

W. SCHWARTZ.
FUSE ADJUSTING MACHINE.
APPLICATION FILED MAR. 9, 1908.

932,181.

Patented Aug. 24, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

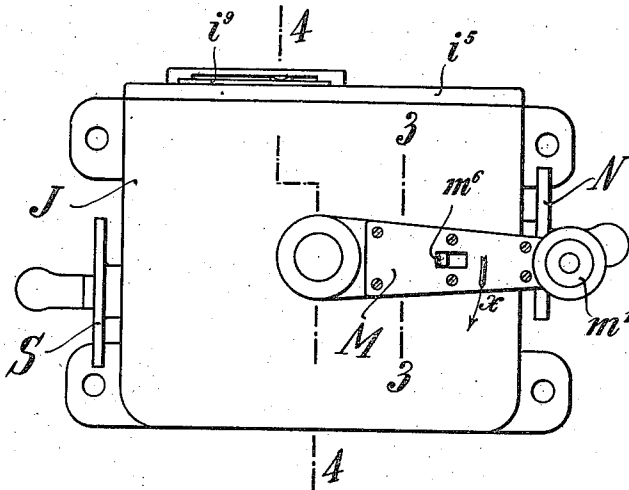


Fig. 2.

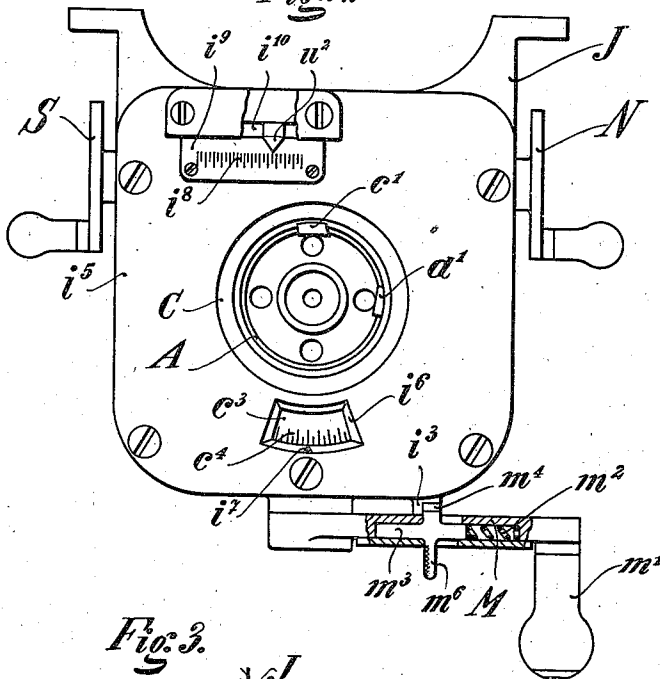
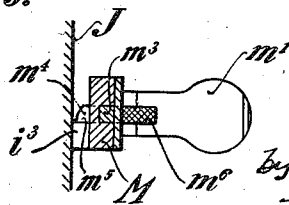


Fig. 3.



