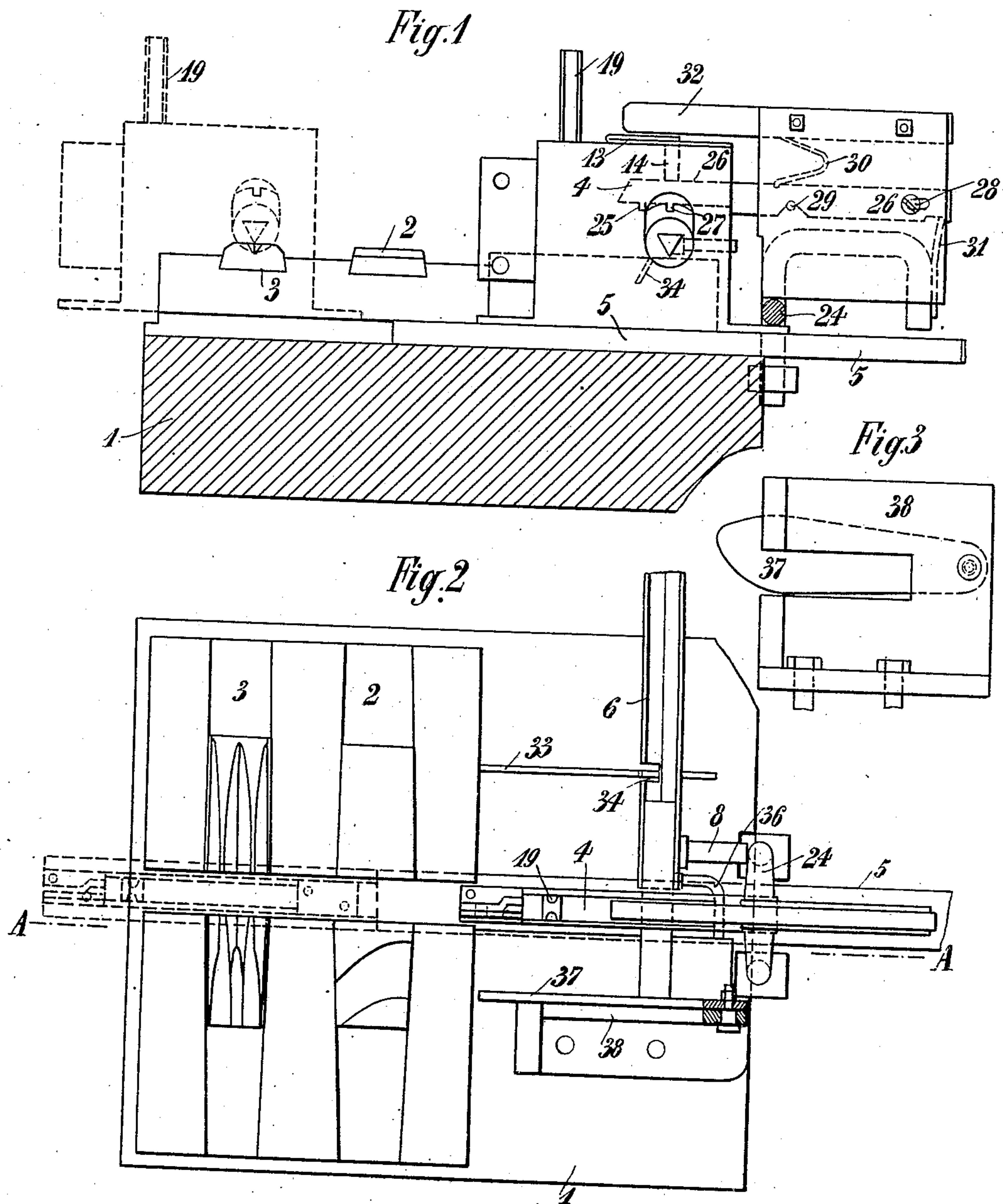


F. W. & E. WOLFF.
 FORGING MACHINE.
 APPLICATION FILED MAR. 29, 1907.

908,187.

Patented Dec. 29, 1908.

