W. SCHWARTZ.

FUSE ADJUSTING MACHINE.

APPLICATION FILED DEC. 9, 1908.

943,474.

Patented Dec. 14, 1909.

2 SHEETS—SHEET 1.

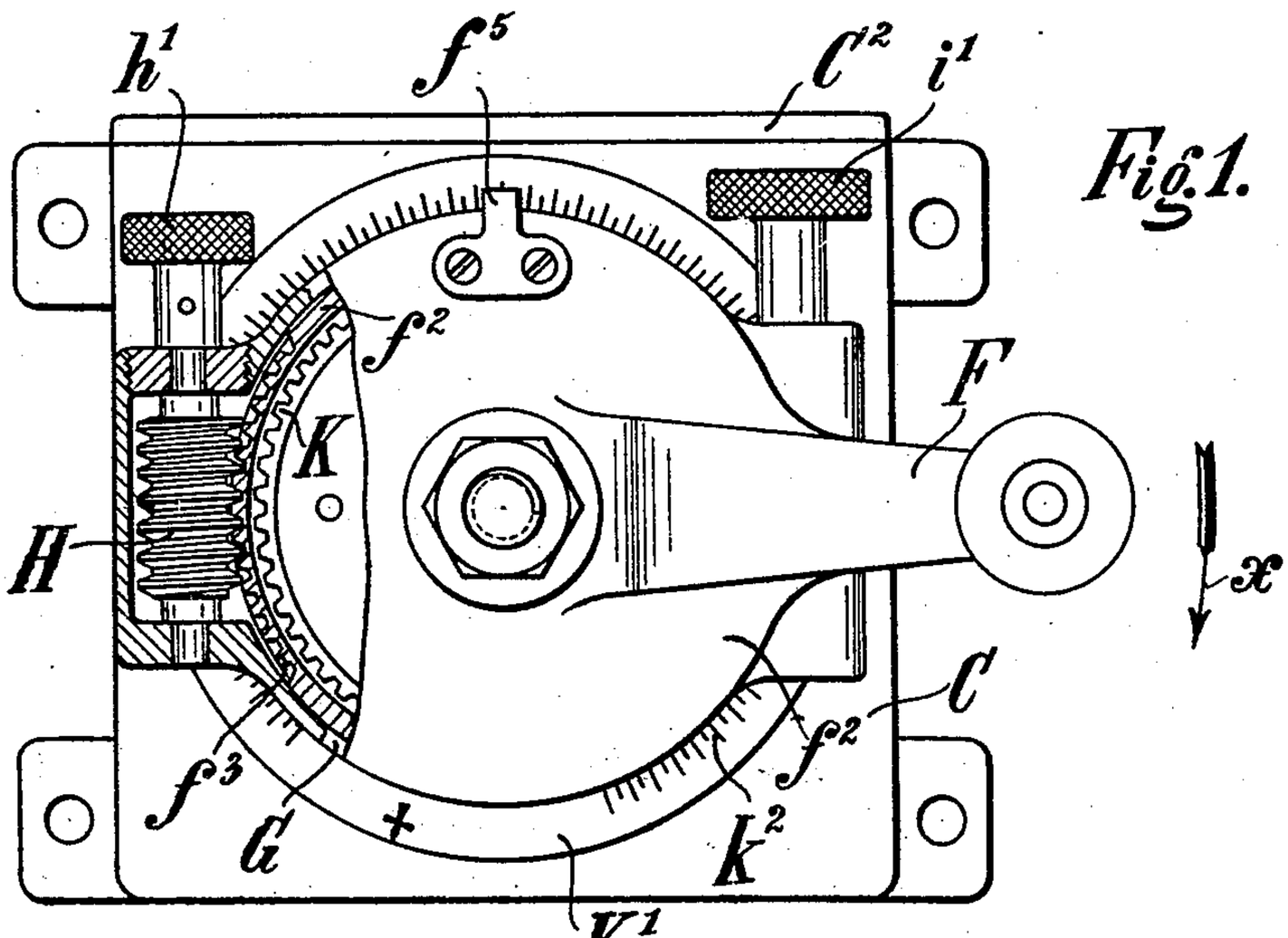

Fig. 1.

Fig. 2.

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Fig. 3.