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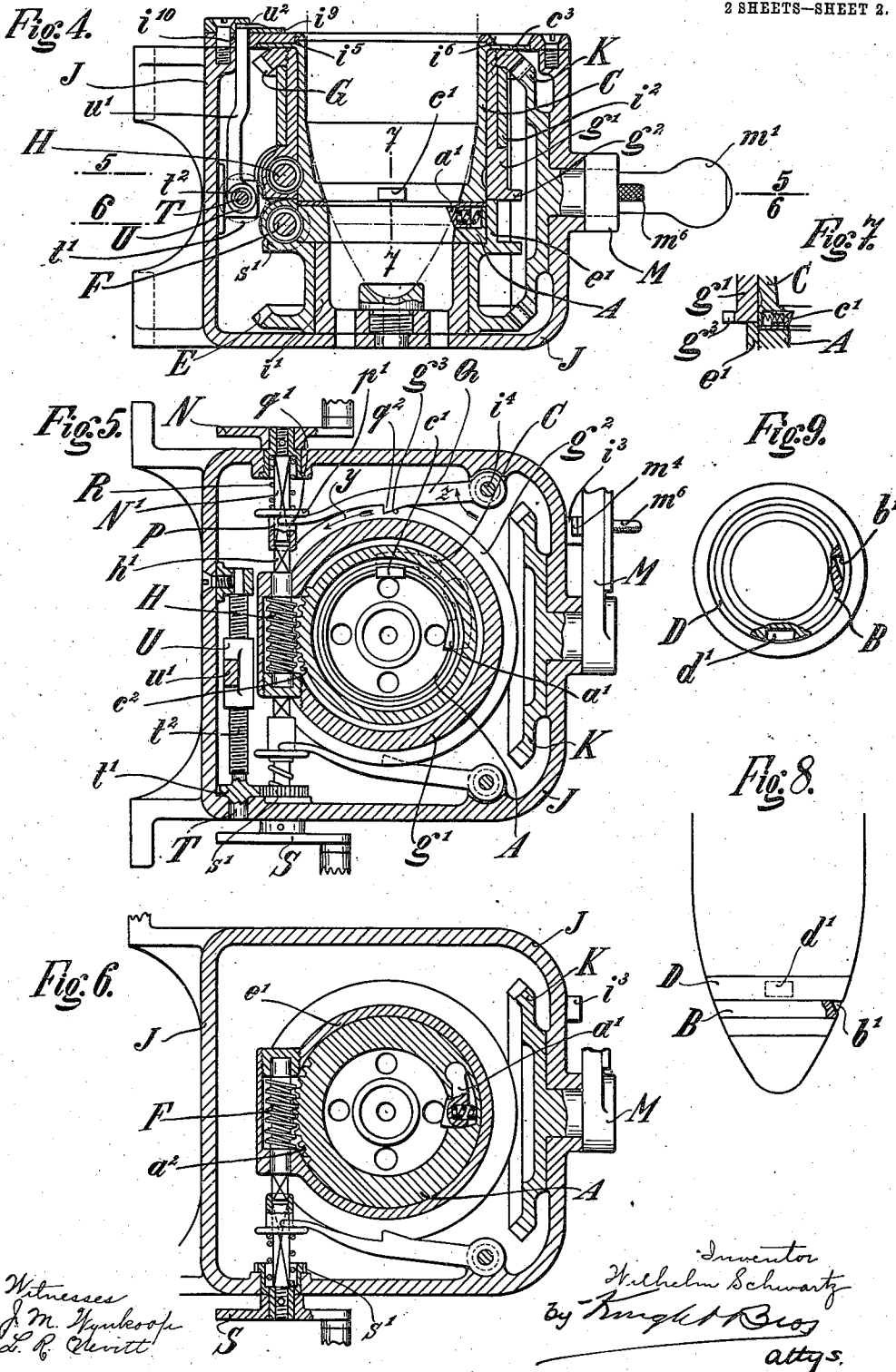
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2 SHEETS—SHEET 2.



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FUSE-ADJUSTING MACHINE.

932,181.

Specification of Letters Patent.

Patented Aug. 24, 1909.

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To all whom it may concern:

Be it known that I, WILHELM SCHWARTZ, a subject of the Emperor of Germany, and a resident of Essen-on-the-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 fuse adjusting machines of the type which is provided with two co-axial and relatively rotatable adjusting members and a crank journaled in the machine for adjusting the fuse. One of the adjusting members of the machine is adapted to be coupled to the adjustable part of the fuse and the other is adapted to be coupled to a fixed part of the fuse, for instance the fuse-base. In the known fuse adjusting machines of this type the adjustment of the fuse is effected by causing one of the adjusting members to carry out two complete revolutions while the other adjusting member remains stationary. The ratio of transmission between the crank which serves for adjusting the fuse and the adjusting member which rotates during the adjusting operation is selected either in such a manner that the crank must also carry out two complete revolutions or in such a manner that only one complete revolution of the crank is required. The adjusting machines of the first type have the drawback that the adjusting operation takes place comparatively slowly. In the adjusting machines of the second type this drawback is removed but they have another drawback which is as follows: In these adjusting machines—the conditions otherwise being equal—the angular velocity of the adjusting member, which rotates during the adjusting operation is twice as great as in the adjusting machines of the first type. As the kinetic energy increases as the square of the angular velocity the kinetic energy of the projectile body, which rotates with the adjusting member during the adjusting operation, is therefore four times as great as in the adjusting machines of the first type. When the projectile body passes into the position of rest a violent shock will therefore take place which is likely to cause breakage of the driving mechanism of the machine and which has a detrimental influence on the exactness of the adjustment of the fuse.