6 SHEETS—SHEET 1.



Witnesses:
Th. König
Sal. Rottschädel

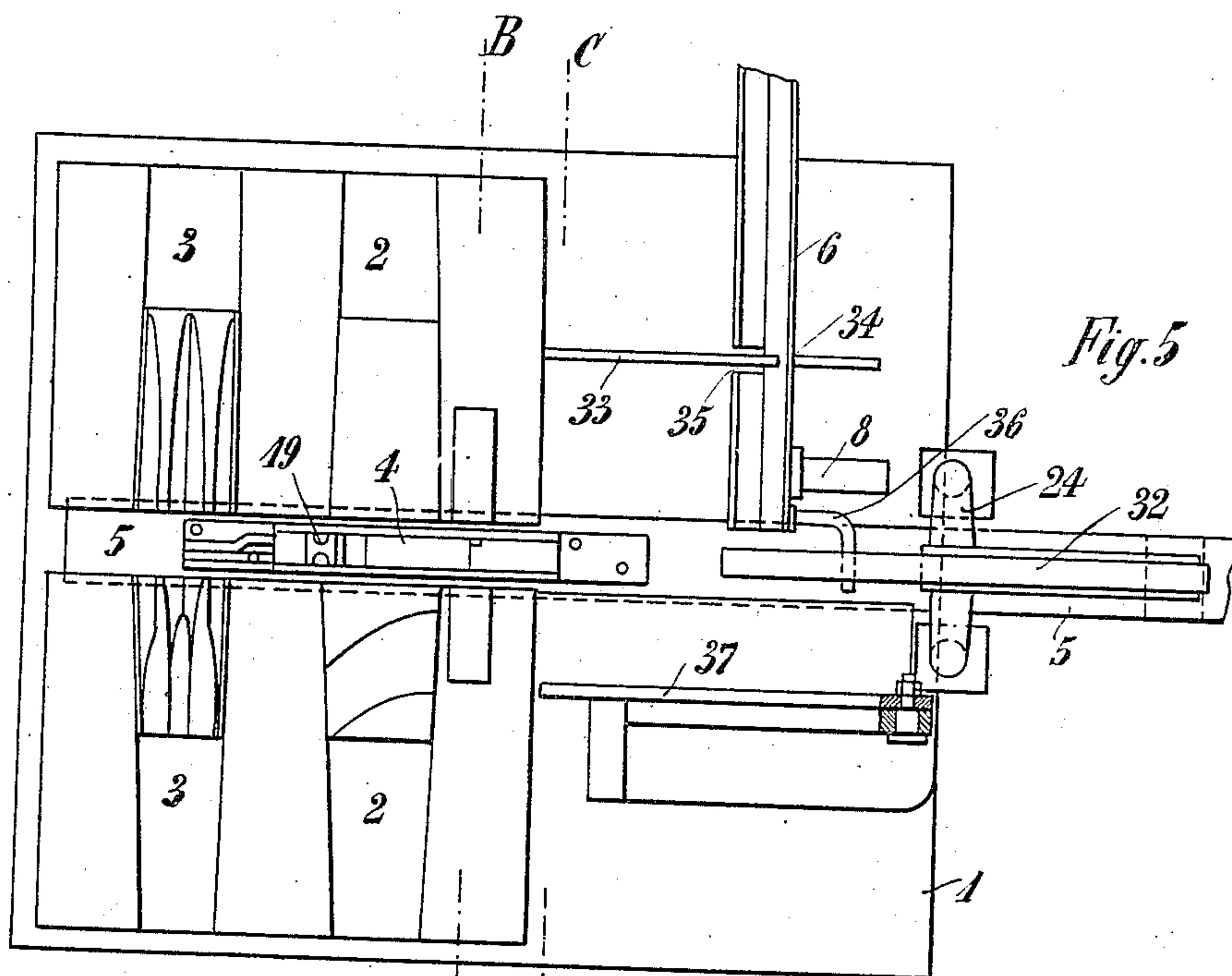
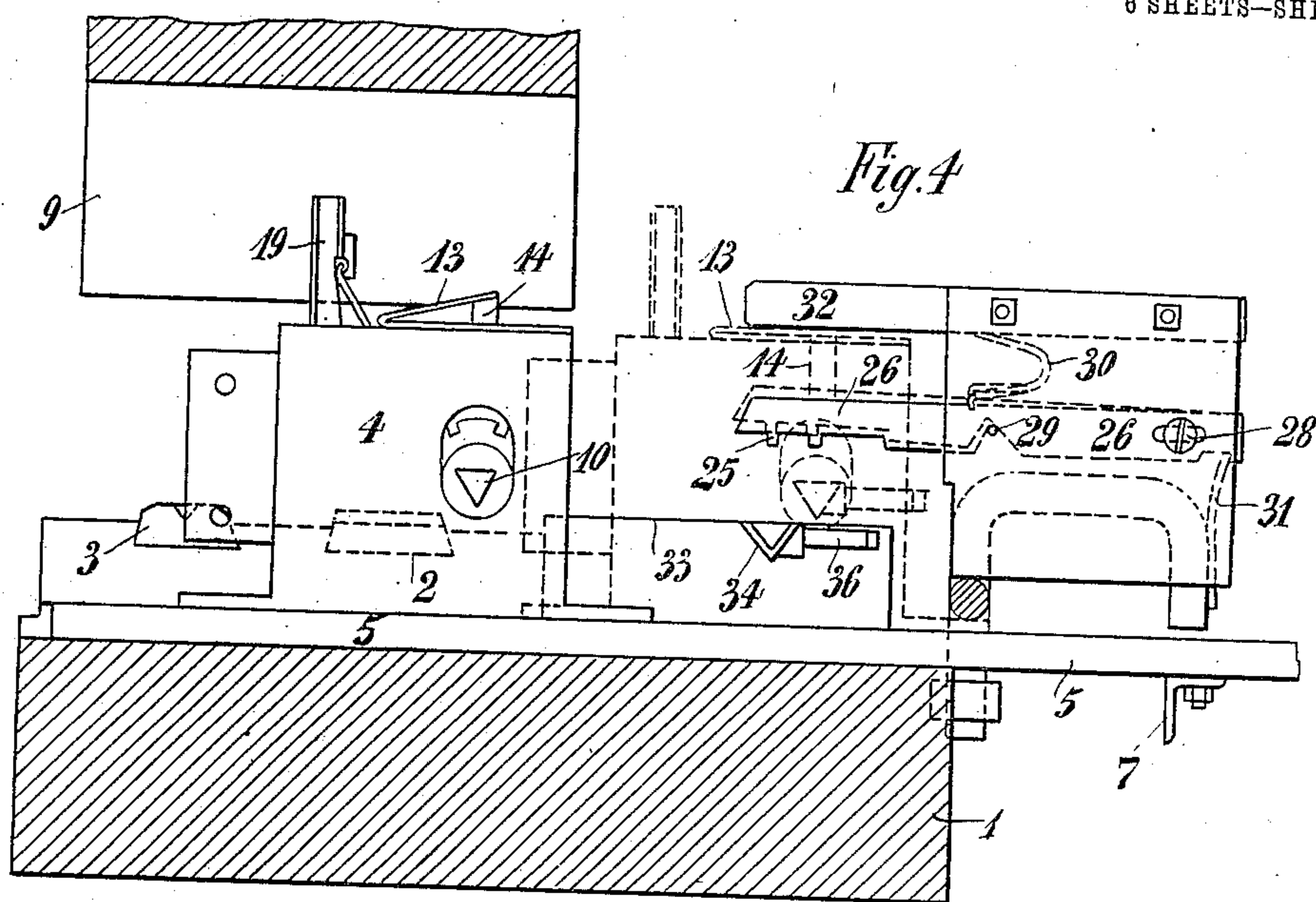
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6 SHEETS—SHEET 2



Witnesses:

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3 SHEETS—SHEET 3.

