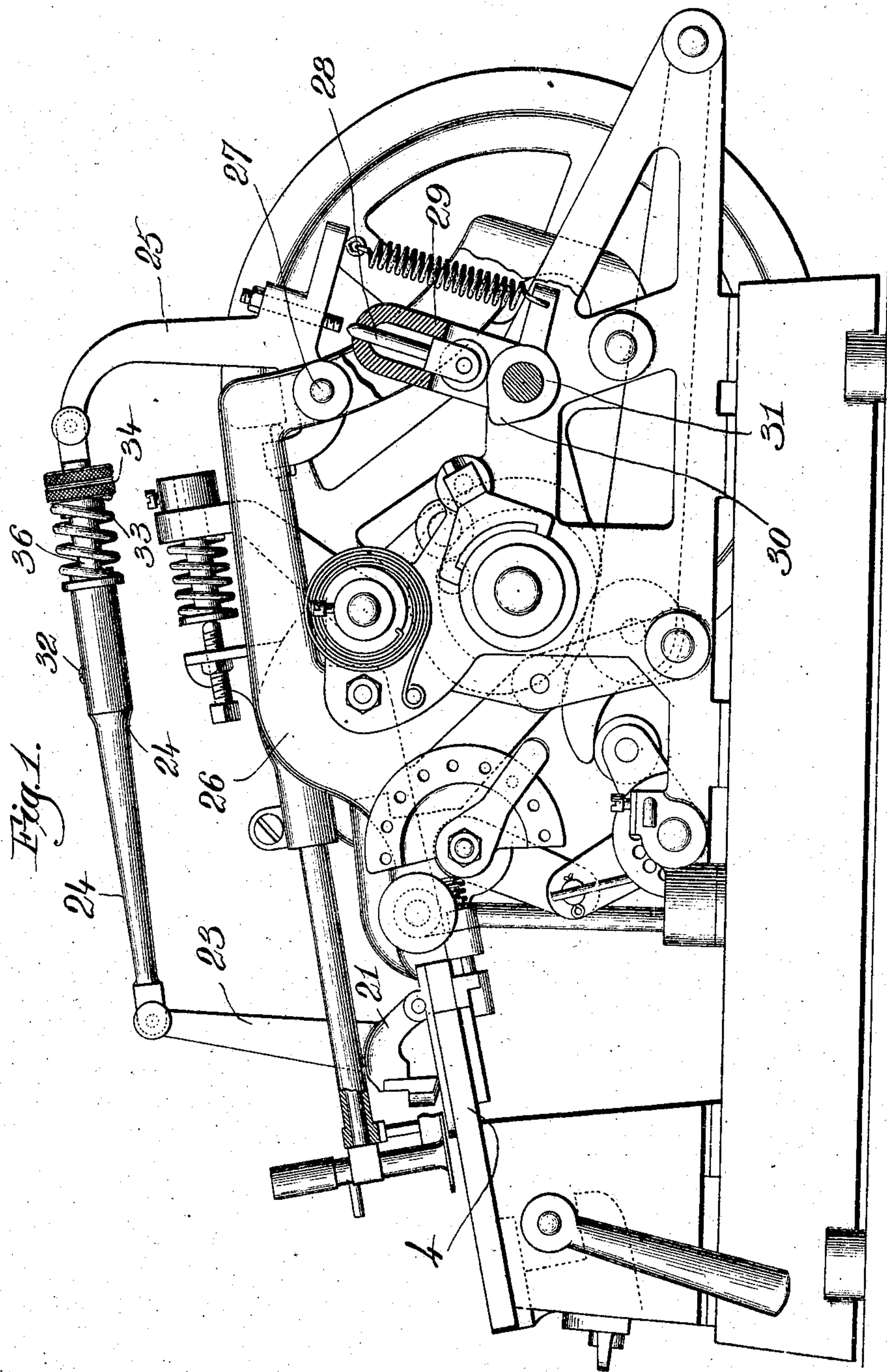


No. 868,024.

PATENTED OCT. 15, 1907.

B. A. SLOCUM.
FOLDING MACHINE.
APPLICATION FILED MAR. 5, 1906.

3 SHEETS—SHEET 1.



Witnesses:
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3 SHEETS—SHEET 2.