The object of this invention is to provide a fuse adjusting machine of the aforesaid type in which only one revolution of the crank is required and in which the concussion is not any greater than in the adjusting machines with two revolutions of the crank.

In the accompanying drawings, one embodiment of the invention is shown by way of example.

Figure 1 is a side view of the improved fuse adjusting machine; Fig. 2 is a top view; Fig. 3 is a section on line 3—3, Fig. 1, looking from the left; Fig. 4 is a section on line 4—4, Fig. 1, looking from the left; Fig. 5 is a section on line 5—5, Fig. 4, looking from above; Fig. 6 is a section on line 6—6, Fig. 4, also looking from above; Fig. 7 is a section on line 7—7, Fig. 4, looking from the left; Fig. 8 is a side view of a burning time fuse for which the embodiment of the adjusting machine shown in the drawings is adapted, the adjacent part of the projectile body being shown in side elevation, and Fig. 9 is a bottom view of Fig. 8, partly in section.

The adjusting member A of the fuse adjusting machine is adapted to be coupled to the adjustable part of the fuse, viz. the rotatable composition ring B of the burning time fuse shown in Figs. 8 and 9, while the adjusting member C is adapted to be coupled to the fixed part of the fuse, for instance the base D of the burning time fuse. For the purpose of coupling the adjusting members to the corresponding parts of the fuse in the known manner the members A and C have mounted therein spring-pressed latches a^1 and c^1 for which corresponding notches b^1 and d^1 are provided in the rotatable composition ring B and in the fuse-base D. The adjusting member A can be turned in the nave e^1 of a cone-wheel E through the medium of a worm F which engages with a toothed portion a^2 of the member A. The adjusting member C can be turned in the nave g^1 of a cone-wheel G through the medium of a worm H which engages with a toothed portion c^2 on the member C. The cone-wheel E is rotatably mounted on a hollow trunnion i^1 (Fig. 4) secured on the bottom of the housing J of the fuse adjusting machine, and the cone-wheel G can turn in a bearing i^2 (Fig. 4) which is secured to

two opposite side-walls of the housing J. A cone-wheel K, which is of the same diameter as the cone-wheels E and G and which is journaled in a side-wall of the housing J, meshes with the cone-wheels E and G. On the pivot-pin of the cone-wheel K is secured a crank M which is provided with a handle m^1 and in which is mounted a bolt m^3 which is under the action of a helical spring m^2 (Fig. 2). The bolt m^3 is provided with a nose m^4 having a surface m^5 (Fig. 3) for which a stop i^3 is provided on the housing J. The spring m^2 tends to hold the bolt m^3 in such a position that the stop i^3 is located in the path of the nose m^4 . The bolt m^3 is further provided with a thumb-piece m^6 by means of which the bolt can be brought into such a position that, when the crank is turned, the nose m^4 can move past the stop i^3 . When, as shown in the drawings, the nose m^4 abuts with its face m^5 against the stop i^3 the crank M is secured against turning in the direction of the arrow x (Fig. 1). The position which the crank assumes in this instance will in the following be termed the position of rest. When the crank is turned a complete revolution each of the cone-wheels E and G must also turn 360° and they therefore always assume the same angular position when the crank M is in the position of rest.

