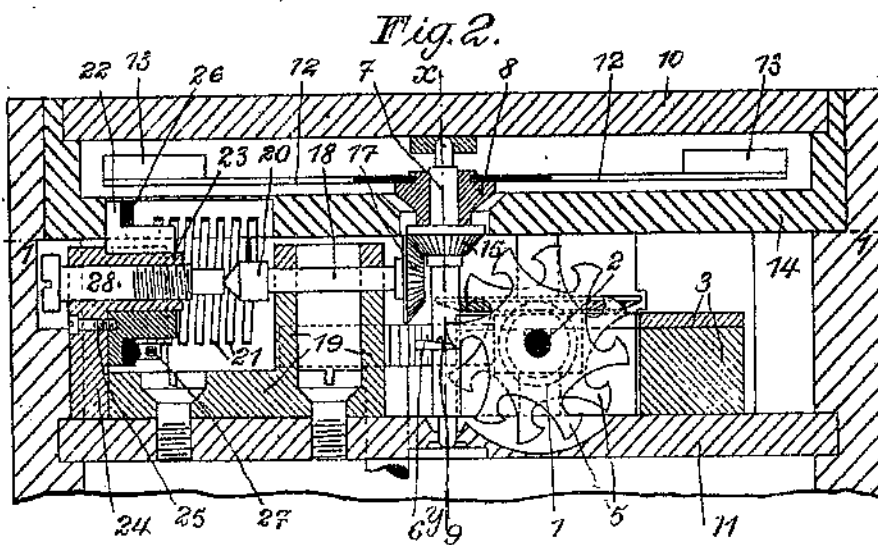
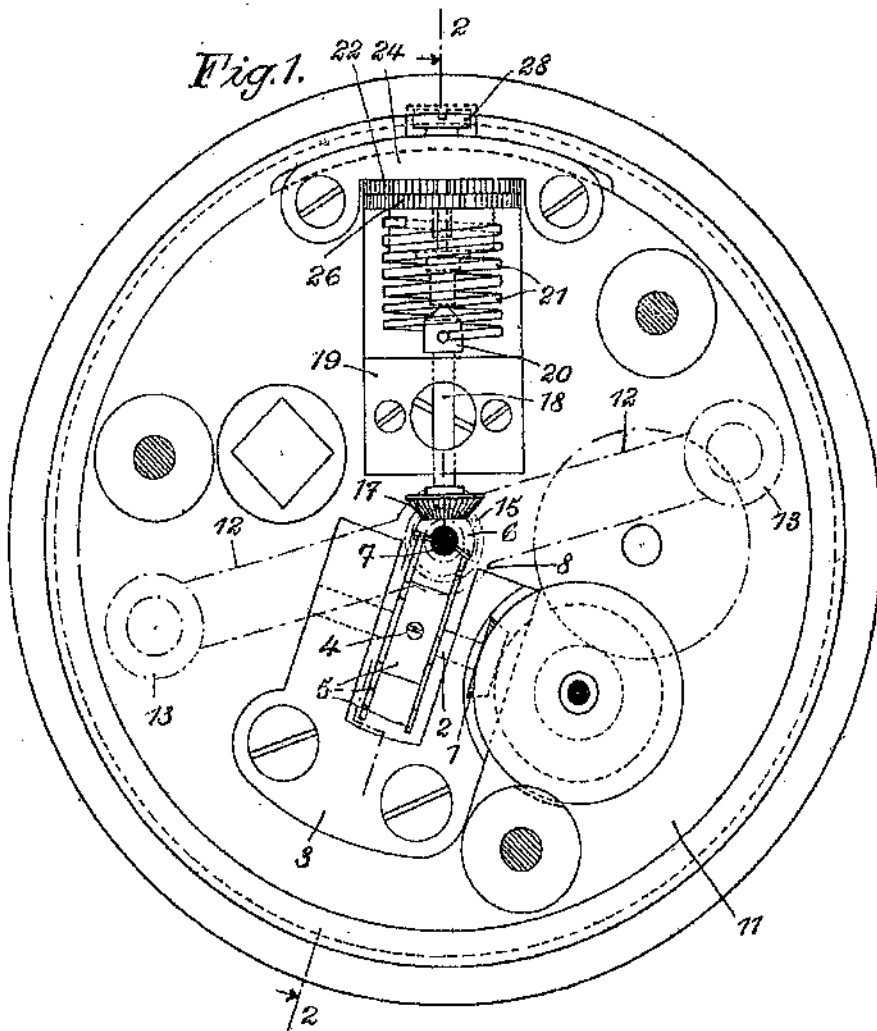


[This Drawing is a reproduction of the Original on a reduced scale.]



Referring to the drawing it will be seen that the last wheel of the clockwork movement of the fuse, of which only that part in which is housed the regulating arrangement is shown, is a bevel pinion 1, keyed to one of the extremities of a shaft 2, turning in a U-shaped bearing 3. At the middle of this shaft is fixed, by the aid of a radial screw 4, a double escapement wheel 5 of the type having impulsing inclines on alternate teeth called "Garnier escapement wheel", from the name of its inventor. This wheel co-operates with a pallet in the form of a sector 6, fixed to the verge shaft 7 of the balance 8. The size of the sector in an angular sense is about 180—200°. The impulses are given alternately in one sense and in the other to one part and the other of the verge shaft 7 by the pressure of the teeth of the double wheel 5 on the edge of this sector, whilst the rests take place when the point of one of the teeth of the wheel 5 bears upon the upper face of the sector 6. To facilitate disengagement of the wheel, this face is slightly inclined at 9 towards the edge of the sector.