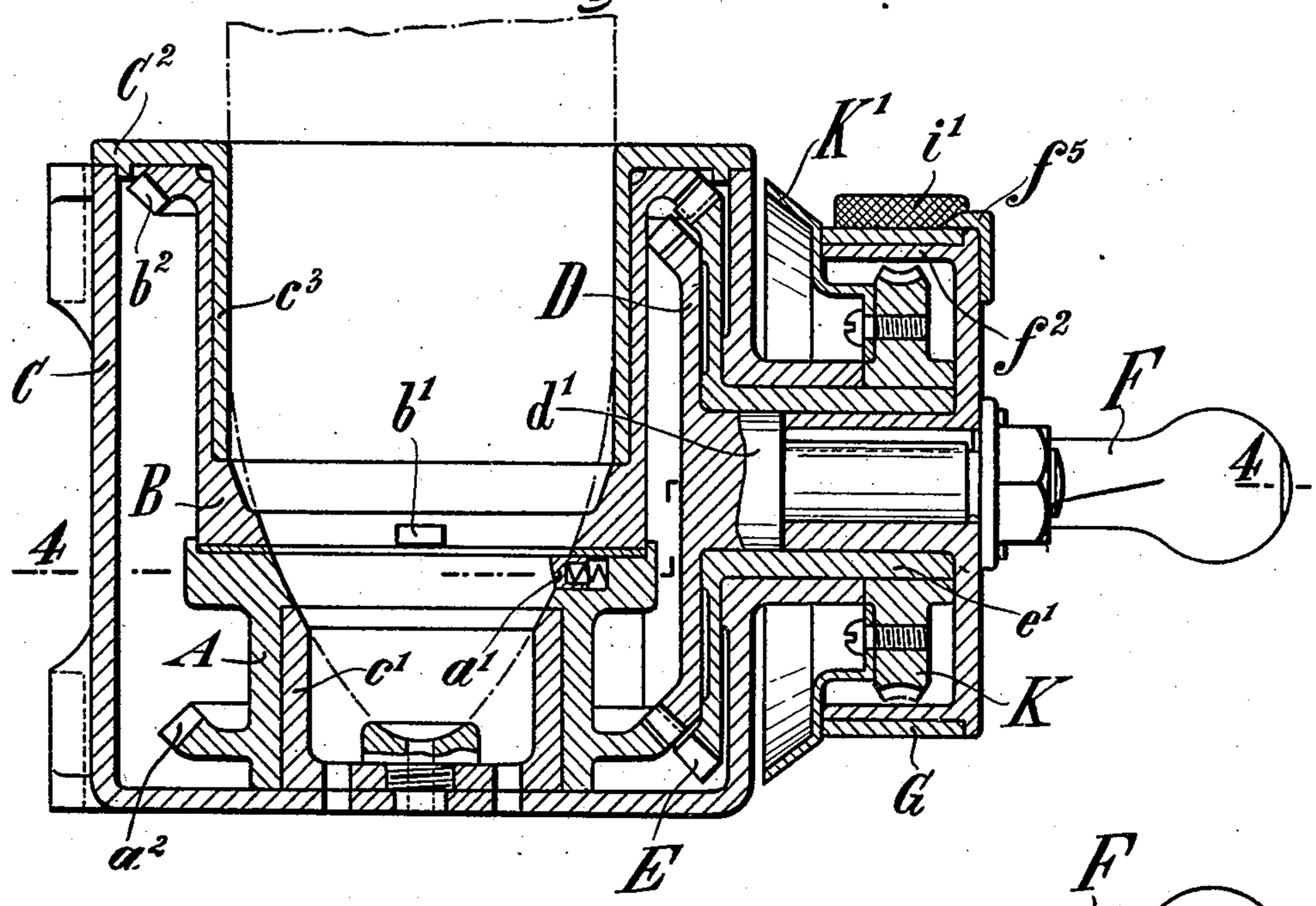