The worm H, which is mounted in the nave g^1 of the cone-wheel G and therefore must partake of the rotation of the wheel G, is operated by means of a crank-disk N which is journaled in the housing J in the manner shown in the drawings (see especially Fig. 5). A shaft N^1 , which is of square cross-section and on which is slidably but non-rotatably mounted a sleeve P, can be rotated by means of the crank-disk N. The arrangement is selected in such a manner that the axis of rotation of the shaft N^1 and the worm H are located at the same level and at the same vertical distance from the axis of rotation of the cone-wheel G. By reason of this arrangement the axis of rotation of the worm H must coincide with the axis of rotation of the shaft N^1 when the cone-wheel G assumes a predetermined angular position and the conditions are selected in such a manner that the two axes coincide when the crank M is in its position of rest. The shaft of the worm H projects to one side outside of the nave g^1 of the cone-wheel G and terminates in a square h^1 (Fig. 5) which fits with a slight amount of play in the sleeve P. The sleeve P is provided with a collar p^1 . A releasing lever Q (Fig. 5) is journaled in one of the side-walls of the housing J through the medium of a pivot-pin i^4 and is provided with a bifurcated end q^1 which embraces the sleeve and abuts against the collar p^1 . A helical spring R inserted on the shaft N^1

holds the collar p^1 of the sleeve P in continuous engagement with the bifurcated end q^1 of the releasing lever Q. By reason of this arrangement each position of the releasing lever Q will correspond to a predetermined position of the sleeve P. The lever Q is provided with a nose q^2 for which a notch g^3 is provided in a flange g^2 on the nave g^1 of the cone-wheel G. The arrangement is selected in such a manner that the nose q^2 engages in the notch g^3 when the crank M is in the position of rest. The releasing lever Q then assumes such a position that the sleeve P to a slight extent engages the square h^1 of the shaft of the worm H, the axis of the worm-shaft, as already stated, coinciding with the axis of the shaft N^1 when the crank M is in the position of rest. The faces of the nose q^2 and the walls of the notch g^3 are of such formation that, when the nose q^2 rests in the notch g^3 , the cone-wheel G can only rotate in the direction of the arrow y (Fig. 5) and, when the cone-wheel makes such rotation, the nose q^2 can automatically slide out of the notch g^3 . When the nose q^2 has left the notch g^3 the releasing lever Q assumes such a position that the sleeve P does not any longer project into the path along which the square h^1 moves during the rotation of the cone-wheel G. When the crank M is in the position of rest the square h^1 engages in the sleeve P with so much play that sufficient space is provided for the relative movement carried out by the square h^1 within the sleeve P while the nose q^2 of the releasing lever Q passes out of the notch g^3 . The amount of play required for that purpose is, however, so small that the crank-disk N is securely coupled to the worm H in the position of the parts shown in the drawings.

The worm H serves to adjust the adjusting member C to the desired burning length. This adjustment can be read by means of a distance-scale c^4 (Fig. 2) and by means of a mark i^7 . The scale c^4 is arranged on the front face of a flange c^3 on the adjusting member and is visible through a window i^6 provided in the cover i^5 of the housing J. The mark i^7 is arranged on the edge of the window i^6 .

The worm F, which is mounted in the nave e^1 of the cone-wheel E and therefore must partake of the rotation of the wheel E, is operated by means of a crank-disk S which is journaled in the housing J of the fuse-adjusting machine. The means which serve for coupling the crank-disk S to the worm F are identical with the means which serve for coupling the crank-disk N to the worm H.

The worm F serves to adjust corrections of the burning length. The adjustment which is imparted to the adjusting member A by means of the worm F can be read by

means of a scale i^3 (Fig. 8) and an index-hand u^2 . The scale i^3 is provided on a plate i^0 secured on the cover i^5 of the housing J and the index-hand u^2 is positively connected to the crank-disk S in such a manner that it can slide along the scale i^3 when the crank-disk S is rotated. To that end the pivot-pin of the crank-disk S is provided with a circular row of teeth s^1 which meshes with a pinion t^1 . The pinion t^1 is secured on a shaft T which is journaled in the housing J and which has its central part provided with screw-threads t^2 . On the threaded portion of the shaft T is mounted a screw-threaded sleeve U which is provided with an arm u^1 .

The arm u^1 is slidably guided in a slot i^{10} (Fig. 10) in the cover i^5 of the housing and on its upper end it carries the index-hand u^2 .

