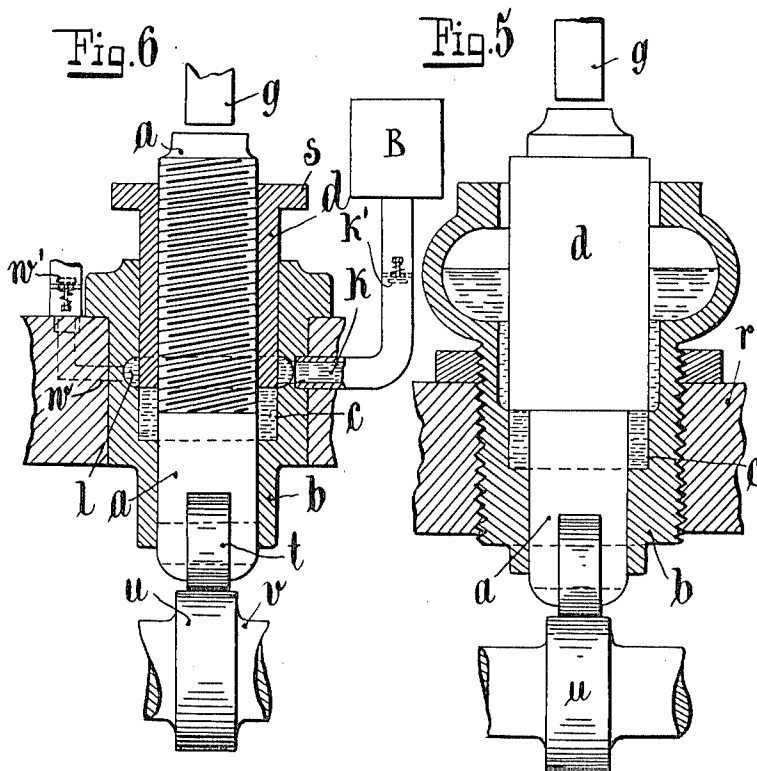
Inventor
Carl Buckhartz
Glenview, Wittenberg, N. Y. 1890.
In testimony:

C. TECKLENBURG.
EXPLOSION MOTOR.
APPLICATION FILED NOV. 11, 1912.

1,064,109.

Patented June 10, 1913.

3 SHEETS—SHEET 2.



Witnesses
E. W. Wether.
H. W. Rimm.

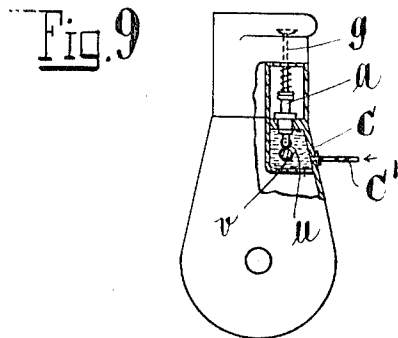
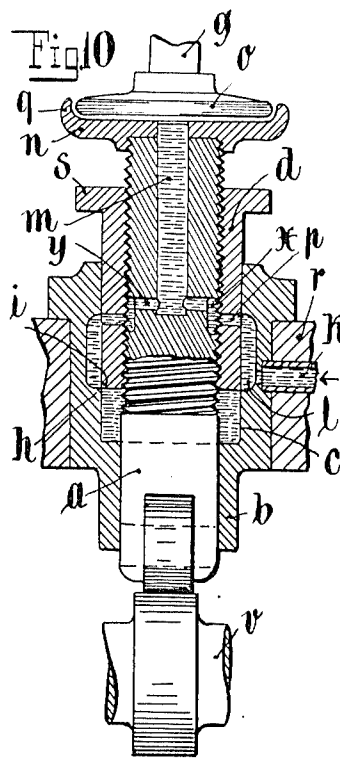
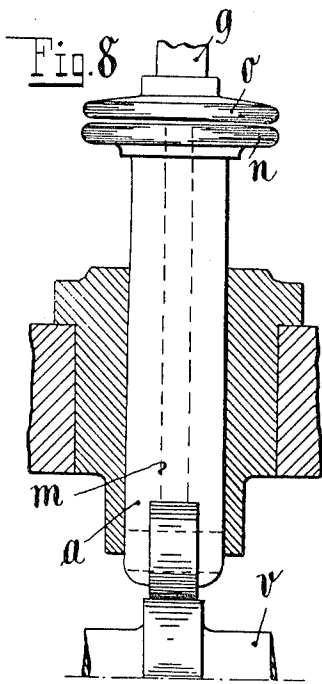
Inventor
Carl Tecklenburg
Gustav Wether, Attorney.

