W. SCHWARTZ.

FUSE ADJUSTING MACHINE.

APPLICATION FILED DEC. 10, 1909.

1,029,146.

Patented June 11, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

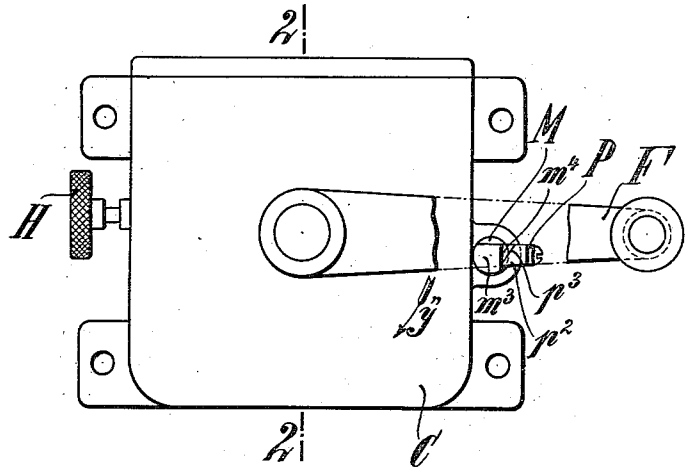
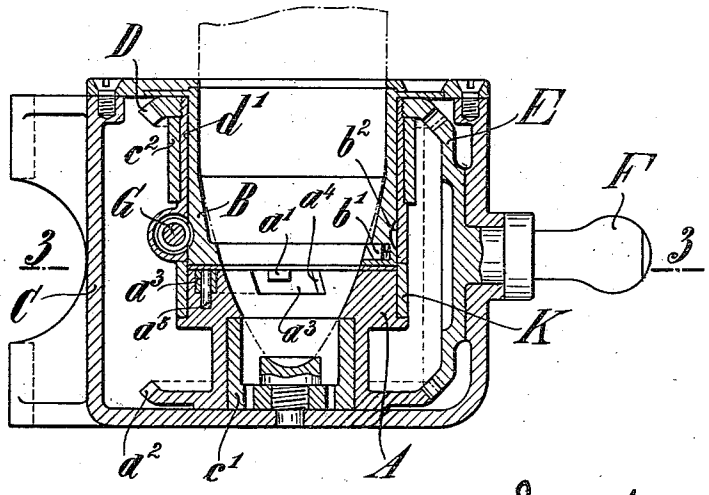


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

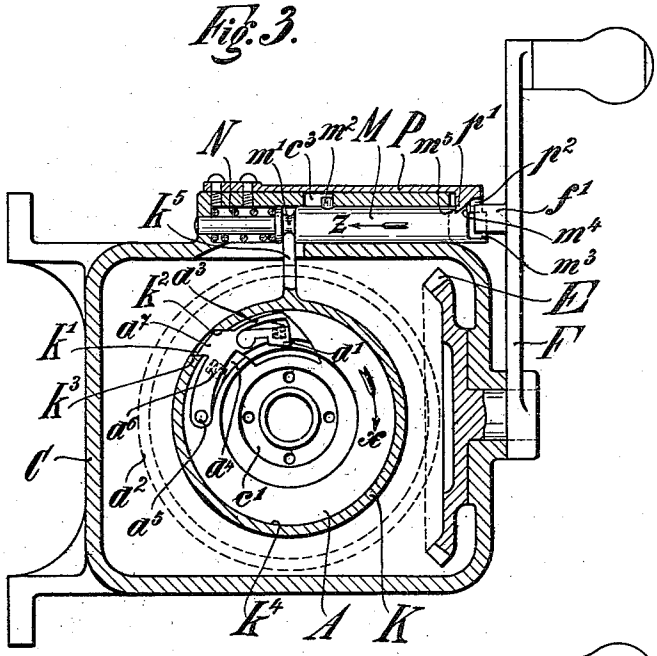
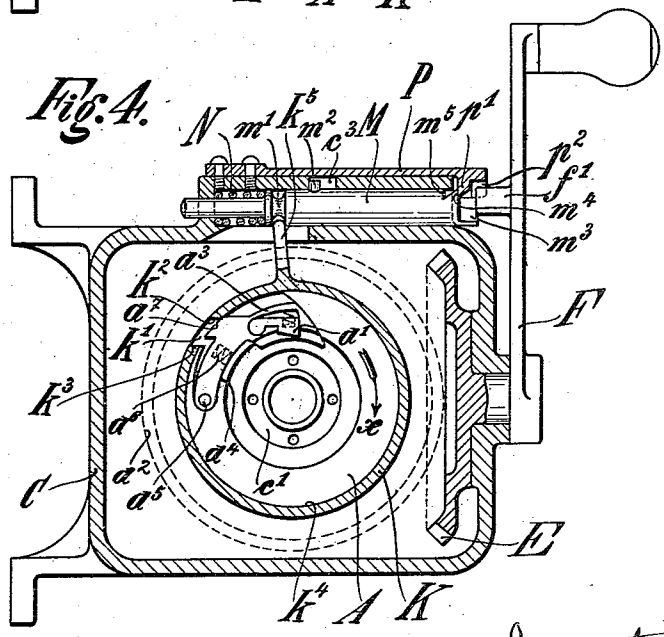