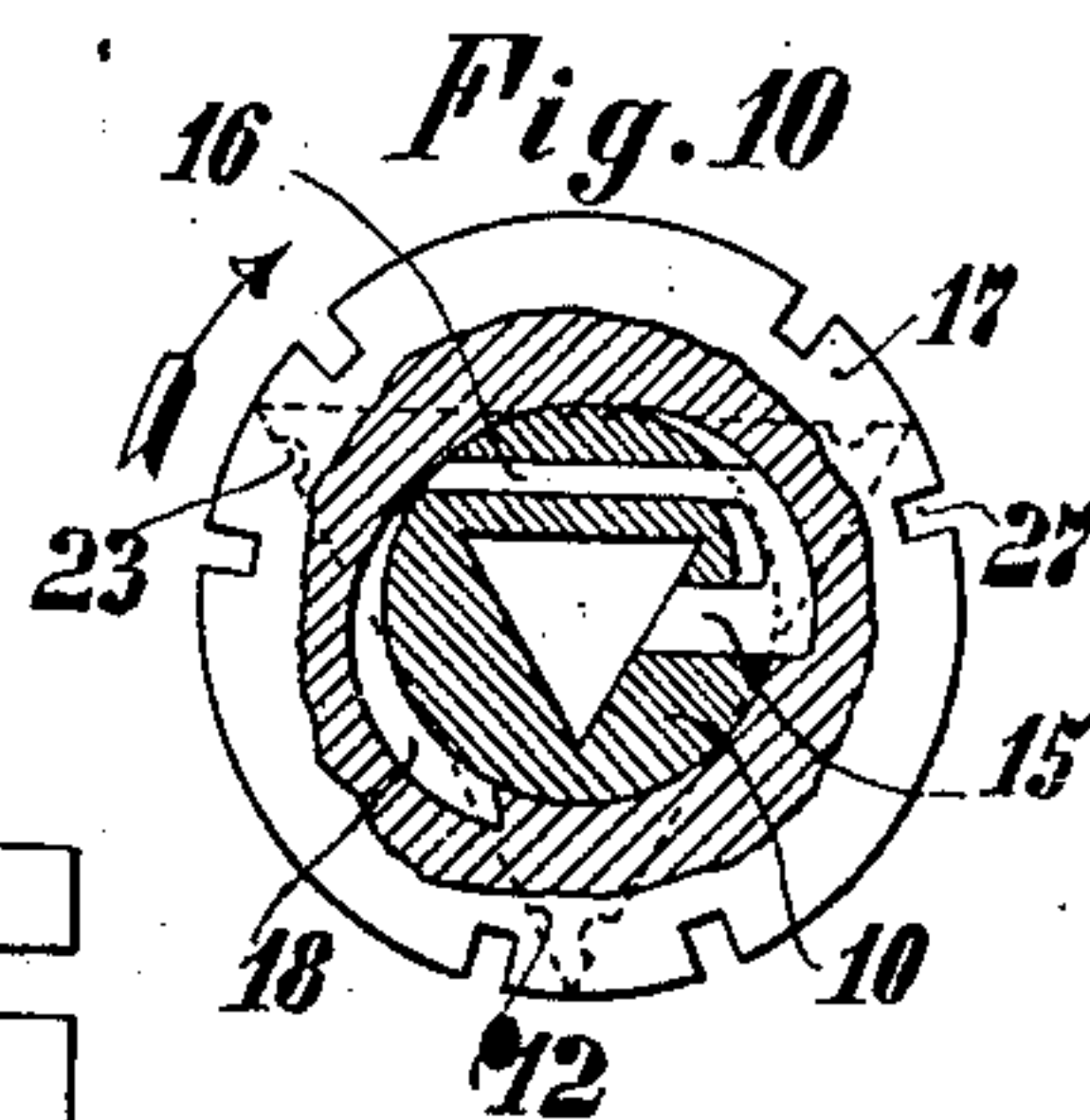
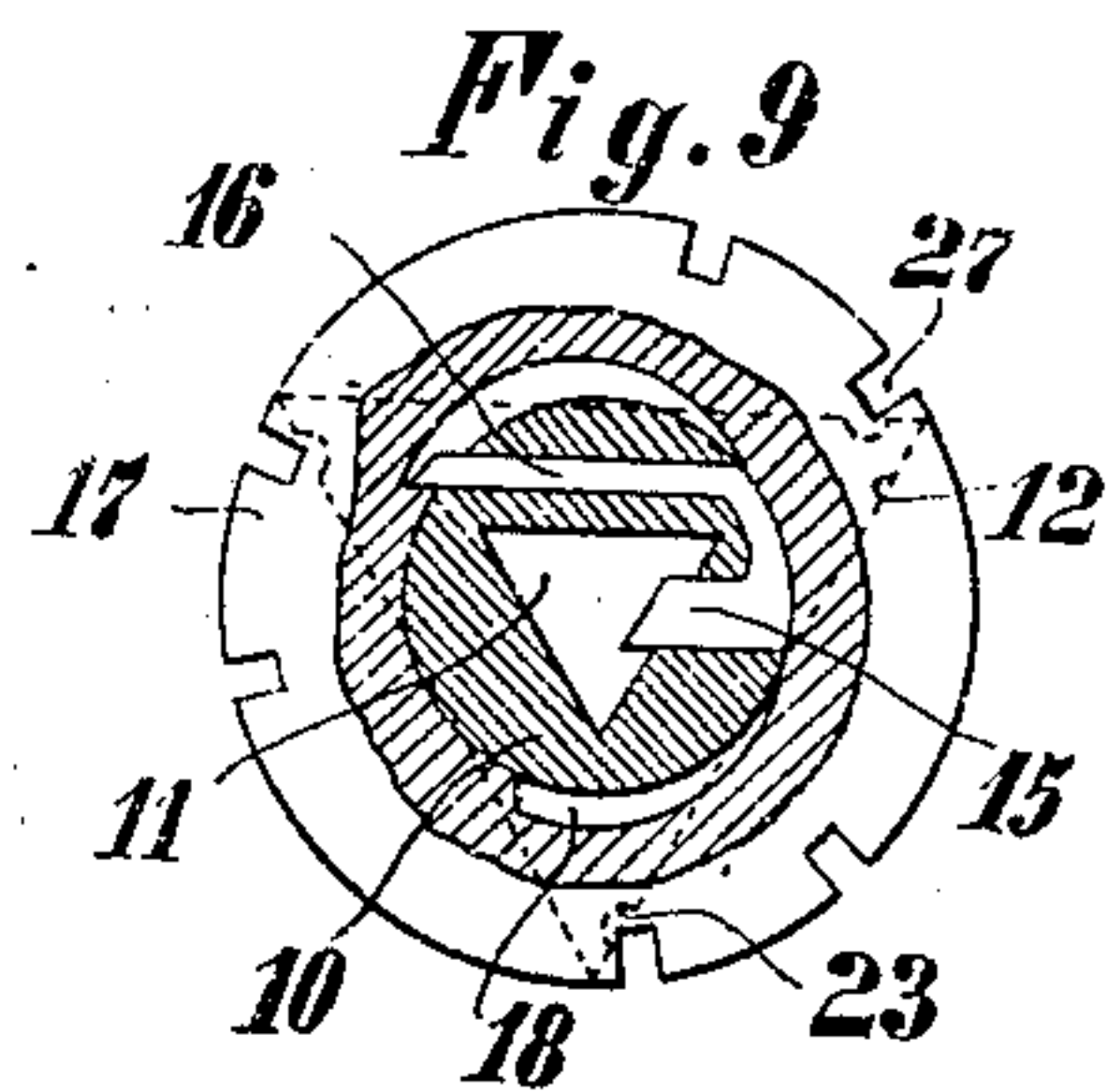
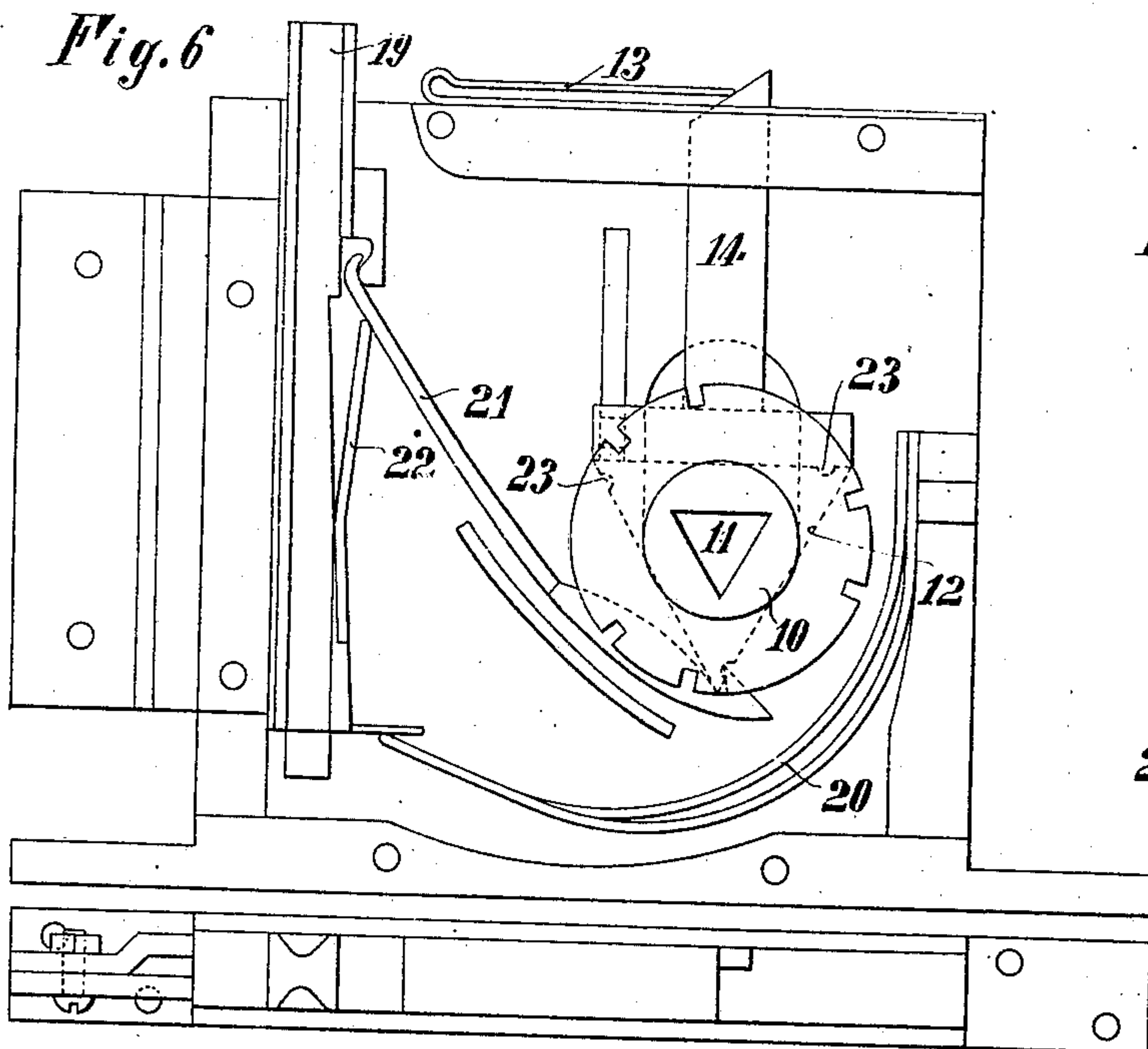