In the following description of the manipulation and mode of operation of the improved fuse-adjusting machine it will be assumed that the parts are in the position shown in the drawings. The crank M is in its position of rest and the worms H and F are coupled to their driving members, viz. the crank-disks N and S.

The latch c^1 of the adjusting member C is first brought into an angular position relatively to the latch a^1 of the adjusting member A which corresponds to the desired burning length. To that end the crank-disk N is rotated and through the medium of the shaft N¹ and the coupling P h^1 the rotation of the disk is transmitted to the worm H which in turn transmits the rotation to the adjusting member C with the latch c^1 and the flange c^3 carrying the scale c^4 . The rotation of the crank-disk N is continued until the division-line of the scale c^4 , which corresponds to the desired burning length, registers with the mark i^7 . Any correction of the burning length that may be necessary is effected by turning the crank-disk S, the rotation of which is transmitted to the worm F and thence to the adjusting member A with the latch a^1 . Through the medium of the gearing s^1 t^1 the rotation of the crank-disk S is also transmitted to the shaft. As the screw-threaded sleeve U is prevented from turning by reason of the engagement of its arm u^1 in the slot i^{10} of the cover i^5 the rotation of the shaft T will cause the sleeve U to move axially, this movement being partaken of by the index-hand u^2 . The turning movement of the crank-disk S is continued until the index-hand u^2 registers with the division-line of the scale i^3 which corresponds to the desired correction of the burning length. The latches a^1 and c^1 then have an angular distance from each other which corresponds to the desired position of the fuse.

In order to adjust the fuse the operator

takes hold of the base of the projectile or cartridge and inserts the fuse in the adjusting members A and C without paying any attention to how the notches b^1 and d^1 become located relatively to the latches a^1 and c^1 . When the fuse has been inserted in the adjusting machine neither of the latches a^1 and c^1 will therefore as a rule engage in the corresponding notch in the fuse. This being the case—and it is assumed to be so in the following explanation of the mode of operation—the latches a^1 and c^1 are forced back into the recesses provided for them in the adjusting members A and C. After the fuse is inserted in the adjusting machine the operator grasps the handle m^1 of the crank M with one hand and engaging the thumb-piece m^6 with the thumb of the same hand he draws the bolt m^3 back against the action of the spring m^2 until the nose m^4 is out of contact with the stop i^3 and he then rotates the crank one complete revolution. Immediately after the rotation of the crank is started the operator again lets go his hold on the thumb-piece m^6 and the spring m^2 forces the bolt m^3 back into its original position. Through the medium of the cone-wheel K the rotation of the crank M is transmitted to the cone-wheels E and G, the wheel G rotating in the direction of the arrow y (Fig. 5) and the wheel E rotating in the opposite direction. At the commencement of the turning movement of the cone-wheel G the nose q^2 of the releasing lever Q slides out of the notch q^3 which causes the lever Q to turn in the direction of the arrow z (Fig. 5) whereby the bifurcated end q^1 of the lever shifts the sleeve P on the shaft N¹ against the action of the spring R and to such an extent that the square h^1 becomes released. The worm H is then free to partake of the further turning movement of the cone-wheel G. The worm F is uncoupled from the crank-disk S in a similar manner at the commencement of the turning movement of the cone-wheel E. The adjusting members A and C also partake of the turning movement of the cone-wheels E and G as they are coupled to the cone-wheels by the worms F and H. The projectile at first remains stationary while the latches a^1 and c^1 slide along the outer faces of the rotatable composition ring B and fuse-base D. As soon as one of the latches a^1 c^1 reaches the corresponding notch in the fuse the latch snaps into the notch and the adjusting member appertaining to the notch is then coupled to the corresponding part of the fuse and carries such part along during its rotation. As on the one hand the fuse-base D is rigidly connected with the projectile-body and on the other hand the rotatable composition ring can only rotate with comparative difficulty the entire pro-