C. TECKLENBURG.
EXPLOSION MOTOR.
APPLICATION FILED NOV. 11, 1912.

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3 SHEETS—SHEET 3.



Witnesses
John W. Huns.
N. W. Brown

Inventor
Carl Tecklenburg
G. W. Huns, Attorney
his Attorney

UNITED STATES PATENT OFFICE.

CARL TECKLENBURG, OF DESSAU, GERMANY.

EXPLOSION-MOTOR.

1,064,109.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed November 11, 1912. Serial No. 730,683.

To all whom it may concern:

Be it known that I, CARL TECKLENBURG, a subject of the Grand Duke of Hesse, residing at Dessau, in the Duchy of Anhalt, Germany, have invented certain new and useful Improvements in Explosion-Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

It is a well known fact that in high speed explosion motors noisy hammer-like blows or knocks are set up between the valve tappet and cam on the one hand and the tappet and valve spindle on the other hand. The hammering set up between the valve tappet and the cam is due to the fact that during the rapid working of the motor a springing or jumping of the valve tappet on the cam is produced, whereas the hammering set up between the valve tappet and the valve spindle is due to the lost motion, for which provisions must be made between these two parts on account of the expansion due to the heat produced during the working of the motor and which lost motion causes the valve tappet to strike the valve spindle with a blow during each stroke.

According to this invention a coöperation of the tappet with the cam which is unaccompanied by any hammering noises and consequently noiseless, is insured by causing the tappet during its downward movement to come to a standstill at a definite distance from the base circle of the cam by means of a fluid brake in order to avoid an impact. During the continued revolution of the cam the anti-friction roller of the valve tappet is brought again into contact with the suitably formed cam curve quite gradually, so that the contact between the two parts is re-established practically without causing any noise. In order to prevent the hammering set up between the valve tappet and the valve spindle, fluid is supplied under pressure through a longitudinal bore provided in the valve tappet between the contacting surfaces of the tappet and the valve spindle. Several forms of the invention are shown by way of example in the accompanying drawings, in which:—

Figure 1 shows in vertical section a tappet guide which takes the form of a fluid brake, Fig. 2 shows a corresponding horizontal section on the line A—A in Fig. 1, Fig. 3

shows a plan thereof. Figs. 4, 5 and 6 show modified constructions. Fig. 7 shows one form of the cam curve, and its coöperation with the tappet roller. Figs. 8 and 9 show a form of the device for damping the blows set up between the valve tappet and the valve spindle, and Fig. 10 shows a modified form in which said means are combined with a fluid brake acting on the valve tappet.

In the construction shown in Figs. 1 to 3, *g* is the valve spindle, *a* is the guide tappet, the anti-friction roller *t* of which is arranged opposite the cam *u* of the controlling shaft *v*. The guide casing *b* for the tappet which is mounted in a supporting plate *r*, forms in its upper part a cylinder *c*, which is widened on the top to form a vessel *f*. The upper part of the tappet is provided with a thread on to which is screwed a sleeve *d* having a hexagon shaped top *s*. The sleeve *d* guides the tappet *a* in the cylinder *c* and acts in the same as a plunger. A number of longitudinal grooves *e* is cut into the inside surface of the cylinder *c* which grooves terminate at a certain level above the bottom of the cylinder. If now the plunger *d* moves downward and in doing so closes the valve, it may at first move quite freely without encountering any resistance, as the fluid beneath the effective area of the plunger *d* may escape through the grooves *e* into the vessel *f*. As, however, the edge *i* of the plunger approaches the ends *h* of the grooves *e*, the flow of the fluid is throttled more and more until it is completely cut off when assuming the position shown in the drawings, the result being a powerful braking of the tappet which comes to a standstill in the position shown. By turning the plunger *d* by means of its hexagon shaped top *s*, the device may be so adjusted that the tappet comes to a standstill at a predetermined distance from the base circle of the cam curve, for instance, at a distance of $\frac{1}{4}$ — $\frac{1}{2}$ mm. (Fig. 7). This adjustability is also very important for the reason that it renders it possible to take into account the unavoidable wear of the controlling parts and their variation in length due to heating. Apart from this by providing the fluid brake, it is rendered possible to give the sloping part of the cam curve any suitable shape. The same is made preferably quite steep as shown in Fig. 7, so that the roller of the tappet cannot come

into contact at all with the same during the descending of the tappet. In order to cause the roller to remount the cam as noiselessly as possible, the cam curve at first very gradually rises from the base circle, so that the tappet roller is brought into contact with the same only quite gradually. The rapidity with which the tappet is brought to a standstill by means of the fluid brake may be regulated by gradually restricting the grooves *e* in a downward direction, so that the commencement of the throttling of the flow of fluid does not exclusively depend on the restriction of the cross sectional area due to the approach of the edges *h* and *i*.