Fig. 7

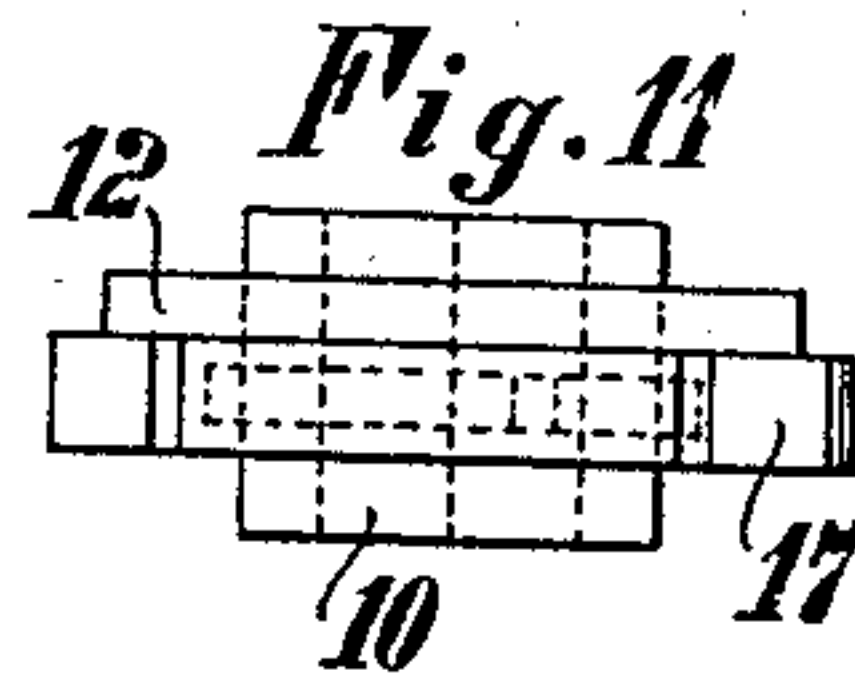
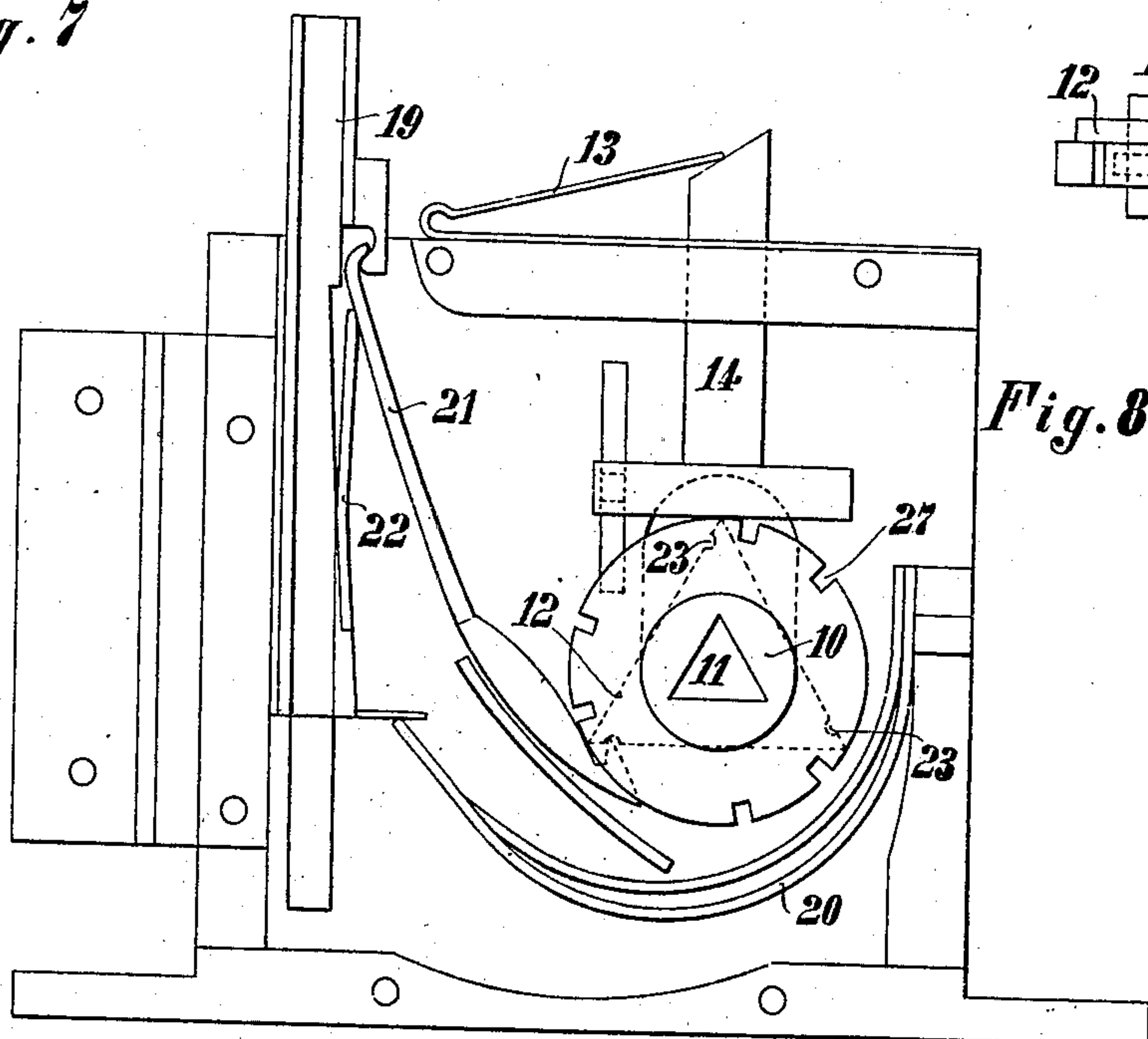


Fig. 8

Witnesses:

Richard C. Babcock.
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Patented Dec. 29, 1908