jectile will generally partake of the rotation of the aforesaid fuse-part. As the projectile together with the adjusting member which already has its latch in engagement with the corresponding notch now rotates in the direction opposite to that of the other latch the latter will soon come into engagement with the corresponding notch in the fuse and the adjustment of the rotatable composition ring then commences. The coupling of the adjusting members A and C with the rotatable composition ring B and the fuse-base D is also effected with absolute certainty if it should happen that the composition ring B rotates so easily that it is not capable of carrying the entire projectile along when the latch a^1 first snaps into its notch b^1 . In this instance the adjusting member A carries only the rotatable composition ring B along while the fuse-base D and the other part of the projectile remain at rest. As however the latch c^1 must describe a path of 360° during a complete revolution of the crank M the latch c^1 also in this instance always comes into engagement with its notch d^1 . When the crank M has made a complete revolution, that is when it has once more reached its position of rest, the face m^5 of the nose m^4 hits the stop i^3 and holds the crank in the position of rest. Simultaneously herewith the nose q^2 of the releasing lever Q snaps into the notch q^3 and the spring R causes the sleeve P to slide over the square h^1 of the shaft of the worm H. The coupling of the worm F with the crank-disk S takes place in a similar manner. All the parts of the adjusting machine are now once more in their original position and the latches a^1 and c^1 , especially, have the same angular distance from one another as prior to the commencement of the turning movement of the crank M. As both latches a^1 c^1 are in engagement with the corresponding notches b^1 d^1 of the fuse the notches have also the same angular distance from each other, that is the fuse is adjusted to the desired burning length.

It is apparent that the desired adjustment will also be imparted to the fuse in case the fuse is inserted in the adjusting members A C in such a manner that one of the latches a^1 c^1 snaps into the corresponding notch in the fuse or in case both of the latches snap into their notches.

When the desired adjustment has been imparted to the fuse the projectile is removed from the adjusting machine and while this is being done the latches a^1 c^1 pass automatically out of engagement with the notches b^1 d^1 in the known manner.

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

1. A fuse adjusting machine comprising a

pair of co-axial and relatively rotatable adjusting members, and a single means for rotating the adjusting members simultaneously and in opposite directions to adjust the fuse.

2. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, one of the members carrying means for engaging a rotatable part of the fuse and the other carrying means for engaging a relatively fixed part of the fuse; and single means for imparting rotary movement to the members simultaneously and in opposite directions to adjust the fuse.

3. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, an operating crank, and a connection between each of the members and the crank whereby the adjusting members are rotated in opposite directions when the crank is turned to adjust the fuse.

4. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, an operating crank, a connection between each of the members and the crank whereby the adjusting members are rotated in opposite directions when the crank is turned to adjust the fuse, a self-locking gearing in the connection between the crank and one of the adjusting members, and means for operating said gearing to vary the initial angular position of said last-named member relatively to the other member.

5. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, an operating crank, a connection between each of the members and the crank whereby the adjusting members are rotated in opposite directions when the crank is turned to adjust the fuse, a self-locking gearing in each of said connections, and means for operating said gearings independently of each other to vary the initial angular position of one adjusting member relatively to the other member.

6. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, an operating crank, a connection between each of the members and the crank whereby the adjusting members are rotated in opposite directions when the crank is turned to adjust the fuse, a self-locking gearing in one of said connections whereby one of the members may be rotated to vary the initial position of the members, a member for operating the self-locking gearing, means normally coupling said operating member to said gearing, and means releasing said coupling means when the crank is turned to adjust the fuse.

7. In a fuse-adjusting machine, the combination with a pair of co-axial adjusting members rotatable relatively to each other,

an operating crank, and a connection between each of the members and the crank whereby to rotate the adjusting members in opposite directions when the crank is turned;
5 of a self-locking gearing in the connection between the crank and one of the adjusting members; means for operating said gearing to vary the initial angular position of said last-named member relatively to the other
10 member; and means driven by said self-

locking gearing whereby the initial angular adjustment is indicated.

The foregoing specification signed at Dusseldorf, Germany, this 9th day of January, 1908.

WILHELM SCHWARTZ.

In presence of—

CARL GRUNWALD,
WILHELM FLASCHE.