In the modification illustrated in Fig. 4, the grooves *e* are provided on the surface of the plunger *d*. The throttling is here effected by the ends *i* of the grooves approaching the upper edge *h* of the cylinder *c*. The same result which is obtained by the adjustment of the plunger *d* on the tappet *a* in Figs. 1 and 4, may be obtained by making the cylinder *c* adjustable in relation to the supporting plate *r* as shown in Fig. 5 where the guide casing *b* forming cylinder is adjustable. This arrangement has the very important advantage that it renders possible a regulation during the running of the motor, for instance through the intermediary of a special gear operated from the driver's seat.

Instead of widening the guide casing *b* at the upper end so as to form a kind of vessel, the cylindrical chamber *c* may be placed in communication with any suitable vessel or container *B* through the intermediary of a conduit or a passage *k*, as shown in Fig. 6, in which case said conduit opens into an annular passage *l* provided in the casing. Further, instead of allowing the fluid used for braking purposes always to flow to and fro between the cylindrical braking chamber *c* and a reservoir, the braking device might be utilized for pumping a fluid such as oil, or water used for cooling purposes by providing a second passage *w* as indicated in Fig. 6 which communicates with the annular passage *l*, both conduits *k* and *w* being for instance fitted with non-return valves *k'* and *w'* respectively, in such a manner that *k* serves as supply conduit and *w* as delivery conduit.

In connection with the form of the device for damping the blows set up between the valve tappet and the valve spindle shown in Figs. 8 and 9, it is assumed that in contradistinction from existing arrangements the cam shaft is arranged by itself in a closed casing *C*, which casing will of course be combined as a rule with the crank casing of the motor, and further that oil is supplied continually under pressure into said casing during the working of the motor through a pipe *C'*. This arrangement has

the advantage on the one hand that the hammering set up between the tappet roller and the cam is damped by the intervening layer of oil. On the other hand the oil which is under pressure will be forced uninterruptedly into the guide for the tappet which will therefore be amply lubricated. Finally in the event of a loose working of the tappet in its guide due to the wear caused after the motor has been working for a considerable time by the lateral pressure produced every time the cam strikes the tappet roller, the noise thus caused by the separate impacts is damped by the layer of oil permanently to be found in the clearance between the tappet and its guide owing to the oil pressure prevailing in the casing. The tappet *a* is traversed by a longitudinal bore *m*, which opens at the bottom into the cam shaft casing containing oil under pressure. Through this bore therefore oil continuously issues under a certain pressure from the center into the clearance or gap between the contacting surfaces of the valve tappet *a* and the valve spindle *g*, in order to finally escape at the periphery. If now during the lifting of the tappet the two surfaces are caused to approach one another, the oil flowing through between them offers a certain amount of resistance to this approaching of said parts. This resistance not only depends upon the pressure of the oil, but is partly due to the fact that the layer of oil between the contacting surfaces must be forced out from the same, the result being a considerable damping of the blow which would otherwise be produced if dry metal surfaces collided with each other. In order to increase this damping action the tappet is provided at its top end with a plate *n* opposite which there is arranged a similar plate *o* on the lower end of the valve spindle *g*.

In connection with the modification shown in Fig. 10, it is assumed that the downward movement of the tappet is braked by an oil brake. In the wall of the braking cylinder *c* there is provided, as in the arrangement shown in Fig. 6, an annular passage *l*, into which there opens a passage *k* leading to a receptacle containing oil under pressure. With the annular passage *l* the longitudinal bore *m* provided in the tappet communicates through the intermediary of transverse bores *y* and an annular passage *x* provided in the tappet and of transverse bores *p* provided in the plunger *d*. The width of the annular passage *x* is such that when the plunger *d* is turned about the tappet for adjustment, said annular passage always remains in communication with the bores *p*. The bores *p* are arranged at such a distance from the edge *i* that on the edges *i* and *h* coming into contact with each other, that is when the tappet assumes its

end position, said bores remain within the range of the annular passage *l*. This is necessary in order to insure that the current of oil flows through the bore *m* during the initial stage of the lifting movement. During the continuation of said lift the passages *p* are closed thus preventing a further escape of the oil which might result in an excessive lifting of the valve independently of the stroke of the controlling cam. The plate *n* may if desired be provided with an upwardly pointing rim *q* as shown in Fig. 9, so that it is capable of accommodating a larger quantity of fluid.