6 SHEETS—SHEET 4

Fig. 12

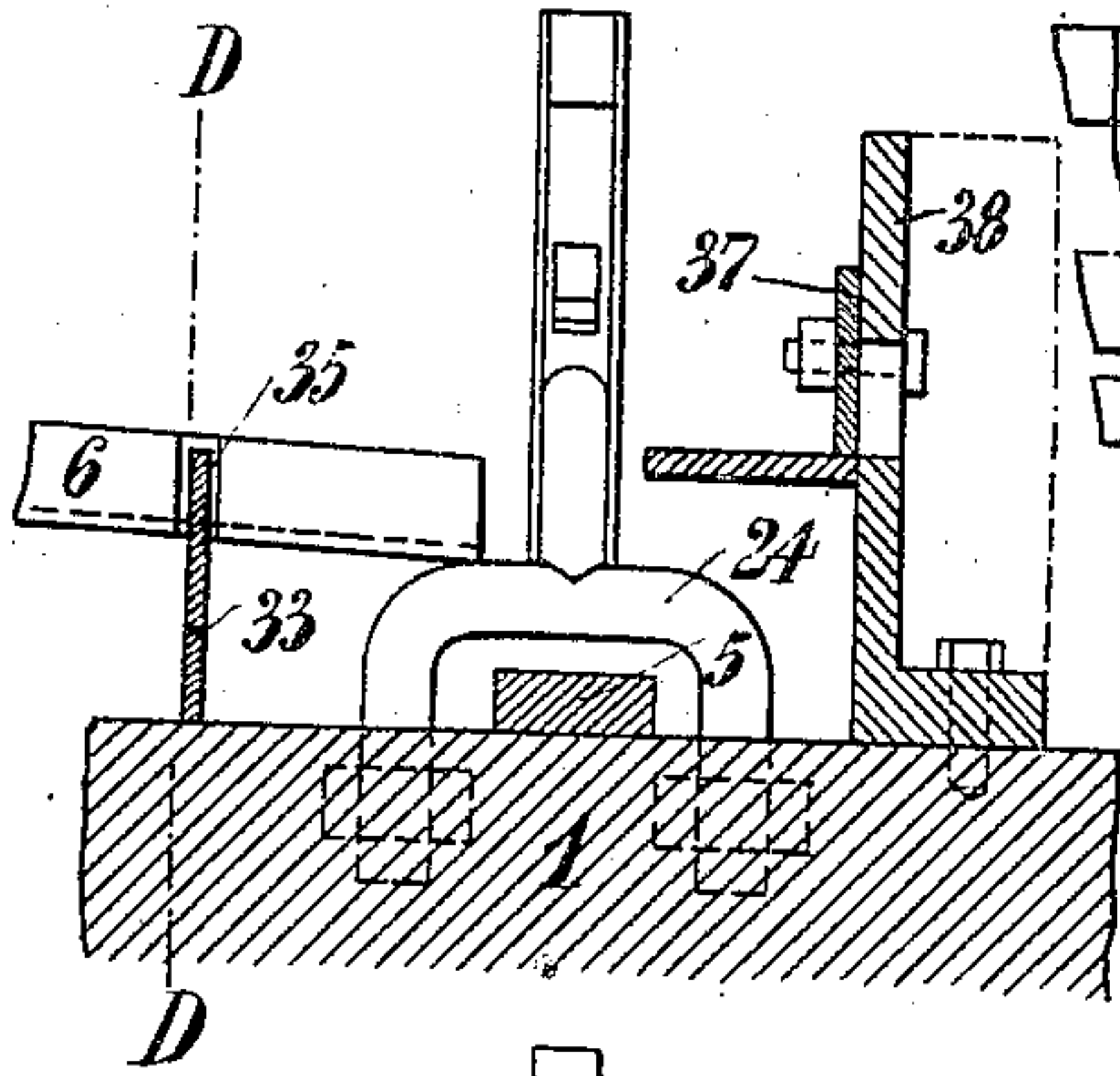


Fig. 13

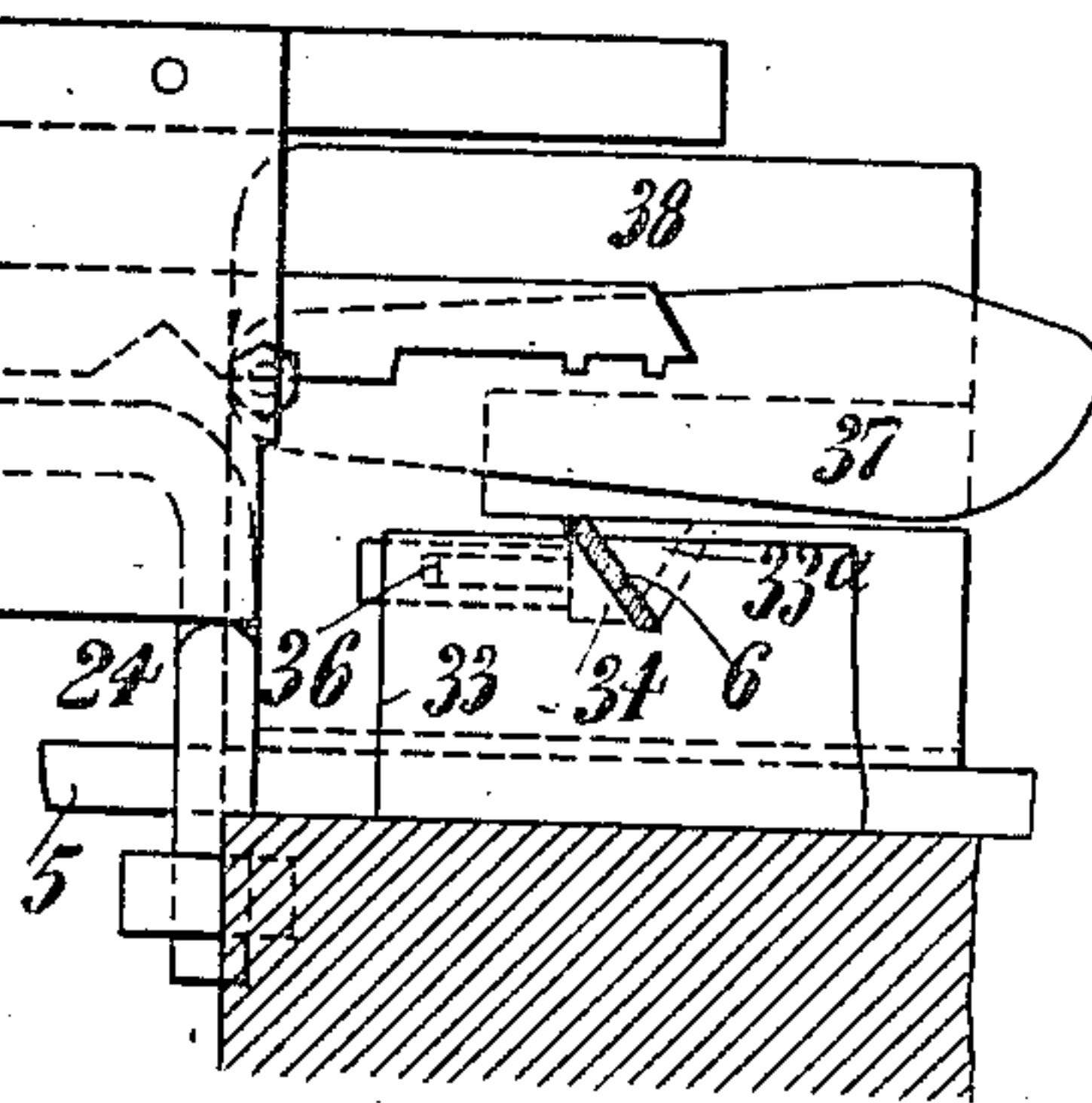


Fig. 14