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILHELM SCHWARTZ, OF BREDENEY, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIEN-GESELLSCHAFT, OF ESSEN-ON-THE-RUHR, GERMANY.

FUSE-ADJUSTING MACHINE.

1,029,146. Specification of Letters Patent. Patented June 11, 1912.

Application filed December 10, 1909. Serial No. 532,391.

To all whom it may concern:

Be it known that I, WILHELM SCHWARTZ, a subject of the Emperor of Germany, and a resident of Bredeney, Ruhr, Germany, have invented certain new and useful Improvements in Fuse-Adjusting Machines, of which the following is a specification.

The present invention relates to the type of fuse adjusting machines which is provided with two relatively rotatable adjusting members and a device by means of which the coupling between the adjustable part of the fuse and the appurtenant adjusting member is automatically released at the latest at the end of the adjusting operation.

In the known fuse adjusting devices of this type a coupling between the adjustable part of the fuse and the appurtenant adjusting member cannot take place until the adjusting members have been rotated relative to one another to a slight extent in the direction of the movement of adjustment. If the fuse happens to be introduced into the adjusting device in such an angular position that the coupling face provided on the adjustable part of the fuse is, at the commencement of the adjusting operation, located in direct proximity of the appurtenant coupling member of the adjusting member it may happen that the coupling member of the adjusting device moves past the appurtenant coupling face on the adjustable part of the fuse without entering into effective contact therewith. If, at the same time, the fuse has an adjustment which differs only slightly from the adjustment to be imparted to the fuse by the adjusting device it may further happen that, also during the further course of the adjusting operation, a coupling between the adjustable part of the fuse and the appurtenant adjusting member does not take place, that is the fuse remains unadjusted.

The object of the present invention is to remove this drawback and this object is attained by making those parts of the device for the release of the coupling, through the coöperation of which the coupling member is automatically withdrawn at the end of the adjusting operation, adjustable in such a manner that, in the position which the adjusting members assume directly before the commencement of the adjusting operation, the aforesaid parts can assume a position in which the coupling member is capable of effecting the coupling.

The accompanying drawings show an embodiment of a fuse adjusting machine according to the present invention, by way of example.

Figure 1 is a front view of the fuse adjusting machine; Fig. 2 is a section on line 2—2, Fig. 1 looking from the left, the figure showing in dotted lines a fuse inserted in the adjusting machine and also the adjacent parts of the projectile on which the fuse is secured; Fig. 3 is a section on line 3—3, Fig. 2, and Fig. 4 is a similar section with changed position of some of the parts.

A indicates the adjusting member which is adapted to be coupled to the adjustable part of the fuse and B indicates the adjusting member which is adapted to be coupled to the body of the fuse. Two latches a^1 and b^1 (Fig. 2) for which corresponding notches are provided in the fuse serve, in the known manner, to couple the adjusting members A and B to the appurtenant parts of the fuse. The adjusting member A, which is provided with a toothed crown a^2, can turn about a hollow trunnion c^1 secured on the bottom of the housing C.

The adjusting member B is rotatably mounted in the nave d^1 of a cone-wheel D which is rotatable in a bearing c^2 (Fig. 2) secured to the housing C. A cone-wheel E, which is journaled in the housing C and can be rotated by means of a crank F, meshes with the cone-wheel D and the toothed crown a^2. In the nave d^1 of the cone-wheel D is journaled a worm G which meshes with a toothed part b^2 on the adjusting member B. The worm-gear G b^2 serves for imparting to the adjusting member B the angular position relative to the adjusting member A which corresponds to the desired adjustment of the fuse. When the worm G is in the position shown in Fig. 2, which corresponds to the position of rest of the crank F (shown in Fig. 1), the worm is connected with a hand-wheel H journaled in the housing C by means of a coupling (not shown in the drawings) which is automatically released when the crank F is turned in either direction from its position of rest. The device which serves for releasing the coupling is

old and, therefore, need not be further described.