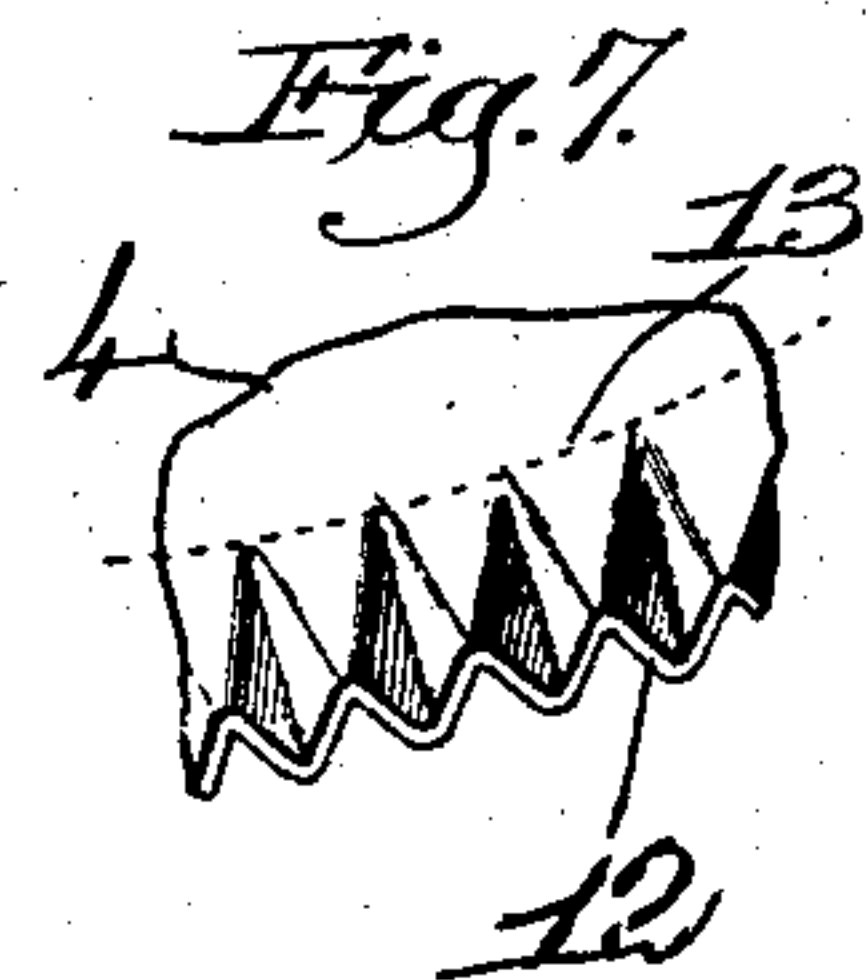
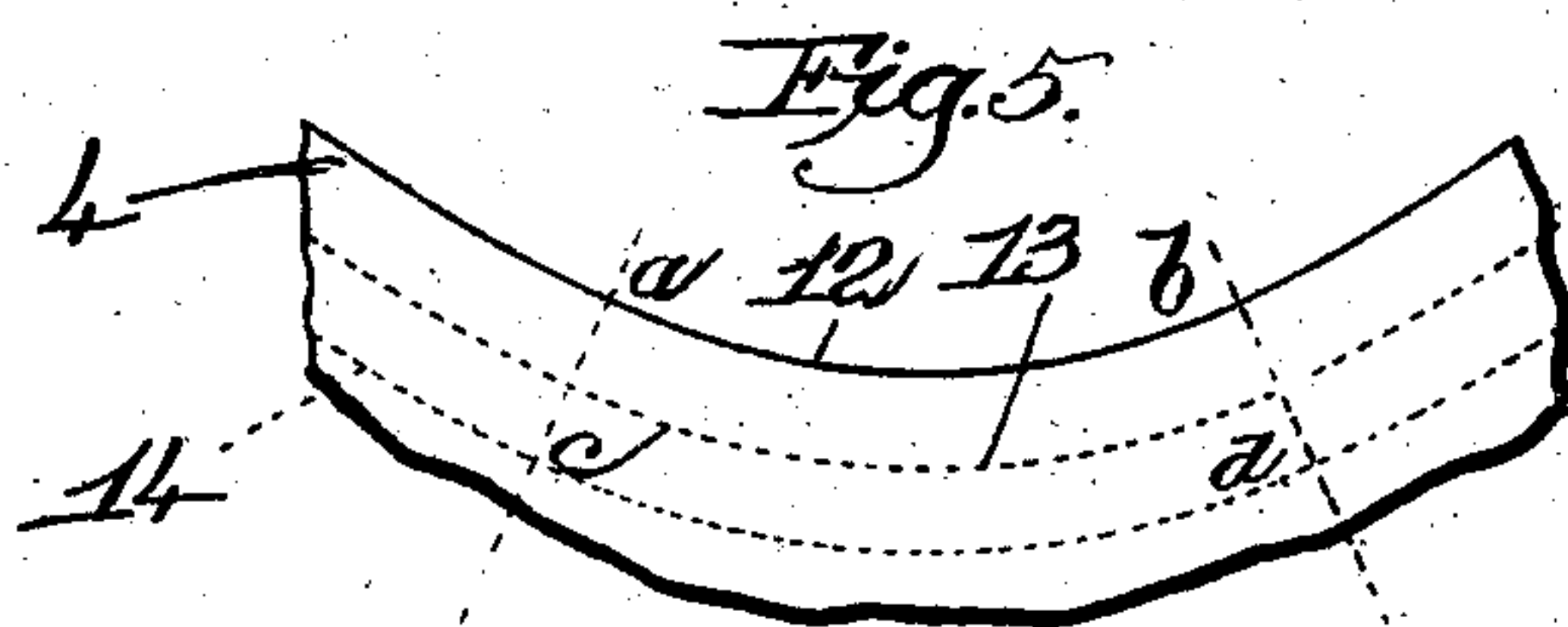
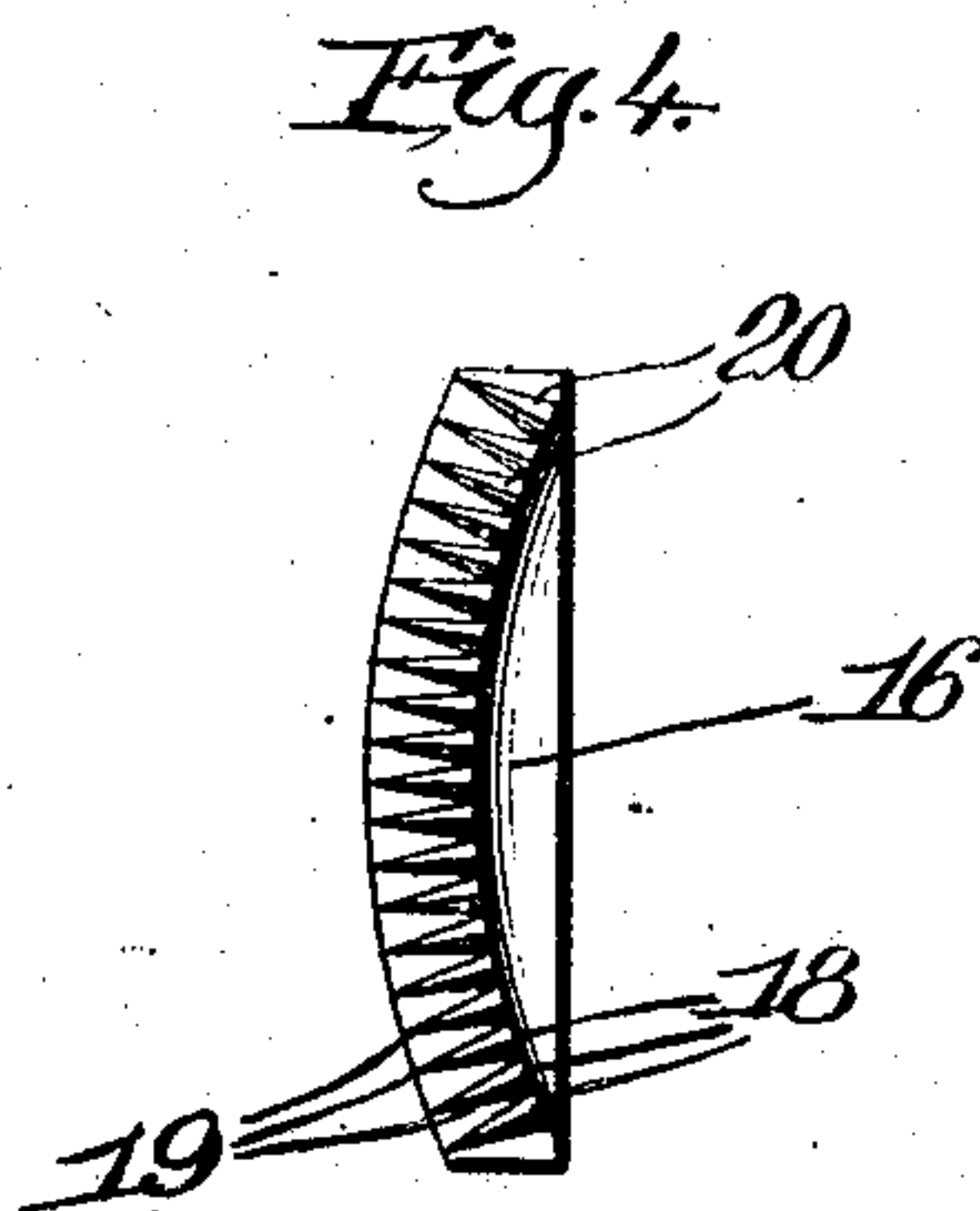