The verge shaft 7 pivots around the axis $x-y$ of the fuse between two plates 10 and 11 of the movement of the latter and carries at its upper part the balance 8, which has two arms 12 in line with one another. Each of these arms is constituted by a thin and flexible metallic blade, carrying at its free end a small weight 13. An intermediate plate 14 limits the bending of these arms, which is produced by inertia on the firing of the projectile to which the fuse is attached.

The verge shaft 7 also carries a bevel pinion 15, which meshes with a second bevel pinion 17, keyed to one extremity of the radial shaft 18, turning in a perforated bearing 19. On its other end this shaft 18 carries the ring 20 for fixing one end of the cylindrical spring 21 of the balance, which spring is mounted radially across the fuse, its axis being perpendicular to the axis $x-y$ of the latter. The turns of the spring are sufficiently spaced to prevent the centrifugal force causing them to bear one against another. The other end of the spring is fixed to a split ring 22, adjustable in angular position on a cylindrical bearing 23, formed by a block 24, screwed to the plate 11. A small fixing screw 25, working in the block 24, allows the fixing of the ring 22 in its regulated position. This ring 22 has a cylindrical projection, on which is frictionally carried a split ring 26, func-

tioning as a regulator in the following manner; this ring has on its internal face a small block 27, traversed freely by the outer turn of the spring 21 in such a manner that on an angular displacement by hand of the ring by means of the ring 22, the working length of this turn is regulated. At their peripheries the rings 22 and 26 are knurled, to facilitate their engagement by hand. A regulating screw 28 engages in the block 24 and permits the regulation in axial position of the shaft 18 with respect to the bearing 19 in such a manner as to ensure the correct engagement of the bevel pinions 15 and 17 against the action of the centrifugal force developed by the rotation of the projectile to which the fuse is attached.

The bearing 19 projects under the spring 21 to serve as a support for the latter at the moment when it bends owing to its inertia on firing.

I wish it to be understood that I am aware of my communicators' Specification of Letters Patent No. 235,846, and I make no claim for a regulating device for a clockwork-operated fuse for projectiles, characterised by the combination of a balance having a coiled spring or springs mounted transversely across the body of the fuse and perpendicular to the axis of the projectile so as to be able to come tangentially, at the moment of the departure of the projectile, momentarily to bear on a transverse portion of the fuse, with a dead-beat escapement, the axes of the balance and of the escapement wheel being perpendicular one to the other, and each locking or rest being determined by the contact of the point of a tooth of the escapement wheel upon a shoulder fixed to the spindle of the balance, but:

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed (as communicated to me from abroad), I declare that what I claim is:—

In a balance regulator for clockwork-operated fuses of artillery projectiles the use of one or more coiled springs the axis or axes of which is or are arranged transversely across the fuse with respect to the axis of rotation of the projectile, for the purpose set forth.

Dated this 2nd day of April, 1925.

DICKER & POLLAK,
Chartered Patent Agents,
20 to 23, Holborn, London, E.C. 1,
Agents for the Applicant.

PATENT SPECIFICATION



Application Date: April 2, 1925. No. 8829 / 25.

235,841

Complete Accepted: Sept. 2, 1926.

COMPLETE SPECIFICATION.

Improvements in or relating to Balance Regulators for Clockwork-operated Fuses of Artillery Projectiles.

I, JUSTIN ERWIN POLLAK, of 20 to 23, Holborn, London, E.C. 1, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed (as communicated to me by Tavannes Watch Co. Société Anonyme of Tavannes, Canton of Berne, Switzerland, a Swiss company) to be particularly described and ascertained in and by the following statement:—

This invention concerns improvements in or relating to clockwork-operated fuses for artillery projectiles, and has for its object more specifically an improvement in the balance regulators of such fuses.

It has already been proposed to use in this kind of fuse a spiral balance spring for regulating the flow of the motive power of the power spring of the fuse, but it has been impracticable up to now to render the function of this spring independent from the action of the centrifugal force generated by the rotation of the projectile during its trajectory. This has particularly been so in the case of projectiles of a small caliber having a great angular velocity and which are submitted to a considerable nutation. Even in the case, which at first sight appears to be the most favourable one, where the spring is arranged in the axis of rotation of the projectile in order to reduce the intensity of the effect of the centrifugal force on the turns of the spring to the minimum possible, this action remains disturbing, since it prevents the oscillations of the spiral being effected in conditions of isochronism sufficient to allow the operation of the clock-work to remain altogether independent of the variations of the motive power.

This phenomenon appears to be due to the fact that the action of the centrifugal force is normal with regard to the spring,

or in other words radial with regard to the axis thereof, and is thus added to the action of the spring itself during its expansion, whilst it is opposed to its contraction.

Now according to the present invention the balance is provided with one or more coiled springs the axis or axes of which is or are arranged transversely across the fuse with regard to the axis of rotation of the projectile. In the course of very extended studies and a long series of trials concerning the action of centrifugal force it has been established that the disturbing influence of the centrifugal force on the oscillations of the spring diminishes in proportion as the axis of the spring approaches the direction in which this force is applied to any point of a turn, and that it becomes zero when the axis of the spring is arranged in the manner indicated, i.e. across the fuse with regard to the axis of rotation of the projectile, it being, of course, understood that the turns of the spring are sufficiently spaced one from the other so as not to come into touch with one another under the action of the centrifugal force.

The coiled spring or springs may be of any form whatsoever, for example cylindrical, conical, flat, etc., so long as they are capable of oscillations obeying the laws of isochronism.

The annexed drawing shows, by way of example, one constructional form of a fuse similar to that described in Specifications Nos. 235,846 and 235,843 and embodying the invention.

Fig. 1 is a section taken on the line 1—1 of Fig. 2 of this form, in which a part of the wheel work of the movement and of the balance is shown in dotted lines.

Fig. 2 is a transverse section thereof, taken on the broken line 2—2 of Fig. 1.