The latch a^1, which serves for coupling the adjusting member A to the adjustable part of the fuse, is mounted in an arm a^3 in the manner shown in the drawings (see especially Figs. 3 and 4) which arm is arranged in a recess a^4 in the adjusting member A and is rotatably connected with the member A through the medium of a pin a^5. The arm a^3 is under the action of a spring a^6 which tends to turn the arm outwardly. The part of the adjusting member A which contains the arm a^3 is surrounded by a ring K which is co-axial with the adjusting member A and loosely rotatable relative thereto. The ring K is provided with a notch k^1 in which fits a nose a^7 on the arm a^3. The notch k^1 has two side walls k^2 and k^3 one of which (k^2) is inclined in such a manner that the nose a^7 can automatically pass out of the notch k^1 when the adjusting member A turns in the direction of the arrow x (Figs. 3 and 4) while the ring K remains at rest. The other side wall (k^3) of the notch k^1 is located and shaped in such a manner that the nose a^7 cannot automatically pass out of the notch k^1 when the adjusting member is turned in the opposite direction of the arrow x. When the adjusting member A turns in the last-named direction the ring K is therefore coupled to the member A. When the nose a^7 projects into the notch k^1, the latch a^1 is located at such a distance from the axis of rotation of the adjusting member A that the latch cannot project beyond the inner wall of the member A. However, when the nose a^7 has passed out of the notch k^1 and, after corresponding relative rotation of the ring K and the adjusting member A, abuts against the inner wall k^4 of the ring K, the latch a^1, when in its position of rest as shown in Fig. 4, projects into the hollow space of the adjusting member A which is adapted to receive the fuse.

The ring K is provided with an arm k^5 which engages in an annular groove m^1 in a bolt M. This bolt is slidable in the housing M in a direction parallel to the axis of rotation of the crank F and is under the action of a spring N which tends to move the bolt toward the crank. A pin m^2 which is secured on the bolt M and which is guided in a groove c^3 in the housing C serves for limiting the sliding movement of the bolt in either direction. That end of the bolt M which is toward the crank F projects outside of the housing C and is formed as a stop m^3 which projects into the path of movement of a nose f^1 on the crank F when the bolt M is in the extreme position shown in Fig. 3 in which the bolt is nearest the crank. When the bolt M is in its other extreme position shown in Fig. 4 the stop m^3 is located outside of the path of the nose f^1 on the crank. In this position of the bolt M a locking tooth p^1, which is arranged on a leaf-spring P secured to the housing C, can engage behind a locking face m^4 provided on the bolt and extending at right angles to the direction of movement of the bolt, and the bolt is thus held in the position shown in Fig. 4. When the tooth p^1 engages behind the locking face m^4 on the bolt M a second tooth p^2 on the spring P projects into the path of movement of the nose f^1 on the crank F. The tooth p^2 is provided with an inclined face p^3 (Fig. 1) which is arranged in such a manner that when the crank F is turned in the direction of the arrow y (Fig. 1) the nose f^1 on the crank, when hitting the tooth p^2, forces the tooth p^2 out of its path of movement. This causes the spring P to be forced back to such an extent that the tooth p^1 releases the bolt M. In the position of the bolt M shown in Fig. 3 the tooth p^1 rests in a recess m^5 in the bolt M which recess is formed in such a manner that when the bolt M moves from the position shown in Fig. 3 to the position shown in Fig. 4 the tooth p^1 can automatically pass out of the recess m^5.

As will be understood from the foregoing description, the ring K is positively connected with the bolt M. The position of the notch k^1 in the ring K is selected in such a manner that in the position of the bolt M shown in Fig. 3 the spring a^6 will, when the adjusting member A is turned in the direction of the arrow x, cause the nose a^7 on the arm a^3 to enter the notch k^1 at the latest the moment the nose f^1 on the crank F hits the stop m^3, the crank F turning in the direction of the arrow y when the adjusting member A turns in the direction of the arrow x.