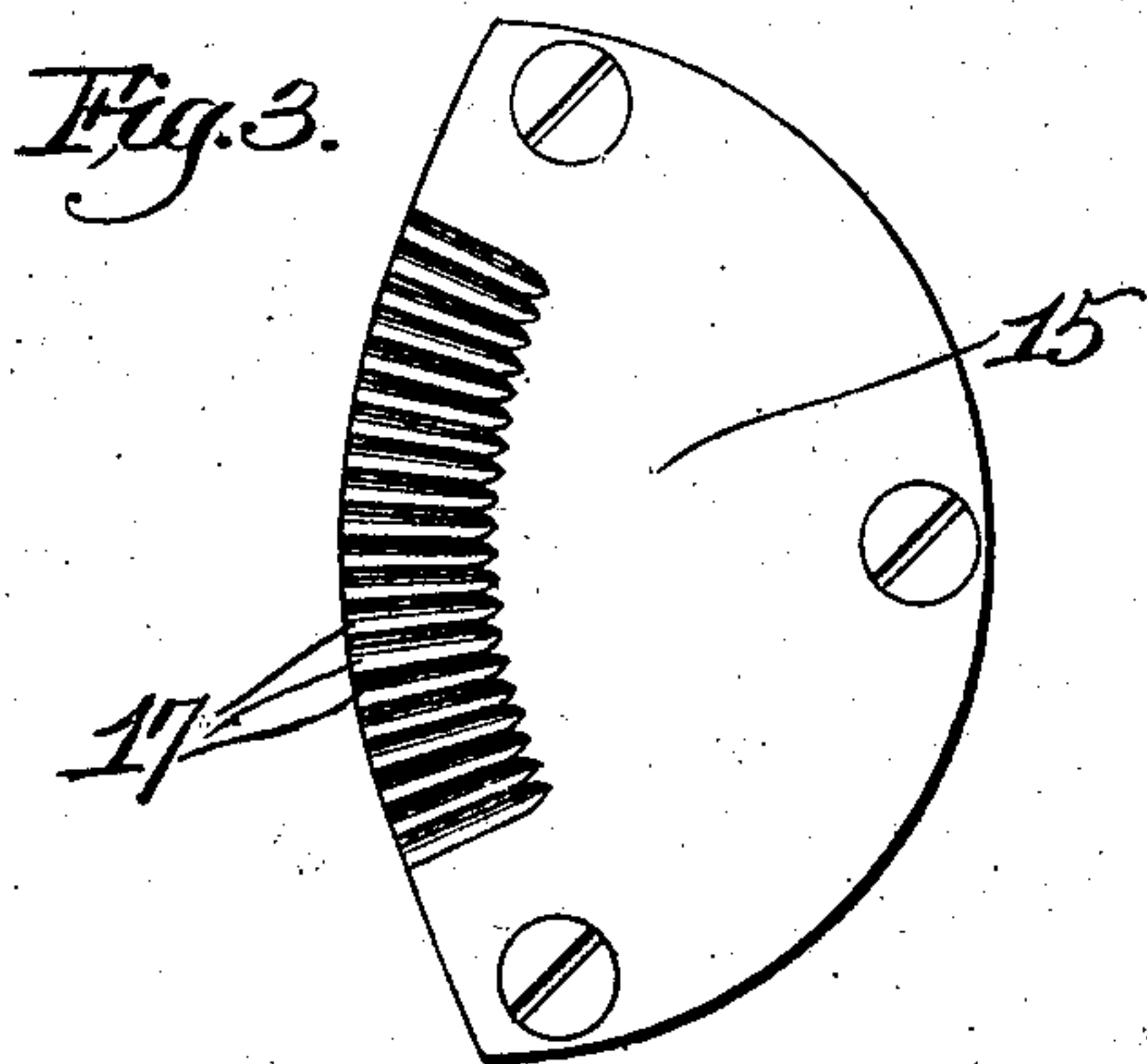
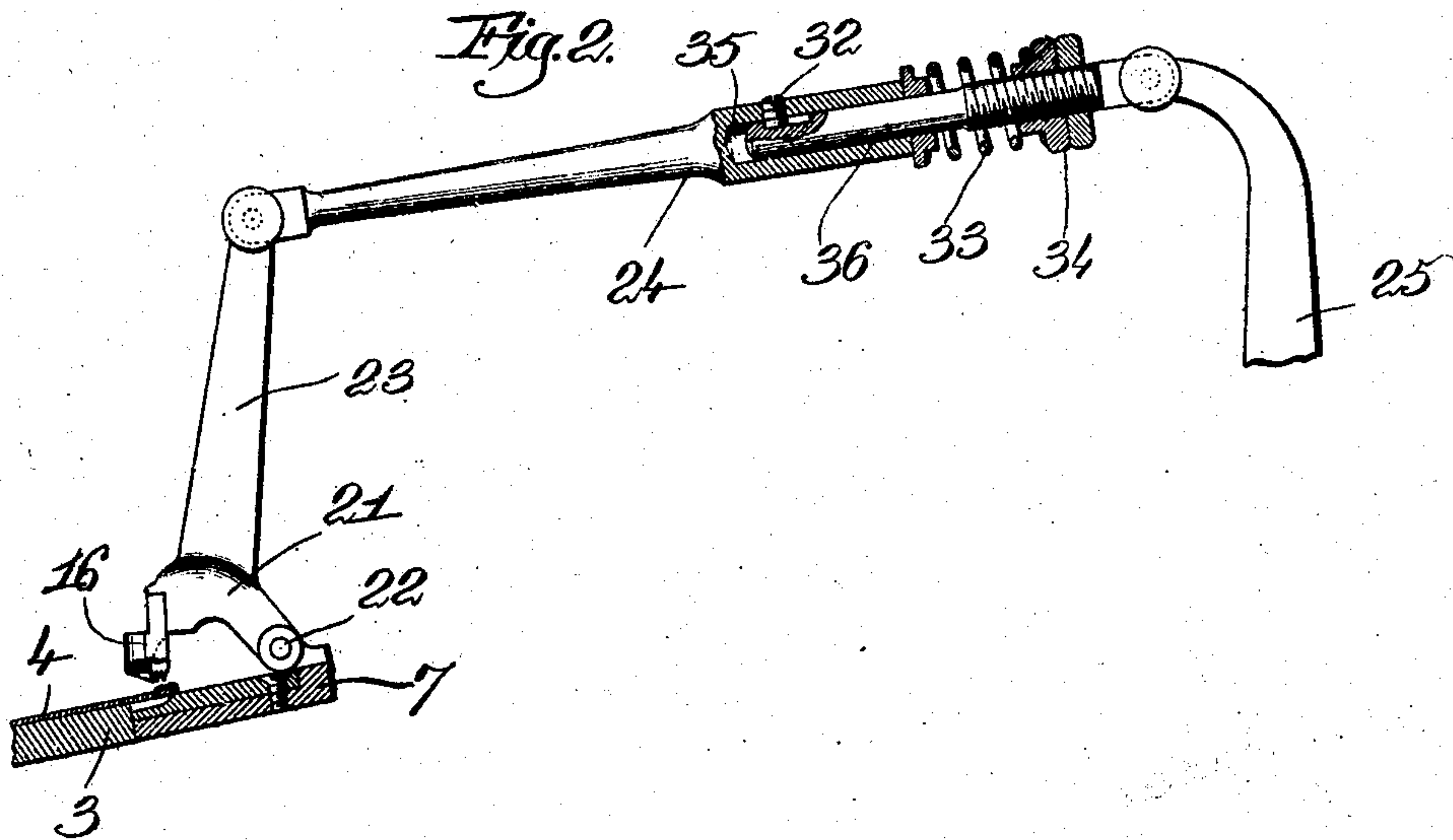
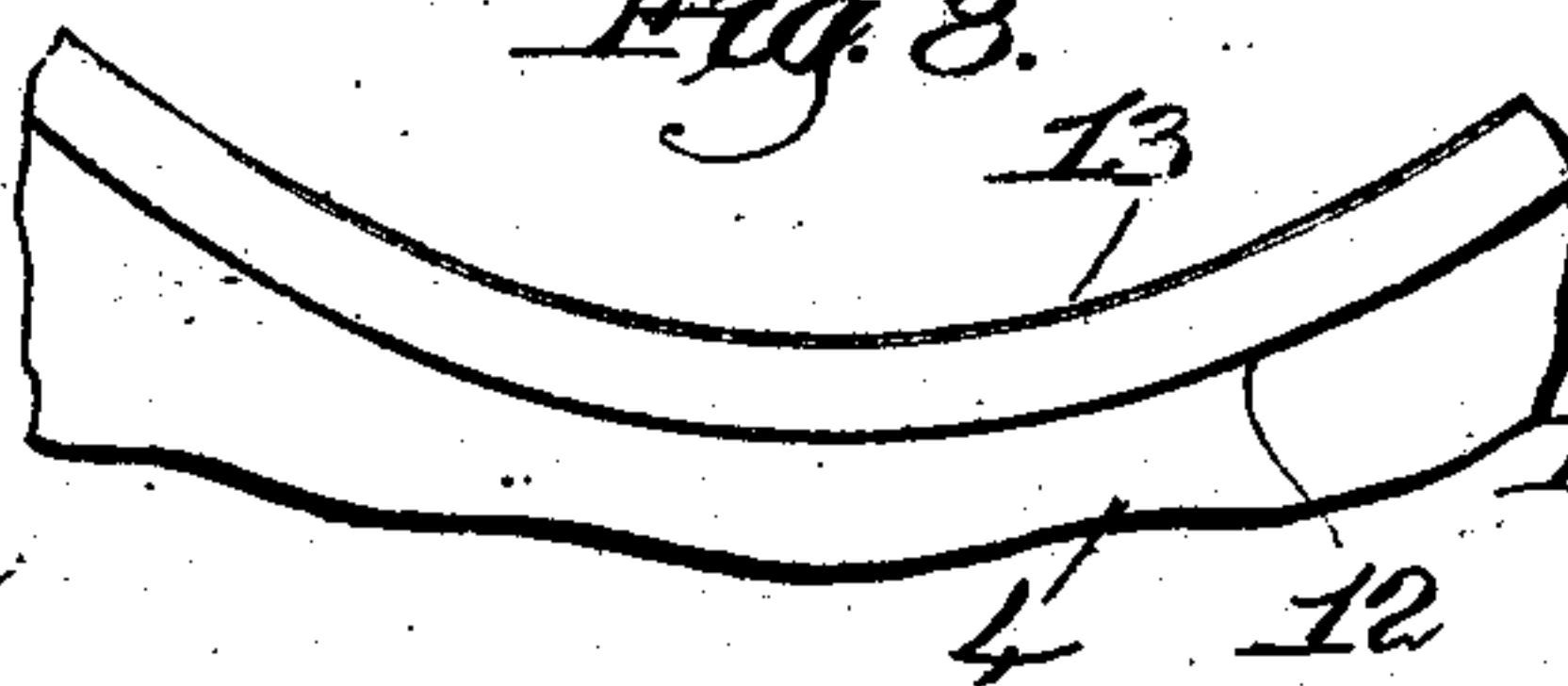