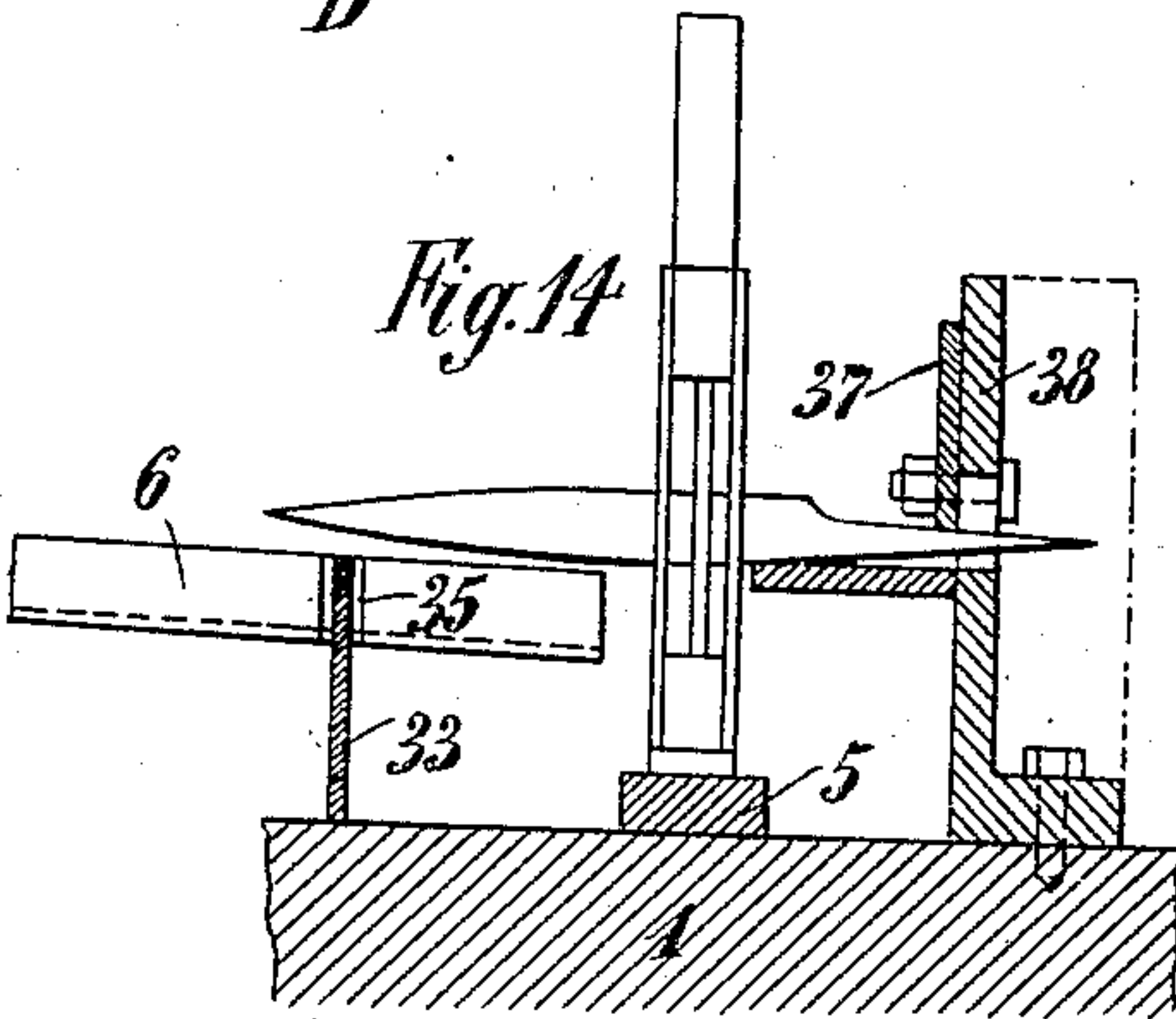


Fig. 15

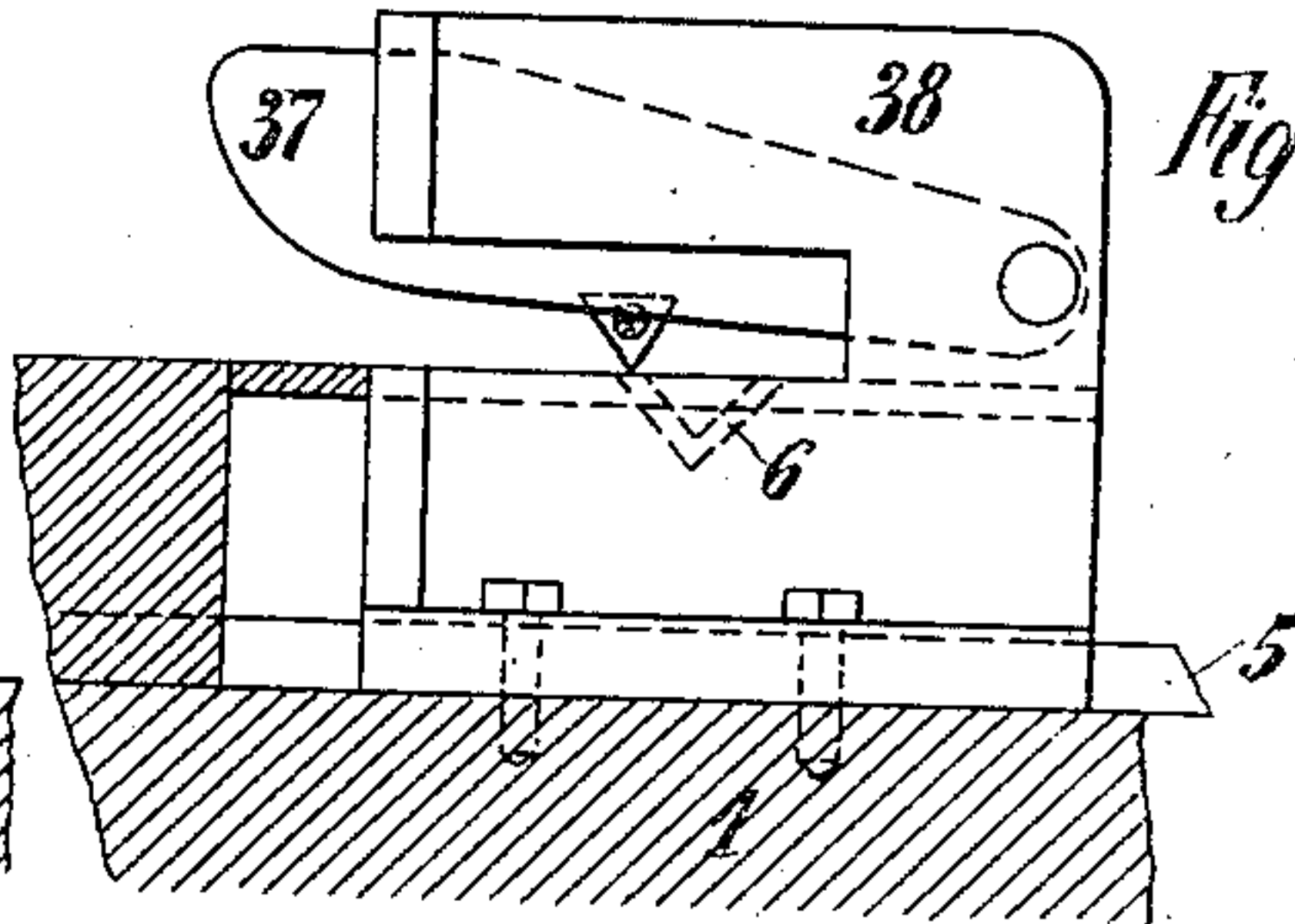
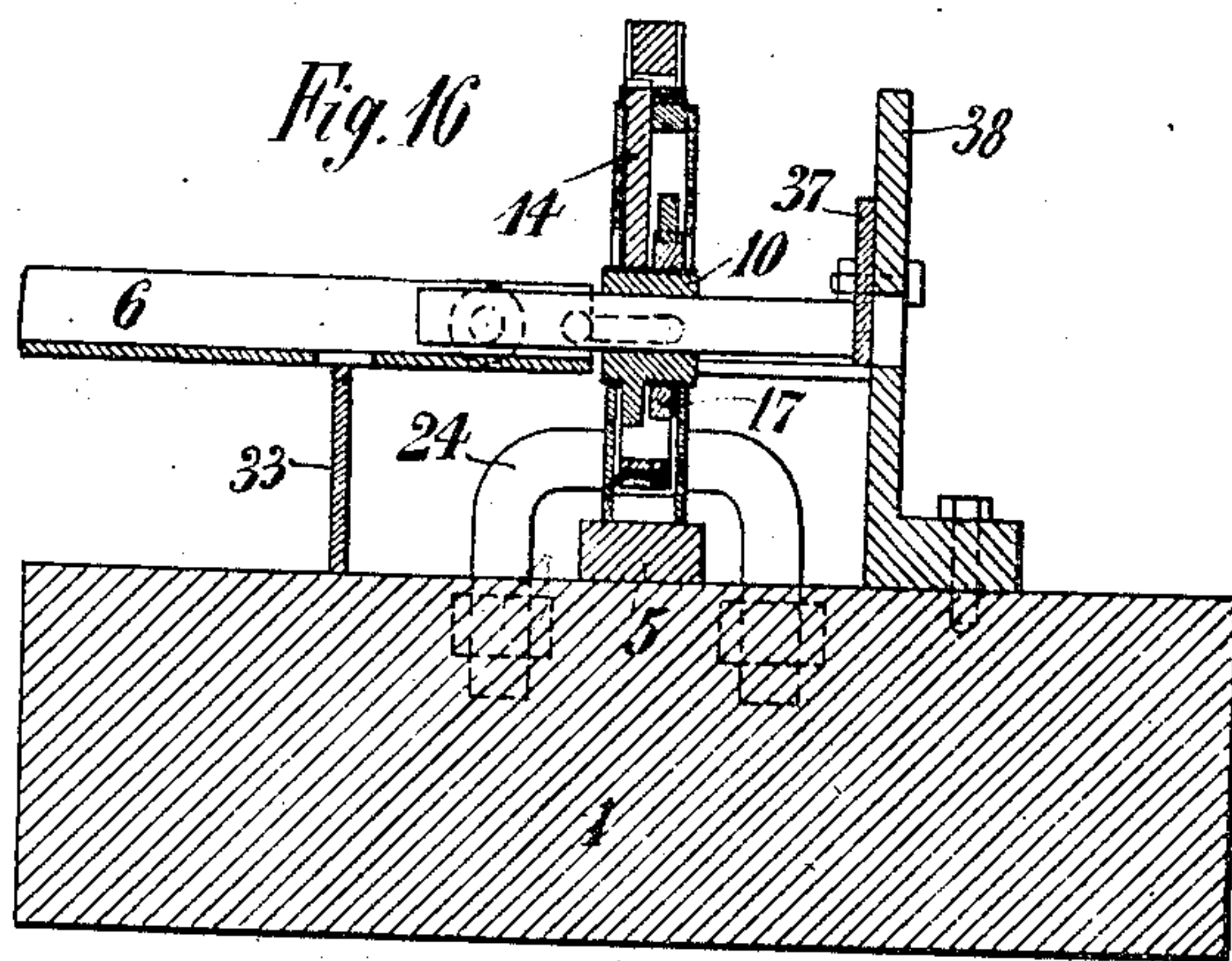