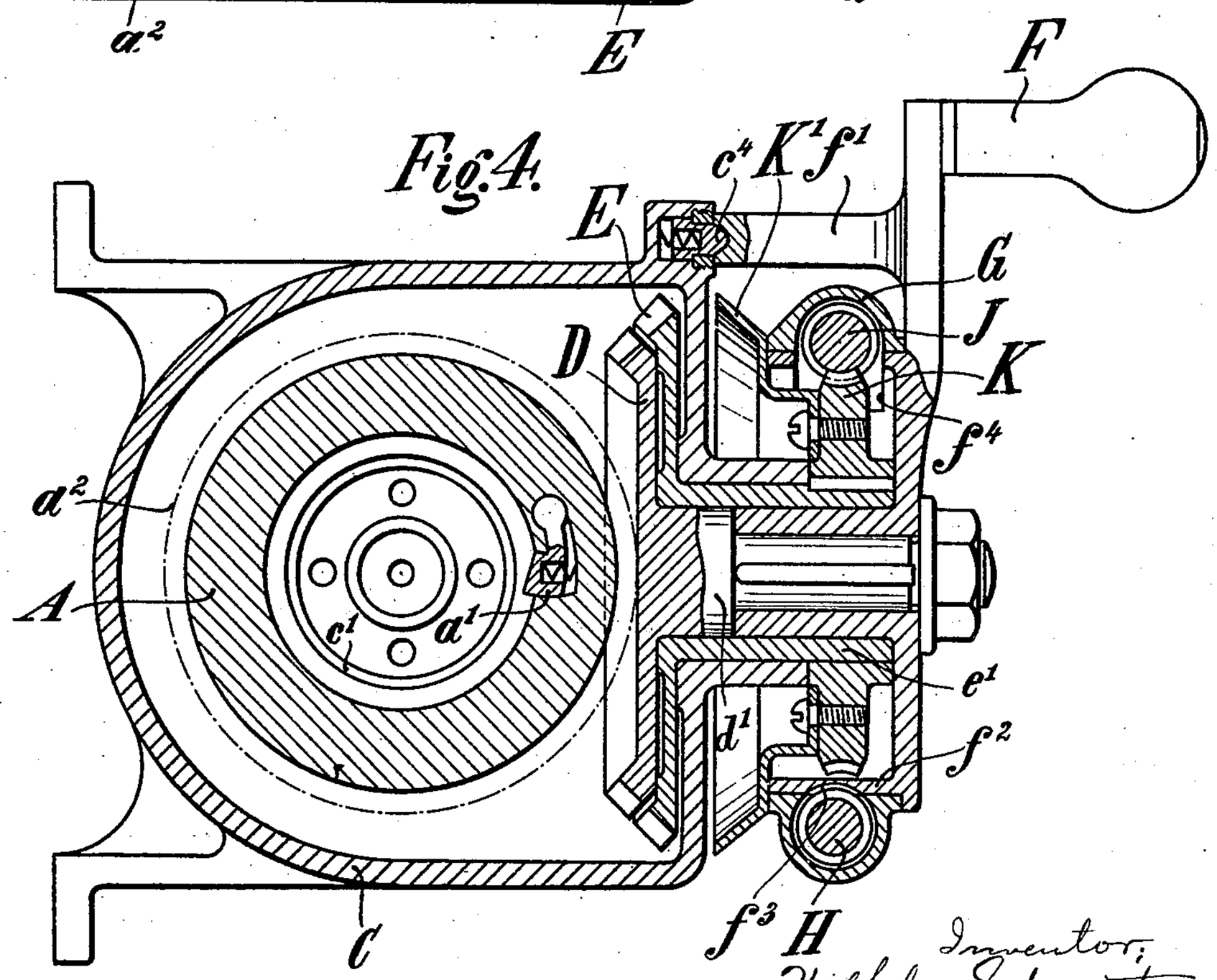