Fig. 6.



Fig. 8.



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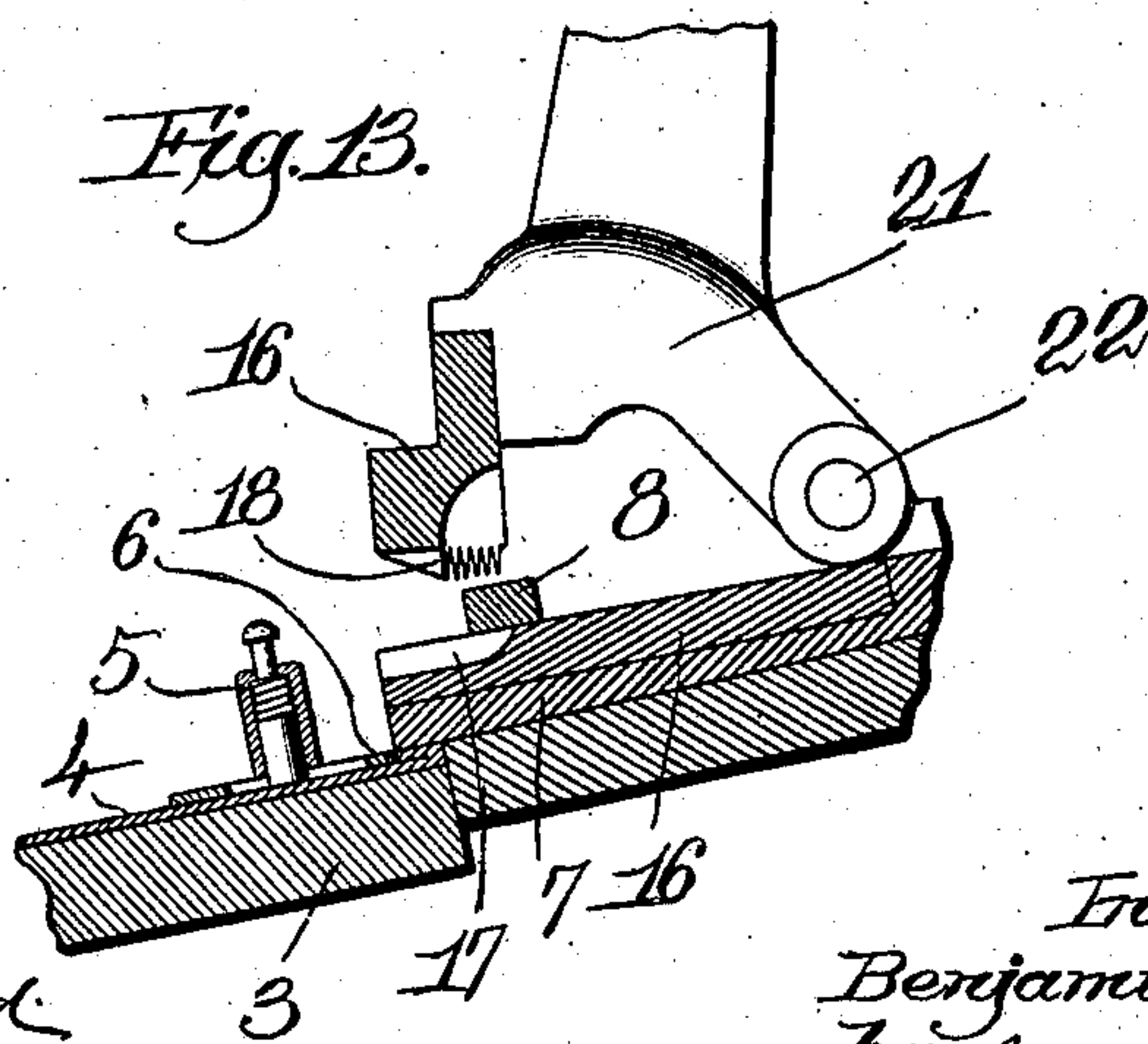
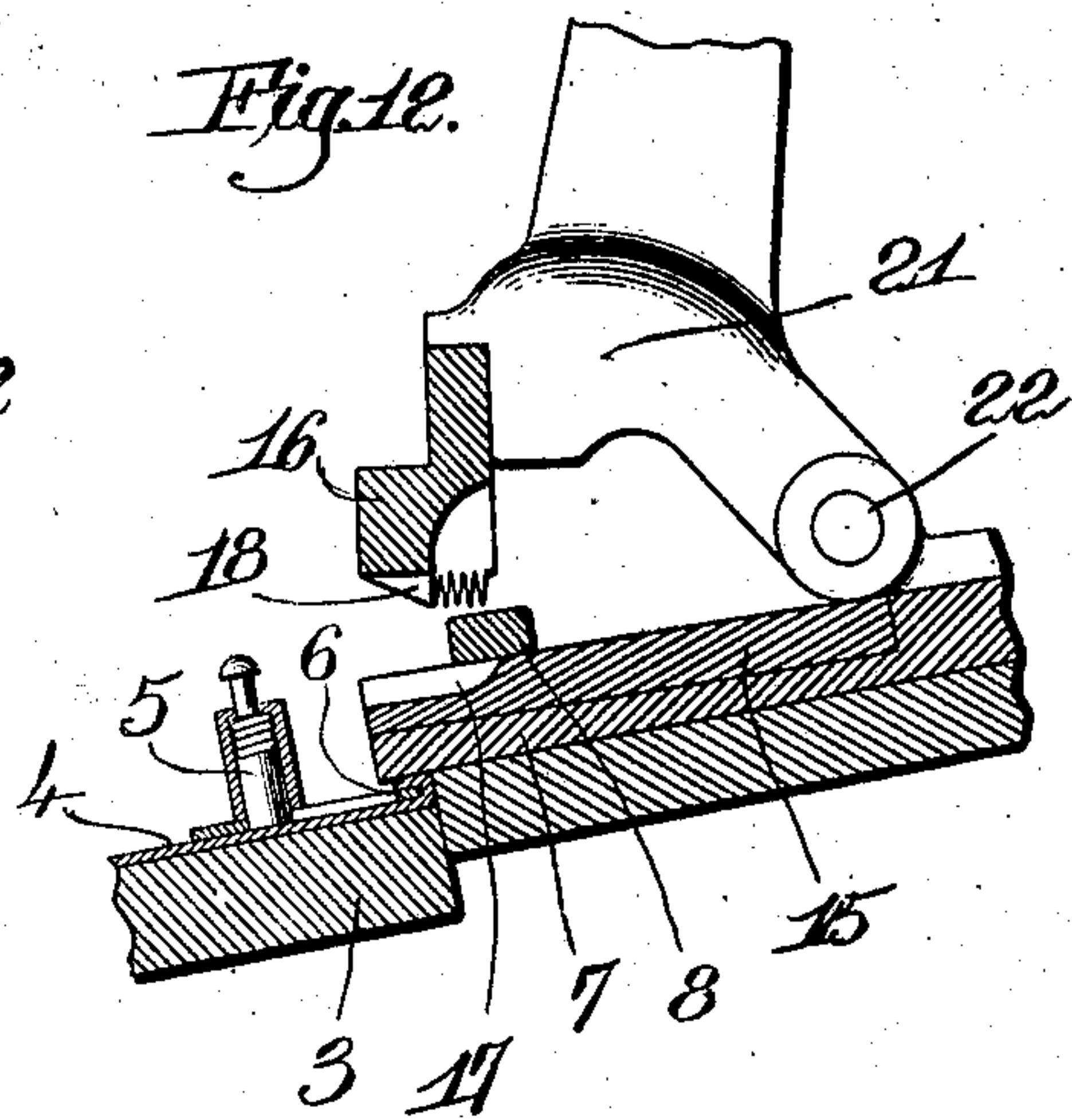