Fig. 16



Witnesses:

Otto König
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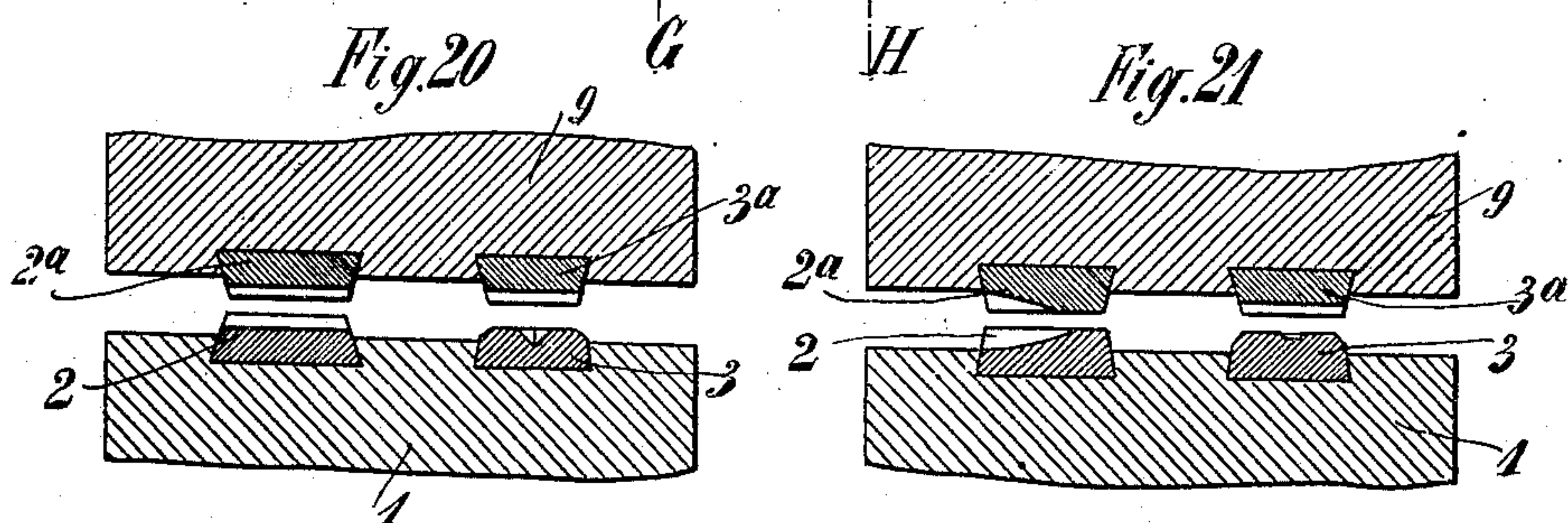
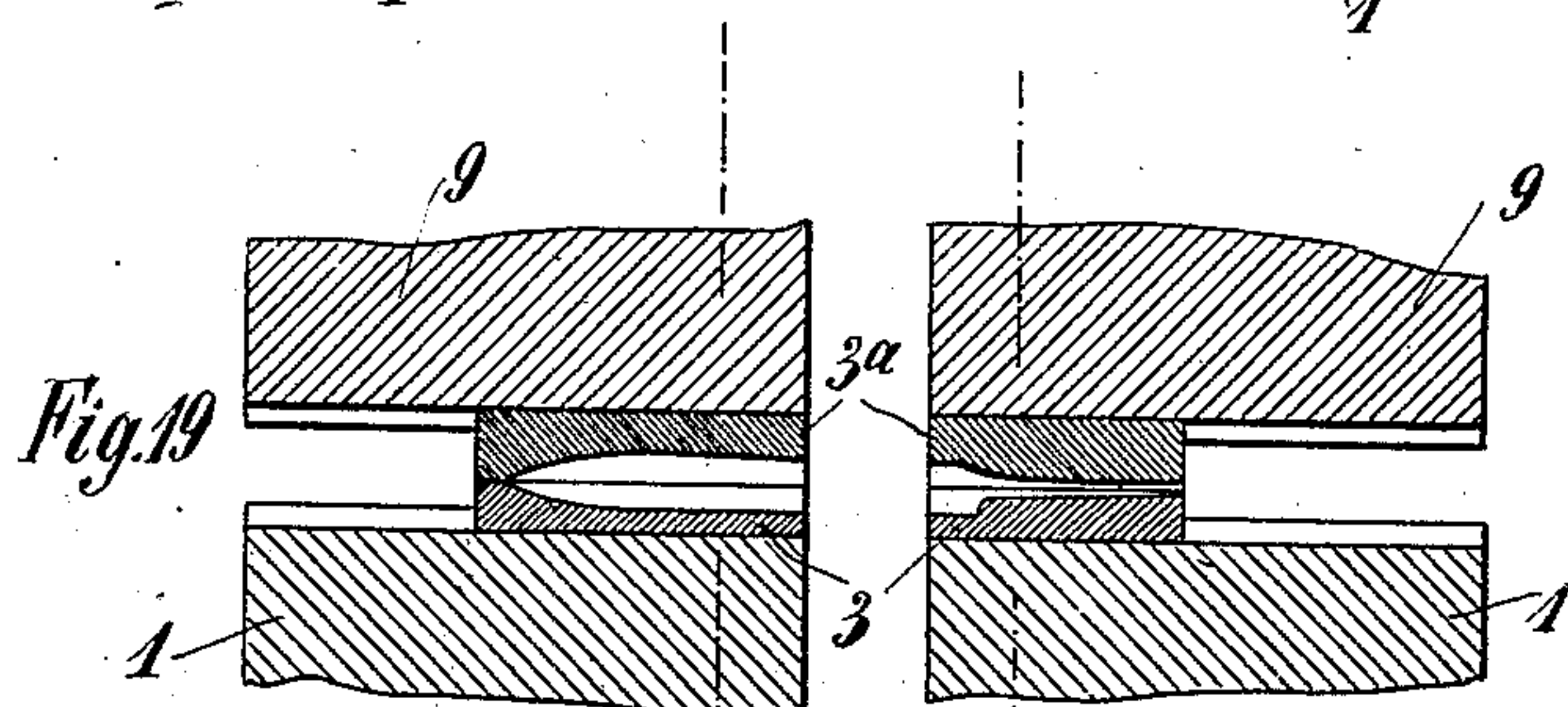
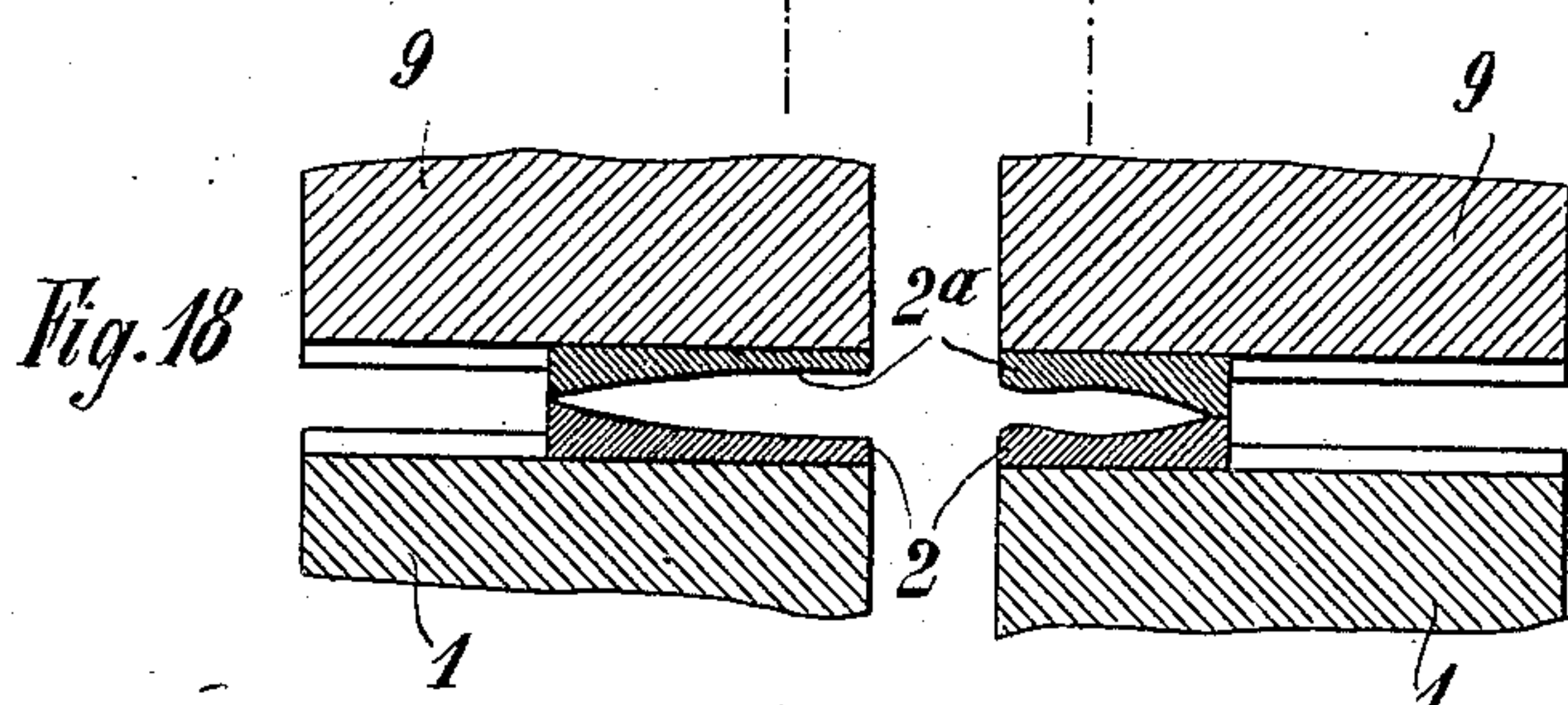