Fig. 4.



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FUSE-ADJUSTING MACHINE.

943,474. Specification of Letters Patent. **Patented Dec. 14, 1909.**

Application filed December 9, 1908. Serial No. 466,722.

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 fuse adjusting machines of the type which is provided with two co-axial and relatively rotatable adjusting members and an operating member, such as a crank or the like, which is rotatably mounted in the machine and serves for adjusting the fuse. One of the two 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.

The invention especially relates to those adjusting machines of the aforesaid type in which at least one of the two adjusting members, in addition to being capable of being rotated by the operating member serving for the adjustment of the fuse, is also capable of rotation independently of the operating member to cause the adjusting members to assume the relative angular position which corresponds to the desired location of the bursting point.

The object of the invention is to simplify the construction of such fuse adjusting machine and to reduce the cost of manufacture. In accordance with the present invention, this object is attained by the fact that the operating mechanism which serves for adjusting the fuse has at least one gearing in common with the operating mechanism which serves for adjusting the adjusting members to the relative angular position which corresponds to the desired location of the bursting point.

One embodiment of the invention is shown in the accompanying drawings by way of example.

Figure 1 is a front view of the fuse adjusting machine, some parts being broken away; Fig. 2 is a top view of the machine; Fig. 3 is a section on line 3—3, Fig. 2, looking from the left, and Fig. 4 is a section on line 4—4, Fig. 3, looking from above.

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 a fixed part of the fuse, in the present instance the fuse base. Latches a^1 and b^1 serve in the known manner for coupling the adjusting members to the appurtenant parts of the fuse. The adjusting member A, which is provided with a toothed crown a^2, can turn on a hollow trunnion c^1 which is secured on the bottom of the housing C of the fuse adjusting machine and the adjusting member B, which is provided with a toothed crown b^2, can turn on a hollow trunnion c^3 which is located on the cover C^2 of the housing C and is co-axial with the trunnion c^1. A cone-wheel D meshes with the crown a^2 and a cone-wheel E meshes with the crown b^2. The nave of the cone-wheel E is formed as a hollow trunnion e^1 by means of which the cone-wheel is rotatably mounted in the housing C. The cone-wheel D has its nave d^1 formed as a trunnion by means of which it is rotatably mounted in the hollow trunnion e^1 in the manner shown in the drawing, the axis of rotation of the cone-wheel D coinciding with the axis of rotation of the cone-wheel E. The ratio of transmission of the cone-gears D a^2 and E b^2 is equal to one. In the manner shown in the drawing (see especially Fig. 4) the cone-wheel D is rigidly connected to a crank F which forms the operating member serving for the adjustment of the fuse. The crank F is provided with a projection f^1 which is provided with a conical notch for a correspondingly formed spring-pressed bolt c^4 which is arranged in the housing C (see especially Fig. 4). In the drawings, the crank is shown in the position which it assumes when the bolt c^4 engages in the appurtenant notch in the projection f^1. The arrangement is selected in such a manner that the bolt c^4 can only be brought out of engagement with the appurtenant notch when a comparatively great force acts on the crank F. In addition to the projection f^1, the crank F is provided with a second projection f^2 which is bell-shaped and is cylindrical on the outside. The projection f^2 has its axis coinciding with the axis of rotation of the crank F and forms a trunnion for a ring G, in which are journaled two diametrically opposite worms H and J (Figs. 1 and 4). The worm H, which can be rotated by means of a hand-wheel h^1, engages with a toothed portion f^3 provided on the projection f^2 of the crank F and extending over an angle of 60°. The worm J,

which carries a hand-wheel i^1, engages with a worm wheel K which is arranged within the bell-shaped projection f^2 and which is rigidly connected to the cone-wheel E in the manner shown in the drawings (see Fig. 4). To make it possible for the worm J to engage with the worm-wheel K, the projection f^2 is provided with an opening f^4 which is of such size that the ring G is free to turn within the limits within which it can be adjusted by means of the worm-gear H f^3. The worm-gears H f^3 and J K are self-locking. A drum K^1 which has its outer face provided with a distance-scale k^2, is rigidly secured to the worm-wheel K. The appurtenant mark g^1 (Fig. 2) is provided on the ring G which is also provided with a scale g^2 (Fig. 2) for corrections, to which appertains an index-hand f^5 secured on the bell-shaped projection f^2 of the crank.