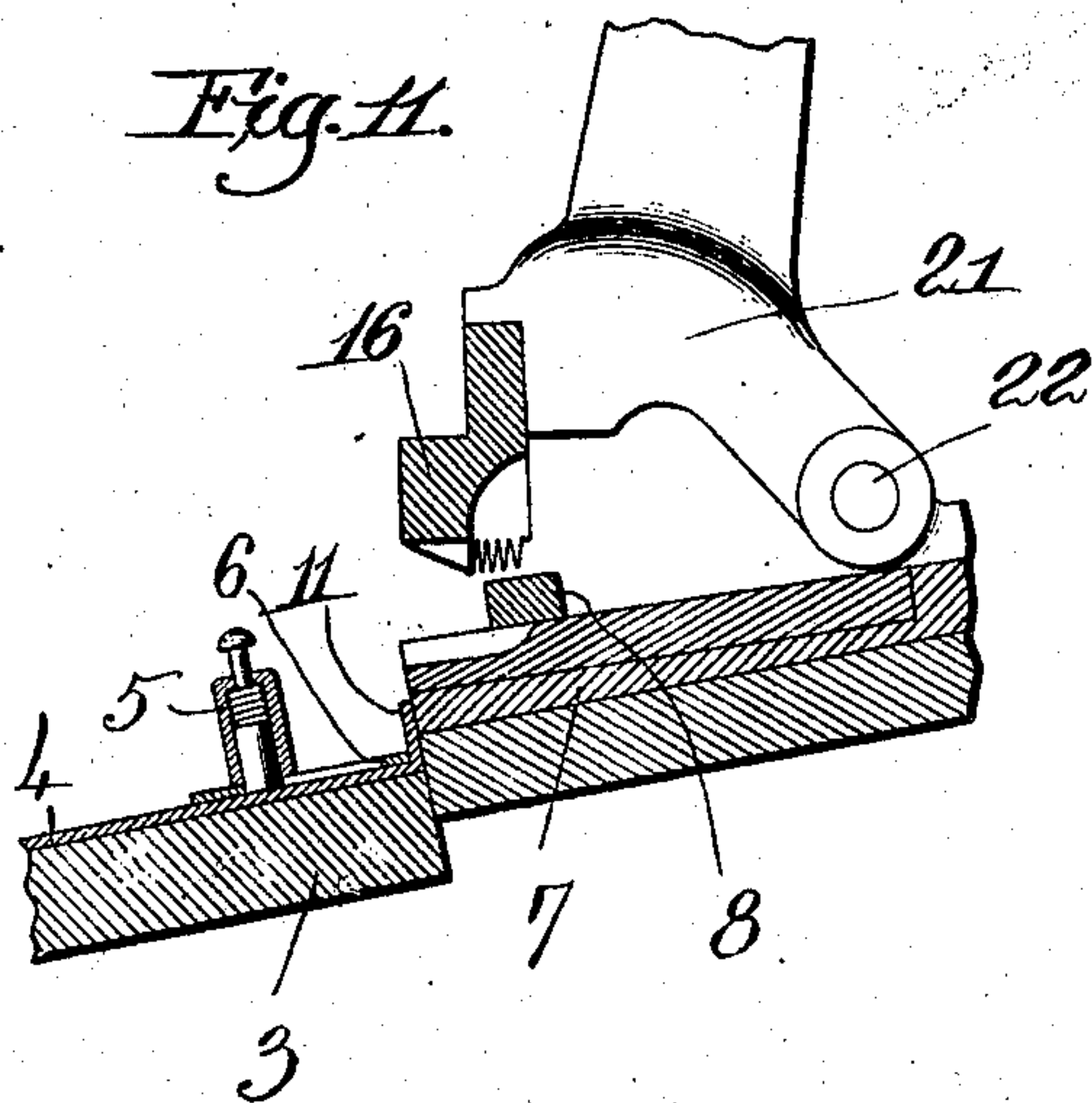
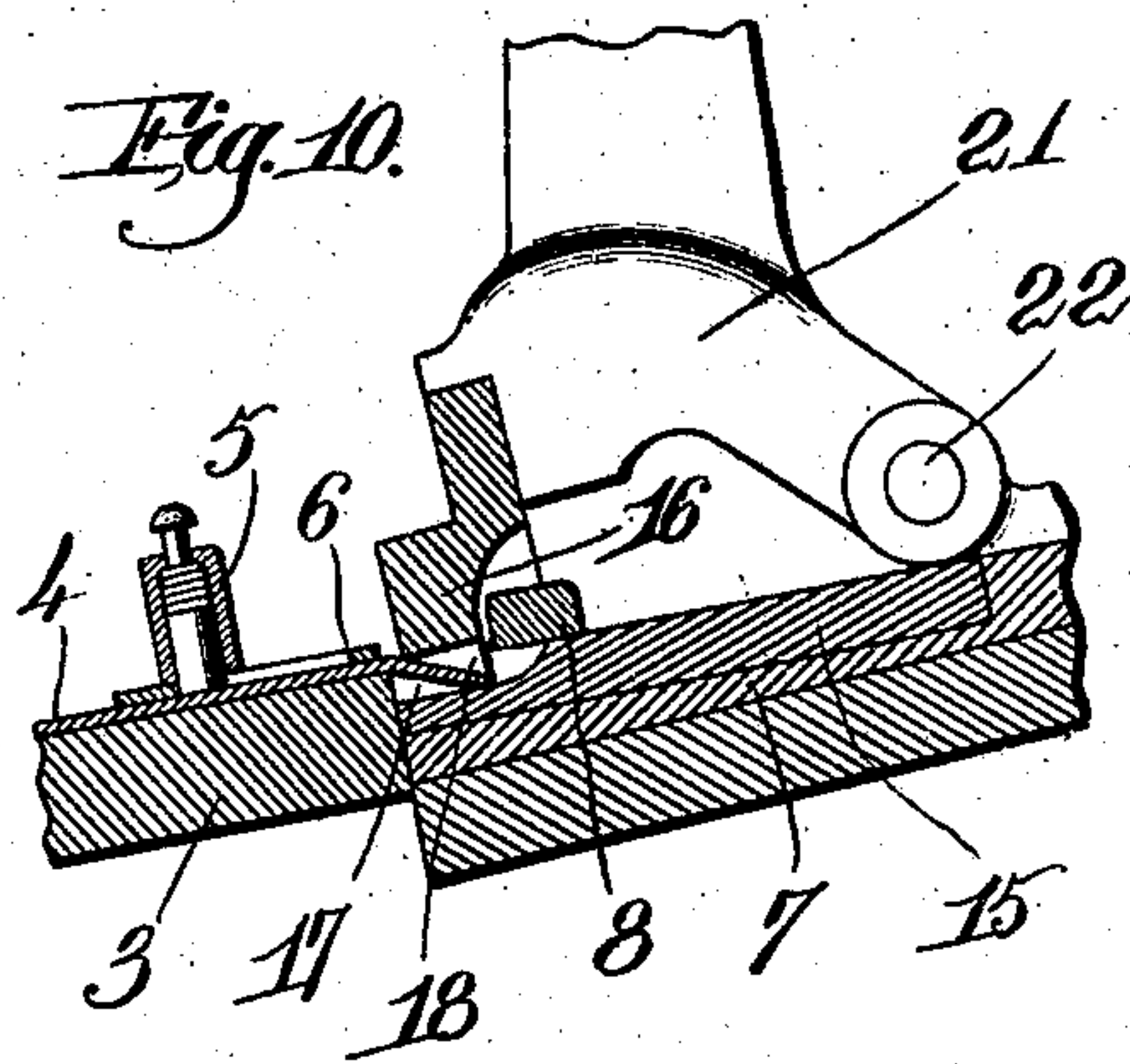
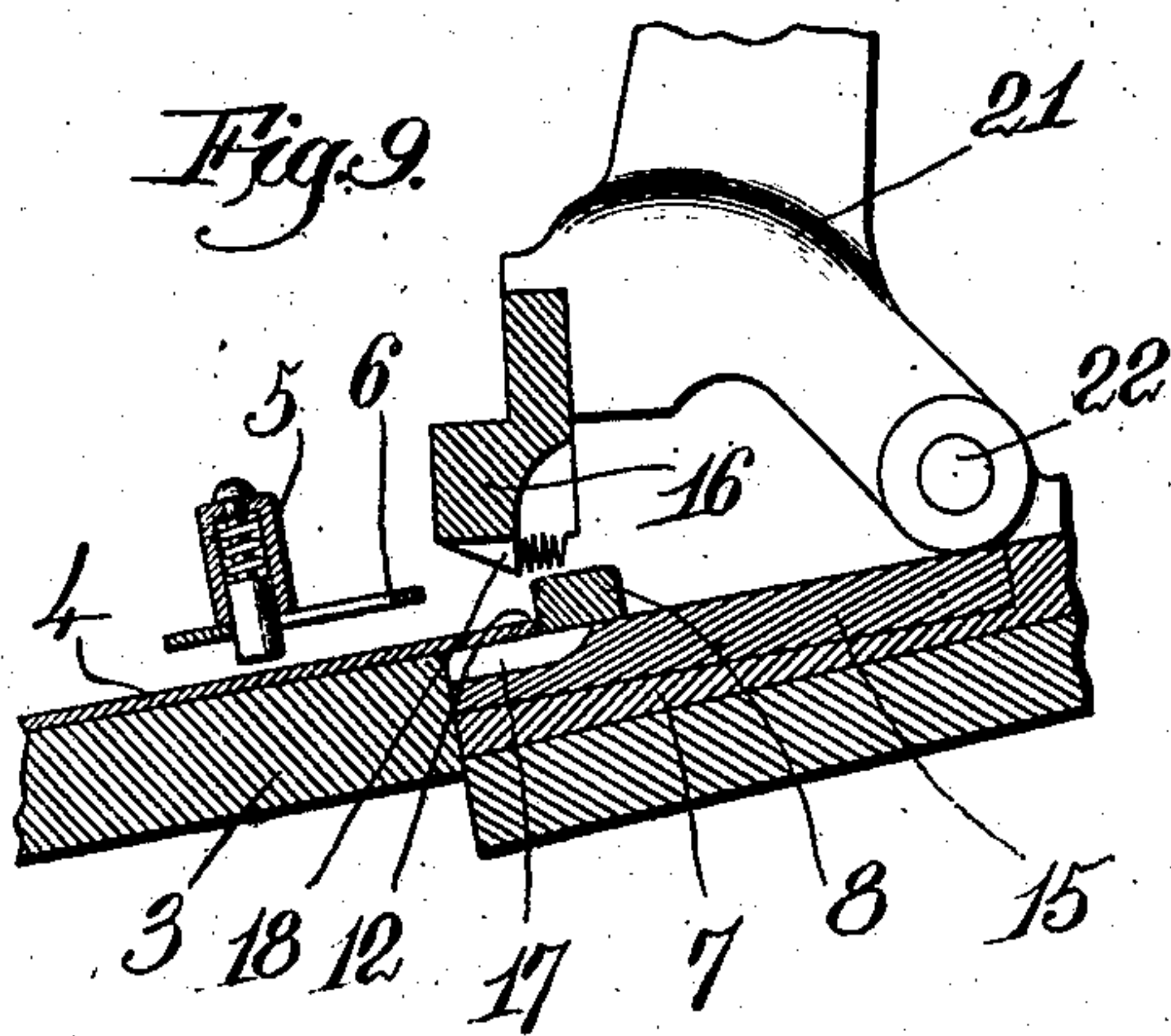
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No. 868,024.