In the following description of the mode of operation of the adjusting device the start will be made from the position of the parts shown in Figs. 1 to 3. A projectile (see Fig. 2) is inserted into the adjusting device after the adjusting member B has been moved relative to the adjusting member A to the angular position corresponding to the desired location of the bursting point, this relative movement of the adjusting members being effected by turning the hand wheel H (Fig. 1) and through the medium of the worm gear G b^2 which, in the position of the adjusting device shown in Figs. 1 to 3 is coupled to the hand wheel H. Thereupon the crank F is first turned in the opposite direction of the arrow y (Fig. 1). This causes the adjusting member A to be turned in the opposite direction of the arrow x through the medium of the cone-wheel gear E a^2. The ring K partakes of this turning movement as, in this direction of the rotation, the ring is coupled to the adjusting member A due to the engagement of the

nose a^7 in the notch k^1, as has been explained in the foregoing. Simultaneously herewith the bolt M is moved by the arm k^5 of the ring K in the direction of the arrow z (Fig. 3) until the pin m^2 on the bolt hits that end of the groove c^3 which is farthest away from the crank. The bolt M is then in the position shown in Fig. 4 and a further turning movement of the crank F in the opposite direction of the arrow y is precluded. In the position of the bolt M shown in Fig. 4, the tooth p^1 on the spring P, which during the preceding movement of the bolt has automatically left the recess m^5, engages behind the locking face m^4 of the bolt and secures the bolt in the position shown in Fig. 4 in which the stop m^3 is located outside of the path of movement of the nose f^1 on the crank F. The crank F is thereupon turned back, that is in the direction of the arrow y (Fig. 1). While this is being done the ring K first remains at rest because the bolt M is secured in position by the locking device p^1 m^4. The tooth a^7 on the arm a^3 therefore slides along the inclined face k^2 and leaves the notch k^1 as the adjusting member A now turns in the direction of the arrow x. As soon as the crank F has again reached its initial position the tooth a^7 has completely passed out of the notch k^1, as shown in Fig. 4, so that the latch a^1 is ready for engagement with the corresponding notch in the adjustable part of the fuse.

In the operation described in the foregoing the turning of the crank F merely serves for moving the stop m^3 out of the path of the nose f^1 on the crank and for bringing the arm a^3 into the position in which the latch a^1 is capable of effecting a coupling between the adjusting member A and the adjustable part of the fuse.

To adjust the fuse the crank F is turned further in the direction of the arrow y. This can take place without hindrance because the stop m^3, in the present position of the bolt M, is located outside of the path of movement of the nose f^1 on the crank. When, during this turning movement, the crank has passed its initial position the nose f^1 on the crank strikes the tooth p^2, on the spring P and forces the tooth out of its path of movement. The spring P is thereby forced to the side to such an extent that its tooth p^1 releases the bolt M. Under the action of the spring N the bolt M therefore snaps back into the position shown in Fig. 3 in which the stop m^3 again projects into the path of movement of the nose f^1 on the crank. Simultaneously herewith the ring K is again turned back into the position shown in Fig. 3. The turning of the crank F is continued until the nose f^1 on the crank hits the stop m^3. The adjusting members A and B are thereby turned relative to the housing C 360° in opposite directions by the cone-wheel gears E a^2 and E D. As the latch a^1 is already ready for engagement at the commencement of the adjusting operation proper, the coupling of the adjusting member A with the adjustable part of the fuse can also take place when the latch a^1 reaches the corresponding notch in the adjustable part of the fuse immediately after the commencement of the adjusting operation proper. The drawback mentioned in the preamble therefore cannot occur. As soon as the latches a^1 and b^1 have snapped into the corresponding notches in the fuse the adjusting operation of the fuse will commence. During the adjusting operation the nose a^7 on the arm a^3 slides on the inner wall k^4 of the ring K and a short time before the nose f^1 on the crank hits the stop m^3 the spring a^6 causes the nose a^7 to enter the notch k^1 whereby the coupling between the adjusting member A and the adjustable part of the fuse is automatically released. As soon as the nose f^1 on the crank hits the stop m^3 all the parts of the adjusting device again assume the position shown in Figs. 1 to 3. The fuse has then obtained the desired adjustment. Attention is further drawn to the fact that, in the use of the adjusting device, the operator may also proceed by shifting the bolt M, before the commencement of the adjusting operation, from the position shown in Fig. 3 to the position shown in Fig. 4 without employing the crank F, and he may for instance do so by pressing with the thumb on the front face of the stop m^3. Also in that manner the latch a^1 can be brought into its working position, as will readily be understood by comparing Figs. 3 and 4. In this instance the crank F can immediately be turned from its initial position in the direction of the arrow y (Fig. 1).