I claim for the application in explosion motors:

1. The combination of a valve spindle; a tappet for said spindle; a cam controlling said tappet and a fluid brake acting on said tappet.

2. The combination of a valve spindle; a tappet for said spindle; a cam controlling said tappet, and a fluid brake the plunger of which is connected to said tappet.

3. The combination of a valve spindle; a tappet for said spindle; a guide for said tappet, a cam controlling said tappet, a fluid brake the plunger of which is connected to said tappet, the brake cylinder being formed in the guide of the tappet.

4. The combination of a valve spindle; a tappet for said spindle; a guide for said tappet, a cam controlling said tappet, a fluid brake comprising a plunger mounted on the tappet and a cylinder formed in the guide of the tappet, said plunger and cylinder being adjustable in respect to one another.

5. The combination of a valve spindle; a tappet for said spindle; a guide for said tappet, a cam controlling said tappet, a fluid brake comprising a plunger mounted on the tappet and a cylinder formed in the guide of the tappet, said guide being adjustably mounted on a support.

6. The combination of a valve spindle; a tappet for said spindle; a cam controlling said tappet, having a gently rising lifting surface, and a fluid brake acting on said tappet.

7. The combination of a valve spindle; a tappet for said spindle; a cam controlling said tappet, having a gently rising lifting surface, and a fluid brake the plunger of which is connected to said tappet.

8. The combination of a valve spindle; a tappet for said spindle; a guide for said tappet, a cam controlling said tappet, having a gently rising lifting surface, a fluid brake the plunger of which is connected to said tappet, the brake cylinder being formed in the guide of the tappet.

9. The combination of a valve spindle; a tappet for said spindle; a guide for said tappet, a cam controlling said tappet, having a gently rising lifting surface, a fluid

brake comprising a plunger mounted on the tappet and a cylinder formed in the guide of the tappet, said plunger and cylinder being adjustable in respect to one another.

10. The combination of a valve tappet, a guide for said tappet, a cam controlling said tappet, having a gently rising lifting surface, a fluid brake comprising a plunger mounted on the tappet and a cylinder formed in the guide of the tappet, said guide being adjustably mounted on a support.

11. The combination of a valve having a spindle, a valve tappet having a bore extending to the point of contact with said valve spindle, means to supply fluid through said bore, and a cam controlling said tappet.

12. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, a controlling shaft incased in a casing supplied with fluid under pressure, a cam on said shaft controlling said tappet, and a longitudinal bore through said tappet making a communication between the casing of the controlling shaft and the contacting surfaces of said tappet and valve spindle.

13. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, the ends of said valve spindle and tappet being enlarged so as to form plates, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, and a cam controlling said tappet.

14. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, the ends of said valve spindle and tappet being enlarged so as to form plates, a controlling shaft incased in a casing supplied with fluid under pressure, a cam on said shaft controlling said tappet, and a longitudinal bore through said tappet making a communication between the casing of the controlling shaft and the contacting surfaces of said tappet and valve spindle.

15. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of said tappet and valve spindle, at the commencement of the lifting movement, and a cam controlling said tappet.

16. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, a cam controlling said tappet, and a fluid brake acting on said tappet.

17. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, a cam controlling

said tappet, and a fluid brake the plunger of which is connected to said tappet.

18. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, a guide for said tappet, a cam controlling said tappet, and a fluid brake the plunger of which is connected to said tappet, the brake cylinder being formed in the guide of the tappet.

19. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, a guide for said tappet, a cam controlling said tappet, a fluid brake comprising a plunger mounted on the

tappet and a cylinder formed in the guide of the tappet, said plunger and cylinder being adjustable in respect to one another.

20. The combination of a valve having a spindle, a valve tappet having a longitudinal bore, means to supply fluid through said bore between the contacting surfaces of the tappet and valve spindle, a guide for said tappet, a cam controlling said tappet, having a gently rising lifting surface, and a fluid brake acting on said tappet.

In testimony whereof, I affix my signature, in presence of two witnesses.

CARL TECKLENBURG.

Witnesses:

AUGUST TRAUTMANN,
HENRY HASPER.