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FOLDING MACHINE.
APPLICATION FILED MAR. 5, 1906.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

BENJAMIN A. SLOCUM, OF LYNN, MASSACHUSETTS, ASSIGNOR TO BOSTON MACHINE WORKS COMPANY, OF LYNN, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

FOLDING-MACHINE.

No. 868,024.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed March 5, 1906. Serial No. 304,222.

To all whom it may concern:

Be it known that I, BENJAMIN A. SLOCUM, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented an Improvement in Folding-Machines, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawings representing like parts.

This invention relates to folding machines, and particularly to machines of this class which are adapted to fold the curved edge portion of a piece of leather or other sheet material.

In the folding of incurved or concavely curved edges of sheet material, such for instance as the incurved edges of a shoe upper or vamp, it has been the practice to make a plurality of transverse or radial cuts or slits in the concavely curved edge portion of the material prior to the folding thereof, such cuts or slits usually extending inwardly from the edge to approximately the line of the fold. This slitting of the edge portion is done to permit said edge portion to spread out and lie in a smooth unwrinkled condition on the body of the material when the fold is made. One objection to thus slitting the edge portion prior to folding is that when the material is folded the line of fold is apt to assume straight lines between the cuts, and the folded edge instead of being a perfect curve is more or less angular.

I have found from practice that if instead of slitting the incurved edge portion prior to making the fold said edge portion is stretched properly a much better and more even fold can be made than where the edge portion is slitted. In accordance with my invention, therefore, I have embodied in a folding machine means to stretch the incurved edge portion of the material being folded prior to the folding operation.

In order to get a smooth and perfect fold I have so constructed my stretching device that the material is stretched the maximum amount on the outer edge and the minimum amount on the line of fold, the amount of stretch progressively increasing from the line of fold to the edge of the material.

I will first describe one embodiment of my invention and then point out the novel features thereof in the appended claims.

In the drawings, Figure 1 is a side view of a folding machine having my improved stretcher applied thereto; Fig. 2 is a detail view of the stretcher showing the means for operating it; Fig. 3 is a plan view of one of the elements of the stretcher; Fig. 4 is a bottom plan view of the other element; Fig. 5 shows a curved edge of a piece of material which is to be folded; Fig. 6 is an edge view of the material after being stretched preparatory to folding; Fig. 7 is an enlarged perspective view of the

stretched edge; Fig. 8 is a view showing the curved edge completely folded; Figs. 9 to 13 show different steps in the operation of stretching and folding an edge.