It is apparent that, without deviation from the spirit of the invention, any other suitable device may be employed for bringing the latch a^1 from its position shown in Fig. 3 to the position shown in Fig. 4.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:—

1. A fuse adjusting device comprising a pair of relatively rotatable adjusting members; a set of driving gears for said members; means for relative angular setting of said adjusting members; means for locking one of said adjusting members to the fuse body; other means for locking the other adjusting member to the adjustable fuse part; means for releasing said other locking means at completion of the fuse adjustment; means obstructing the advance movement of said driving gears at completion of the fuse adjustment, in coöperation with said other locking means and said releasing means for withdrawing said obstructing

means and simultaneously retracting said locking means back of its final releasing position, on partial reverse movement of said driving element at commencement of the operation.

2. A fuse adjusting device comprising a pair of relatively rotatable adjusting members; a driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; and means coöperating with said driving element whereby said coupling means is automatically released when said driving element has reached a predetermined position, said releasing means being adapted to be moved into a relative position causing the coupling means to return to its effective position when said driving element assumes its initial position.

3. A fuse adjusting device comprising a pair of relatively rotatable adjusting members, a driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; a spring controlled member normally held in a position causing said coupling means to move into its ineffective position when said driving element has reached a predetermined position; and means for holding said spring-controlled member in a position causing said coupling means to return to its effective position when said driving element assumes its initial position.

4. A fuse adjusting device comprising a pair of relatively rotatable adjusting members, a driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; a spring-controlled member normally held in a position causing said coupling means to move into its ineffective position when said driving element has reached a predetermined position; and means for locking said spring-controlled member in a position causing said coupling means to return to its effective position when said driving element assumes its initial position.

5. A fuse adjusting device comprising a pair of relatively rotatable adjusting members; a driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; a spring-controlled member normally held in a position causing said coupling means to move into its ineffective position when said driving element has reached a predetermined position; means for locking said spring-controlled member in a position causing the coupling means to return to its effective position when said driving element assumes its initial position; and means whereby on the advance movement of said driving element beyond its initial position said locking means is automatically released.

6. A fuse adjusting device comprising a pair of relatively rotatable adjusting members; a rotatably mounted driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; a spring-controlled member normally held in a position causing said coupling means to move into its ineffective position when said driving element has reached a predetermined position; and means establishing positive connection between said spring-controlled member and said driving element when the driving element is being turned rearward from its initial position for bringing said spring-controlled member into a position causing the coupling means to return to its effective position when said driving element is returned to its initial position.

7. A fuse adjusting device comprising a pair of relatively rotatable adjusting members; a rotatably mounted driving element for relatively rotating said members, one of said members being provided with means for coupling it to an adjustable part of the fuse; means coöperating with said driving element whereby said coupling means is automatically released when said driving element on its adjusting movement has again reached its initial position, said releasing means being adapted to be moved into a relative position causing the coupling means to assume its effective position when said driving element assumes its initial position; a movable stop adapted to arrest said rotatable driving element in its initial position against forward movement; and means establishing positive connection between said movable stop and said releasing means for causing said stop to move out of its arresting position when said releasing means are brought into said relative position.

8. A fuse adjusting device comprising a rotatable adjusting member; a driving element for rotating said adjusting member; two coöperating parts, one of which consists of an arm movably mounted on said adjusting member and carrying means for coupling the adjusting member to an adjustable fuse part and the other part consisting of an annular member provided with a notch and a guide surface co-axial with the axis of rotation of said adjusting member; means for holding said annular member against movement during the adjusting rotation of said adjusting member; a spring holding said arm in sliding contact with said guide surface during the adjusting rotation of said adjusting member and causing it to engage said notch when said adjusting member on its adjusting rotation has

again reached its initial position whereby said arm when engaging said notch is located at such distance from the axis of rotation of said adjusting member that the coupling means cannot enter into action, while said arm when being held in sliding contact with said guide surface assumes a position permitting the coupling means to effect the coupling; and means for disengaging said arm from said notch and holding it out of engagement therewith when said adjusting member assumes its initial position.

9. A fuse adjusting device comprising a housing, a rotatable adjusting member; a driving element for rotating said adjusting member; two coöperating parts, one of which consists of an arm movably mounted on said adjusting member and carrying means for coupling the adjusting member to an adjustable fuse part and the other part consisting of an annular member rotatably mounted in said housing about the axis of rotation of said adjusting member and provided with a notch and a guide surface coaxial with said axis, means for holding said annular member against movement during the adjusting rotation of said adjusting member; a spring holding said arm in sliding contact with said guide surface during the adjusting rotation of said adjusting member and causing it to engage said notch when said adjusting member on its adjusting rotation has again reached its initial position, whereby said arm when engaging said notch is located so far from the axis of rotation of said adjusting member that the coupling means cannot enter into action while said arm, when being held in sliding contact with said guide surface, assumes a position permitting said coupling means to effect the coupling and means for bringing said annular member and said adjusting member independently of the adjusting movement of said driving element into a relative angular position in which said arm has sliding contact with said guide surface.