In the use of the improved fuse adjusting machine, the two adjusting members A and B must first be brought into the relative angular position which corresponds to the desired location of the bursting point. To that end, the worm J is rotated by means of the hand-wheel i^1 after the crank F, if necessary, has first been brought into the position shown in the drawings. As the forces which act on the crank when the worm J is rotated are only small, the bolt c^4 remains in engagement with the appurtenant notch in the projection f^1 and the crank F therefore cannot turn although it is, by means of the self-locking gearing H f^3, coupled to the ring G which serves as a bearing for the worm J. The rotation of the worm J must, therefore, cause a turning movement of the worm-wheel K and the cone-wheel E which is rigidly connected to the wheel K and through the medium of the toothed crown b^2, the cone-wheel E imparts a turning movement to the adjusting member B. The cone-wheel D which is rigidly connected with the crank F remains at rest as does also the adjusting member A which has its crown a^2 meshing with the cone-wheel D. The drum K^1 which is provided with the distance-scale k^2 turns with the worm-wheel K. The rotation of the worm J is continued until the mark g^1 registers with the division-line of the scale k^2 which corresponds to the desired distance of the bursting point. The adjusting member B has then been turned, relatively to the adjusting member A, an angle which corresponds to the desired distance of the bursting point. The adjustment of corrections of the distance of the bursting point is effected by turning the hand-wheel h^1. As also in this case the forces acting on the crank F can only be small, the bolt c^4 remains in engagement with the appurtenant notch and the crank and the toothed portion f^3 of the projection f^2, therefore, cannot turn. The rotation which is imparted to the worm H by the hand-wheel h^1 will, therefore, cause the ring G to turn relatively to the projection f^2 on the crank. The worm-wheel K must partake of the turning movement of the ring G as the wheel K is coupled to the ring due to the self-locking action of the worm-gear J K. The turning movement of the worm-wheel K is transmitted to the adjusting member B by the cone-gear E b^2. During these operations, the adjusting member A remains at rest. The rotation of the hand-wheel h^1 is continued until the index-hand f^5 points at the division-line on the scale g^2 which corresponds to the desired correction. The adjusting member B has then been turned, relatively to adjusting member A, an angle corresponding to the desired correction. Particular attention is drawn to the fact that these operations do not effect any change in the adjustment of the mark g^1 relatively to the scale k^2, as the drum K^1 is rigidly connected to the worm-wheel K and is, therefore, also coupled to the ring G. After the adjusting members A and B have thus been brought into the relative angular position which corresponds to the desired location of the bursting point, a projectile (shown in dotted lines in Fig. 3) is inserted in the fuse adjusting machine. By a strong pressure on the handle of the crank F, the locking device formed by the bolt c^4 and the notch in the projection f^1 is thereupon released and the crank F is turned a complete revolution in the direction of the arrow x (Fig. 1). The turning movement of the crank F is partaken of not only by the cone-wheel D, which is rigidly connected to the crank, but also by the cone-wheel E as the self-locking action of the worm-gear J K couples the wheel E to the ring G and the self-locking action in the worm-gear H f^3 couples the ring G to the projection f^2 on the crank F. Through the medium of the cone-gears D a^2 and E b^2, the turning movement of the crank F is transmitted to the adjusting members A and B in such a manner that the members turn a complete revolution in opposite directions, whereby the desired adjustment is imparted to the fuse in the known manner. At the end of the turning movement of the crank F, the bolt c^4 snaps into the notch in the projection f^1 and again locks the crank in the position shown in the drawings.

It is apparent that the nature of the invention would not be changed if the cone-wheel D were rigidly connected with the cone-wheel E instead of with the crank F. In such case the two cone-wheels would preferably be combined into one integral cone-wheel having only one toothed crown engaging the toothed crowns a^2 and b^2 at the same time. In this embodiment of the invention the two adjusting members would be turned in opposite directions not only

upon adjustment of the fuse but also when the machine is adjusted to the desired location of the bursting point. Consequently in this embodiment the length of the distance-scale and of the correction-scale would only be half the length of the corresponding scales of the embodiment shown in the drawings. The division lines would, therefore, be closer together and the clearness of the scale and the attainable degree of exactness of the adjustments would, therefore, be less. Furthermore, as the errors committed during the adjustment are transmitted to both adjusting members, the effect of these errors on the adjustment of the fuse would be twice as great. As these faults are not present in the embodiment shown in the drawings, this embodiment is, therefore, the preferred one. Furthermore, it would involve no change in the nature of the invention if the modes of operation of the worm-gears H f^3 and J K were exchanged in such a manner that the gear H f^3 with the appurtenant scale g^2 were used for the adjustment of the distance of the bursting point while the gear J K with the appurtenant scale k^2 were used for the adjustment of corrections of the distance of the bursting point. In this embodiment the ring G would have to be capable of rotation within very wide limits relatively to the projection f^2 of the crank. This would result in the drawback that the operating members h^1 and i^1 of the two worm-gears would change their position within correspondingly wide limits and this would be very inconvenient in the use of the fuse adjusting machine. It is, therefore, preferable to use the embodiment shown in the drawings, in which the worm-gear which is in more direct connection with the cone-gear E b^2 is used for the adjustment of the distance of the bursting point.

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, means for relatively rotating the adjusting members to adjust the fuse, and means for imparting relative rotary movement to said members to vary the initial angular position of said members; said last-named means having a gearing in common with said first-named means, which gearing is operated both in adjusting the fuse and in varying the initial angular position of said adjusting members.

2. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, a driving gear for each of said members, an operating member, a connection between said operating member and said gears for operating said gears to cause them to rotate the adjusting members simultaneously and in opposite directions to adjust the fuse, and means for rotating only one of the adjusting members to vary the initial angular position of the adjusting members, said last-named means having a gearing in common with said first-named means, which gearing is operated both in adjusting the fuse and in varying the initial angular position of said adjusting members.

3. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, a driving gear for each of said members, an operating member, a connection between said operating member and said gears for operating said gears to cause them to rotate the adjusting members simultaneously and in opposite directions to adjust the fuse, means for rotating only one of the adjusting members to vary the initial angular position of the adjusting members, said means comprising a gear co-axial with said operating member, and means for securing said last-named gear in any desired angular position relatively to the operating member.

4. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, a driving gear for each of said members, an operating member, a connection between said operating member and said gears for operating said gears to cause them to rotate the adjusting members simultaneously and in opposite directions to adjust the fuse, means for rotating only one of the adjusting members to vary the initial angular position of the adjusting members, said means comprising a gear co-axial with said operating member, and a self locking gearing in the connection between the operating member and said last-named gear.

5. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, a driving gear for each of said members, an operating member, a connection between said operating member and said gears for operating the gears to cause them to rotate the adjusting members simultaneously and in opposite directions to adjust the fuse, a self-locking gearing in the connection between the operating member and one of said gears whereby the adjusting member may be rotated to the angular position corresponding to the distance of the bursting point, and a second self-locking gearing in said connection whereby the adjusting member may be rotated to correct the distance of the bursting point.

6. In a fuse adjusting machine having relatively rotatable adjusting members constructed to couple with the members of the fuse to be adjusted, and an operating member in driving connection with said adjusting members; means for initially rotating the adjusting members, relatively, consisting of a gear interposed in said driving connection, and an annular extension on the oper-

ating member, carrying one part of the said interposed gear, and surrounding the other part of said gear.

7. In a fuse adjusting machine having relatively rotatable adjusting members constructed to couple with the members of the fuse to be adjusted, and an operating member in driving connection with said adjusting members; means for initially rotating the adjusting members, relatively, consisting of a gear interposed in said driving connection, and an annular extension on the operating member, carrying one part of the said interposed gear, and surrounding the other part of said gear; the part of said gear carried by the annular extension being mounted thereon through the medium of a ring rotatable on said extension and having means for fixing it relatively thereto.

8. In a fuse adjusting machine having relatively rotatable adjusting members constructed to couple with the members of the fuse to be adjusted, and an operating member in driving connection with said adjusting members; means for initially rotating the adjusting members, relatively, consisting of a gear interposed in said driving connection, and an annular extension on the operating member, carrying one part of the said interposed gear, and surrounding the other part of said gear; the part of said gear carried by the annular extension being mounted thereon through the medium of a ring rotatable on said extension and having means for fixing it relatively thereto, consisting of an additional adjusting gear.

9. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, rotating means for imparting relative rotation to the adjusting members to adjust the fuse, an operating member having a bell-shaped projection, a connection between said operating member and said rotating means causing the latter to rotate the adjusting members, an annular member rotatably mounted on said bell-shaped projection, a gearing comprising a driving member and a driven member interposed between the operating member and the rotating means, whereby the adjusting members may be given initial relative rotation corresponding to the distance of the bursting point, and a second interposed gearing, comprising driving and driven members by which the adjusting members may be rotated to correct the distance of the bursting point; said bell-shaped projection surrounding the driven member of the first-named interposed gearing, and both of the interposed gearings having their driving members journaled on said annular member.

10. A fuse adjusting machine comprising a pair of co-axial and relatively rotatable adjusting members, a driving gear for each of said members, an operating member having a bell-shaped projection, a connection between said operating member and said gears for operating the gears to cause them to rotate the adjusting members simultaneously and in opposite directions to adjust the fuse, an annular member rotatably mounted on said projection, a self-locking gearing comprising a driving member and a driven member arranged in the connection between the operating member and one of said gears whereby the adjusting member may be rotated to the angular position corresponding to the distance of the bursting point, and a second self-locking gearing comprising a driving member and a driven member arranged in said connection, whereby the adjusting member may be rotated to correct the distance of the bursting point; said projection surrounding the driven member of the first-named self-locking gearing and both of the self-locking gearings having their driven members journaled in said annular member.

The foregoing specification signed at Barmen, Germany, this 24th day of November, 1908.

WILHELM SCHWARTZ. [L. S.]

In presence of—
OTTO KÖNIG,
WALTER EGKELSKAMP.