My invention may be embodied in folding machines of various types. I have herein shown it as embodied in a machine of the type shown in the patent to Booth *et al.* No. 695438, dated March 18, 1902, in which the material to be folded is supported on a table, and the folder moves transversely of the table. A folding machine of this type is illustrated and described in a pending application filed January 7, 1904, Serial No. 188,063, by Booth, Booth and Flynt, and the machine shown in the present drawings is a duplicate of that shown in the Booth, Booth and Flynt application so far as the folding elements are concerned. These folding elements comprise a table 3 on which the material to be folded rests, a holder 5 for clamping and holding the material on the table during the folding operation, said holder having an edge 6 which constitutes a former or creaser over which the fold is made, and a folder 7 which operates to fold the edge portion of the material about the creaser and afterwards to set the fold.

So far as the folding operation of this machine is concerned the material is first placed on the table 3, as shown in Fig. 9, with the edge thereof to be folded resting against the gage 8 which is carried by the folder. The holder 5 is then brought against the material and the folder 7 is then elevated, as shown in Fig. 11, thereby bending the edge portion 11 of the material up at right angles to the body thereof; the folder is then projected forwardly, as shown in Fig. 13, to fold the edge portion 11 about the former 6 and the former is then withdrawn and the folder depressed to set the fold, as shown in Fig. 13.

The means for operating the folder are or may be all as shown in said patent to Booth *et al.*, or in the application of Booth, Booth and Flynt, above referred to, and as they form no part of my present invention I do not regard it as necessary to specifically describe them.

My invention has special reference to folding the concavely curved or incurved edges of sheet material such for instance as the incurved edge shown in Fig. 5.

In accordance with my invention I employ in connection with the folder, above referred to, a stretching attachment for stretching the incurved edge portion of the material to be folded. For instance, in referring to Fig. 5, 12 designates the incurved edge of the material 4 to be folded. Assuming, for instance, that the dotted line 13 designates the line of fold, and that the edge portion between the line 13 and the edge 12 is to be folded back on the body of the material it will be obvious that in order to get a smooth fold without making transverse slits in said edge portion, the edge 12 will have to be elongated between the points *a* and *b*.

to equal the distance between the points *c* and *d* on the curved line 14, which line indicates the position the edge 12 will occupy after the fold is made. The portion of the material, however, along the line of fold 13 does not require to be stretched at all, and the material between the lines 12 and 13 must be stretched to a greater or less extent dependent upon the distance from the edge 12. Where the curved edge is stretched in this manner before folding the folding may be accomplished without drawing or wrinkling the material, and when folded the edge will have a smooth and even appearance, as shown in Fig. 8. The material may be thus stretched by any suitable means without departing from my invention. In the particular embodiment of the invention herein shown this stretching is accomplished by two corrugated members 15 and 16. The member 15 is shown as mounted on the folder 7, and the member 16 is mounted to be moved toward and from the fixed member 15.

The member 15 is shown as having a plurality of grooves or recesses 17 with intermediate ribs between the recesses, and said recesses are herein shown as being of a uniform depth throughout their extent.

The member 16 is provided with a plurality of ribs 18 adapted to enter the grooves 17, and the ribs are deeper at the inner edge than at the outer edge, each rib tapering both in depth and width to a point, as at 19.

In stretching the material the edge portion to be stretched is placed on the member 15 over the corrugated portion thereof, and the member 16 is then brought against the material, said member 16 being so positioned that the wide edge 20 of the ribs 18 will act on the edge of the material while the tapered pointed end 19 of said ribs will engage the material on substantially the line 13 of fold. When the two parts of the stretching device are forced together the outer edge 12 of the material is stretched to a maximum extent, as will be obvious, while the stretch will be progressively less toward the line of fold 13, the material on said line of fold not being stretched at all. The result will be that the edge when stretched will have the appearance shown in Fig. 7, the very edge 12 of the material being stretched a maximum amount, and an amount equal to the difference between the distances *a* and *b* and *c* and *d*.

When my invention is embodied in the folding machine, such as described, I preferably mount both elements of the stretching device upon the folder 7, the element 15 being rigidly secured to the folder, and the element 16 being pivotally secured thereto. As herein shown the element 16 is mounted on a head 21 which is pivoted to the folder 7, as at 22, and is provided with an arm 23 to which is pivoted a connection 24 by means of which the stretching device is operated. This connection 24 is shown as pivoted at one end to a rocking member 25, suitably pivoted to the frame 26 of the machine, as at 27. One arm of said rocking member is adapted to be acted on by a reciprocating pin 28 which moves up and down in a standard 29 and is acted upon at suitable intervals by a cam 30 carried by the cam-shaft 31. Whenever the cam 30 acts on the pin 28 the head 21 is rocked, as will be obvious, to cause the ribs 18 of one stretching element to enter the grooves 17 of the other stretching element. The mechanism for operating the cam 30 is so timed as to cause this

operation to take place at the appropriate time in the cycle of the folding operation.

Referring now to Figs. 9 to 13 it will be seen that normally the movable element 16 of the stretching device is elevated to permit the material 4 to be placed in position on the folding machine with the edge 12 thereof against the gage 8. The holder 5 is then brought against the material 4, as shown in Fig. 10, and immediately thereafter the head 21 is rocked by suitable mechanism, thereby to bring the two elements of the stretching device together, this movement causing the ribs 18 to enter the grooves 17, as shown in Fig. 10. This results in stretching a portion of the material 4 adjacent the edge 12, as shown in Fig. 7, the material being stretched the greatest extent directly at the edge 12, and a minimum extent along the folding line 13, the amount of stretch varying between these points according to the distance from either. The head 21 is then elevated, as shown in Fig. 11, and thereafter the folder 10 is also elevated, as shown in said figure, and then moved forwardly, as shown in Fig. 12, thereby curving the stretched edge portion of the material over the former 6. The former is then withdrawn by a suitable mechanism, all as shown in said patent and application and the fold of the material is set by the folder, as shown in Fig. 13. A perfectly smooth and even fold can be made on the curved edge by the mechanism above described without the necessity of slitting said edge as has been done commonly heretofore. In fact the fold which results from first stretching and then folding the edge is more even and less angular than the fold which results from first slitting and then folding the edge, because when the edge is slitted the line of fold between adjacent slits is apt to be straight rather than curved, thus giving to the completed edge more or less of an angular appearance.

In order to provide a yielding connection between the movable stretching element and the cam for operating it I have shown the connection 24 as an elastic one. As herein shown it is made in two sections, one of which has the socket 35 into which the other section 36 telescopes, said sections being guided in their movements relative to each other by a screw or projection 32. The section 36 has thereon an adjustable collar 34, and interposed between said collar and the other section 24 is a spring 33. This spring will give when the two parts of the stretcher are closed together, and will thus prevent the stretcher from tearing or injuring the material being stretched.

Although I have illustrated my invention herein as applied to the type of folding machine shown in the Booth *et al* patent it will be obvious that my invention may be used in connection with other types of folding machines, such for instance as shown in the patent to Dunn, No. 651,797, dated June 12, 1901, or Hayward, No. 649,931, May 22, 1900, or Williams No. 513,852, January 30, 1894. I desire, therefore, to claim this stretching feature broadly irrespective of the particular folding mechanism used in conjunction therewith.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a folding machine, folding mechanism to fold the edge portion of the work over on to the body thereof, and means to stretch said edge portion of the work prior to the folding operation.