10. A fuse adjusting device comprising a housing, a rotatable adjusting member; a driving element for rotating said adjusting member; two coöperating parts, one of which consists of an arm movably mounted on said adjusting member and carrying means for coupling the adjusting member to an adjustable fuse part and the other part consisting of an annular member rotatably mounted in said housing about the axis of rotation of said adjusting member and provided with a notch and a guide surface coaxial with said axis, means for holding said annular member against movement during the adjusting rotation of said adjusting member; a spring holding said arm in sliding contact with said guide surface during the adjusting rotation of said adjusting member and causing it to engage said notch when said adjusting member on its adjusting rotation has again reached its initial position whereby said arm when engaging said notch is located at such distance from the axis of rotation of said adjusting member that the coupling means cannot enter into action, while said arm when being held in sliding contact with said guide surface assumes a position permitting said coupling means to effect the coupling, and means for altering the relative angular position of said angular member and said adjusting member independently of the adjusting movement of said driving element to disengage said arm from said notch, said notch having an end wall formed with a surface causing said arm to become automatically disengaged from the notch.

11. A fuse adjusting device comprising a housing, a rotatable adjusting member; a driving element for rotating said adjusting member; two coöperating parts, one of which consists of an arm movably mounted on said adjusting member and carrying means for coupling the adjusting member to an adjustable fuse part, and the other part consisting of an annular member rotatably mounted in said housing about the axis of rotation of said adjusting member and provided with a notch and a guide surface co-axial with said axis; means for holding said annular member against movement during the adjusting rotation of said adjusting member; a spring holding said arm in sliding contact with said guide surface during the adjusting rotation of said adjusting member and causing it to engage said notch when said adjusting member on its adjusting rotation has again reached its initial position, whereby said arm when engaging said notch, is located at such distance from the axis of rotation of said adjusting member that said coupling means cannot enter into action, while said arm, when being held in sliding contact with said guide surface, assumes a position permitting said coupling means to effect the coupling; one end wall of said notch being formed with a surface causing said arm to establish coupling between said annular member and said adjusting member when said driving element is turned rearward from its initial position; and means for locking said annular member in a certain angular position imparted to it by the reverse movement of said driving element, the other end wall of said notch being formed with a surface causing said arm to automatically leave the notch when said driving element is returned to its initial position.

12. A fuse adjusting device comprising a housing; a pair of relatively rotatable adjusting members, a set of driving gears, a crank actuating said driving gears for ro-

tating said members, gears for angular setting of said adjusting members relatively to each other an amount corresponding to the fuse adjustment; a snap latch mounted in one of the adjusting members for locking the fuse body to said adjusting members; a rocking arm pressed outwardly by a spring and mounted in the second one of said adjusting members and carrying a yielding latch for locking the adjustable fuse part to said second adjusting member; an oscillating ring mounted concentric with the adjusting members and having a guiding surface engaging said rocking arm so as to keep the yielding latch in a position during the adjusting rotation ready to enter, on meeting it, a recess in the adjustable fuse part; a notch in said guiding surface, into which a projection of said rocking arm, actuated by its spring will enter on completion of the adjustment of the fuse, thereby withdrawing the yielding latch out of the recess in the adjustable fuse part; said arm projection being adapted to automatically disengage said notch on the advance movement of said driving crank and to positively engage said notch so as to turn said oscillating ring on the reverse movement of said driving crank; a bolt having a limited axial movement coöperating with said oscillating ring, to turn it in one direction actuated by a spring, said bolt constituting a stop for said driving crank at the completion of the fuse adjustment; said bolt being withdrawn by said oscillating ring out of the path of said driving crank on the partial reverse movement thereof at the commencement of operation; a clutch retaining said bolt in the withdrawn position, said clutch being raised, actuated by said driving crank at the beginning of its advance movement thereby releasing said bolt.

The foregoing specification signed at Barmen, Germany, this 27th day of November, 1909.

WILHELM SCHWARTZ. [L. S.]

In presence of—
OTTO KÖNIG,
CHAS. J. WRIGHT.