2. In a folding machine, folding mechanism, and means to stretch at one operation an extended part of the edge portion of the material to be folded between the line of fold and the edge thereof whereby said edge is elongated.
- 5 3. In a folding machine, folding mechanism, and means to stretch the edge portion of the material to be folded between the line of fold and the edge thereof a varying amount dependent upon the distance from said line and the edge.
- 10 4. In a folding machine, folding mechanism, and means to stretch the material to be folded between the line of fold and the edge of the material with a progressively increasing amount from said line to the edge.
- 15 5. In a folding machine, folding mechanism, and means to stretch the edge portion of the material to be folded in the direction of said edge, said means comprising two corrugated members, and means to move one member relative to the other.
- 20 6. In a folding machine, folding mechanism for folding a concavely curved edge portion of material over on to the body thereof, combined with means to act on and stretch said concaved edge portion prior to the folding operation.
- 25 7. In a folding machine, folding mechanism to fold a concavely curved edge portion of material, combined with means to stretch at one operation an extended part of said concavely curved edge portion between the concave edge and the line of fold.
- 30 8. In a machine for folding the concavely curved edge portion of sheet material, the combination with means to stretch at one operation such concavely curved edge portion between the concaved edge thereof and the line of the fold with means to fold such stretched edge portion.
- 35 9. In a machine for folding the concavely curved edge portion of sheet material, the combination with means to stretch such edge portion between the line of fold and the concaved edge of the material a progressively increasing amount from said line to the edge, of means to fold such stretched edge portion onto the body of the material.
- 40 10. In a machine for folding the concavely curved edge portion of sheet material, folding mechanism combined with means to stretch such concavely curved edge portion between the line of fold and the concaved edge with a progressively increasing amount from said line to the edge and prior to the folding operation.
- 45 11. In a machine for folding the concavely curved edge portion of sheet material, the combination of means to elongate the concavely curved edge to substantially the length of the curved line occupied by said edge after the fold is made, and means to fold the edge portion of the material having the elongated edge.
- 50 12. In a machine of the class described, the combination with means to stretch the concavely curved edge portion of the material thereby to elongate the concavely curved edge to substantially the length of the curved line occupied by said edge after the material is folded, of means to fold such stretched edge portion.
- 55 13. A folding machine having in combination folding mechanism to fold the edge portion of the work back onto the body of the work, and means to stretch said edge portion between the line of fold and the edge of the material prior to the folding operation.
- 60 14. A folding machine having in combination folding mechanism to fold the edge portion of the material back onto the body of the material, and means to stretch the edge portion thus folded between the line of fold and the edge of material with a progressively increasing amount from said line to the edge and prior to the folding operation.
- 65 15. In a folding machine, folding mechanism, and means to stretch the edge portion of the material to be folded, said means comprising two members one having grooves or corrugations of uniform depth, and the other having ribs of varying depth.
- 70 16. In a folding machine, folding mechanism, and means to stretch the edge portion of the material to be folded, said means comprising two members one having grooves or corrugations of uniform depth and the other having tapering substantially V-shaped ribs.
- 75 17. In a folding machine, folding mechanism and means to stretch the edge portion of the material to be folded, said means comprising two members one having grooves or corrugations of uniform depth, and the other having ribs tapering in the direction of their length.
- 80 18. In a folding machine, folding mechanism, and means to stretch the edge portion of the material to be folded, said means comprising two members, one having grooves or corrugations of uniform depth and the other having ribs each varying in depth from one end to the other and tapering in the direction of its length.
- 90 19. In a machine of the class described, a folder, a movable stretching member, means for moving the stretcher toward the folder to stretch the edge portion of the work and then away from the folder, and means for moving the folder across the path of the stretcher for folding the work.
- 95 20. In a machine of the class described, a folder, a movable stretching element to be moved toward the folder to stretch the work and then to be moved away from the work, and means for moving the folder first in the path of the stretching element and then laterally across said path for folding the work.
- 100 21. In a machine of the class described, a work-supporting table, means for holding the work on the table in one position during the entire operation of the machine, means for stretching a concavely curved edge portion of the work, and means for folding subsequently the stretched edge portion of the work onto the body of the work.
- 105 22. In a machine of the class described, a work-supporting table, means for holding the work on the table, means for stretching the edge portion of the work, and means for folding the edge portion of the work over said holding means and pressing the folded edge against the work.
- 110 23. In a machine of the class described, a work-supporting table, means for clamping the work upon the table, means for stretching an extended portion of the edge of the work, and means for folding said stretched edge over on the body of the work supported on the table.
- 115 24. In a folding machine, a table, a folder movable relatively thereto to fold the work, and means mounted on the folder to stretch the edge portion of the work.
- 120 25. In a machine of the class described, a work supporting table, a folder movable relatively thereto to make a fold, and means mounted on the folder to stretch the edge portion of the work, said means comprising two normally separated corrugated members, means to move one relative to the other, and means to move one toward the other prior to the folding operation.
- 125 26. In a machine of the class described, a folder, means to stretch at one operation an extended part of the edge portion of the work to be folded, said means comprising a movable stretching element, and means to move said stretching element independently of the folder.
- 130 27. A folding machine having in combination, a stretcher arranged to stretch the edge of the work, a folder arranged for movement to turn up said edge on both sides of the stretched portion to fold the edge over on the body of the work and to press the fold, and actuating mechanism for said parts.
- 135 28. A folding machine having in combination, a work supporting table having an upper face to support the body of the work, means for stretching at one operation an extended portion of the edge of the work, a folder arranged to fold said stretched edge over on the work supported on said upper face of the table, and actuating mechanism for said parts.
- 140 29. A folding machine having in combination, a work supporting table, a folder, stretching means, means for actuating the stretching means to stretch the edge portion of the work, and means for actuating the folder to fold at one operation an extended portion of the edge of the work on a line at the edge of the work supporting table and to press the fold against the body of the work supporting table.
- 145 30. A folding machine having in combination, a folder, stretching means comprising a movable member, means to move said movable member to stretch the edge portion of the work, means for causing the folder to fold at one operation the entire portion of said edge presented to the machine, and means for supporting the body of the work in one position during such operation.
- 150 150
- 155 155
- 160 160

31. In a folding machine, in combination, folding mechanism including a folder and actuating means therefor, a stretching member carried by the folder, and means for actuating said stretching member, said actuating means being arranged to permit said stretching member to be moved with relation thereto in the operation of the folder.
32. In a folding machine in combination, a movable stretching member and a combined folder and cooperating stretching member having provision for permitting the active face of the movable stretching member to pass below its work supporting face, means for actuating the movable stretching member, and means for moving the folder first perpendicularly to the work and then parallel therewith for folding the work.
33. A folding machine having in combination, a work supporting table, a combined folder, presser and stretching member, and another stretching member which cooperates with said combined folder, presser and stretching member to stretch the edge of the work.
34. A folding machine having in combination, a folder, a movable stretching member which cooperates with said folder to stretch the edge portion of the work, means for moving the stretching member independently of the folder, and means for actuating the folder to fold the edge of the work on both sides of the stretched portion and press the folded edge against the body of the work.
35. A folding machine having in combination, a folder, means to stretch the edge portion of the work before the folder begins to operate, means for causing the folder to fold the stretched edge portion of the work, and means for holding the body of the work in one position during said operations.
36. A folding machine having in combination, a stretching member, a folder provided with an upper face to support the edge of the work during the operation of the

stretching member, and means for actuating the folder first to lift the edge of the work and then to fold the edge over on the body of the work.

37. A folding machine having in combination, a former and a table arranged to hold the work between them, means for stretching the edge portion of the work, a folder to fold said edge portion over the former and press the folded edge against the body of the work, and actuating means for said parts.

38. A folding machine having in combination, a table for supporting the work, means for stretching the edge portion of the work, a folder arranged to fold at one operation the entire stretched edge portion of the work along a line which lies substantially within the plane of the body of the work, and actuating mechanism for said parts.

39. A folding machine having in combination, a work supporting table, means for holding the body of the work on said table, a folder, a stretching member, means for operating the stretching member to stretch the edge portion of the work before the folder begins to operate, and means for causing the folder to fold the edge of the work on both sides of said stretched portion concurrently.

40. A folding machine having in combination, means for stretching a concavely curved edge portion of the work, a folder arranged to fold at one operation the entire stretched concavely curved edge portion along a line which lies substantially within the plane of the body of the work, and actuating mechanism for said parts.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

BENJAMIN A. SLOCUM.

Witnesses:

H. I. ILLINGWORTH.

L. H. ATTWILL.