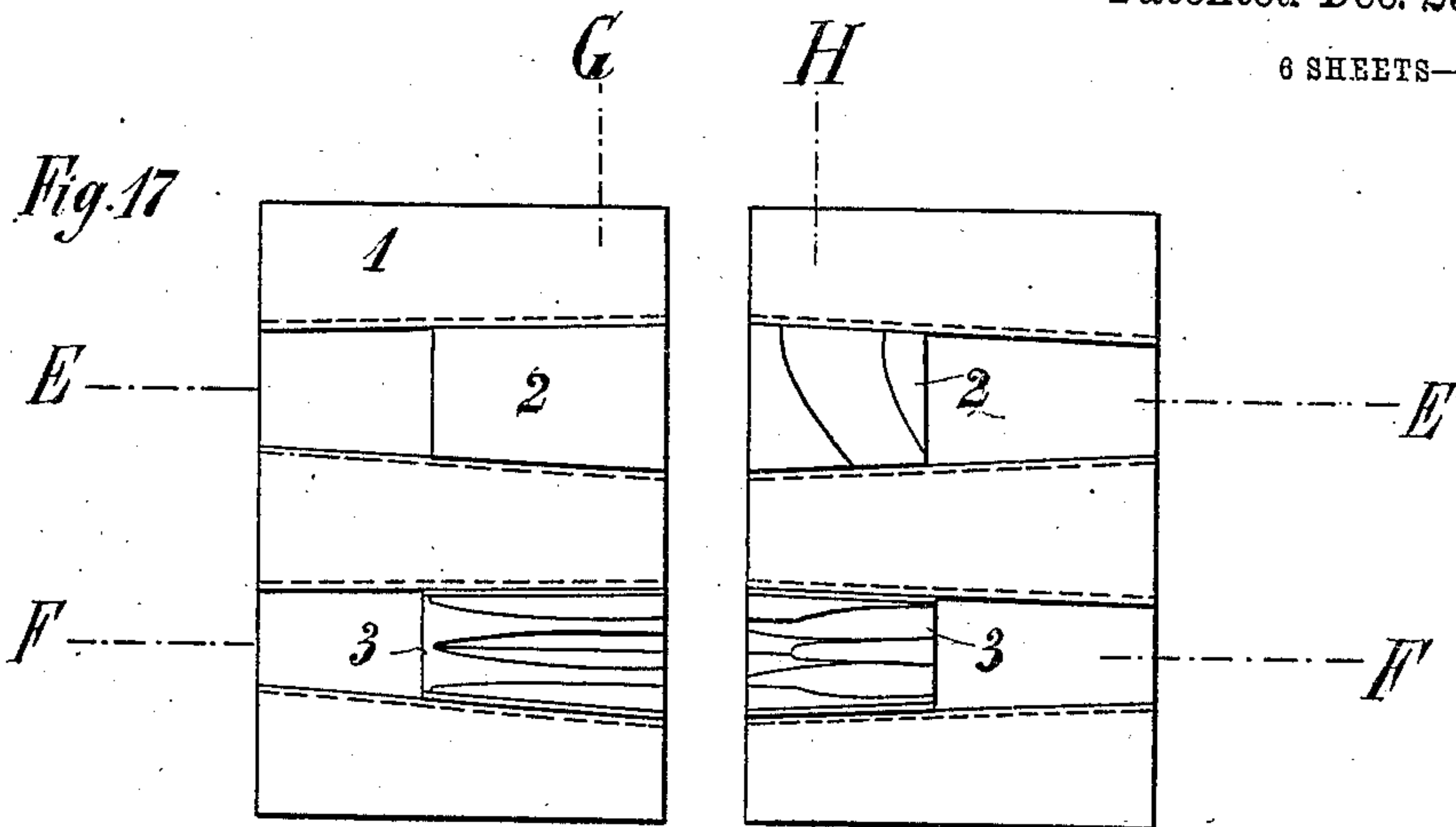
Friedrich Wilhelm Wolff
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FORGING MACHINE.
APPLICATION FILED MAR. 29, 1907.

908,187.

Patented Dec. 29, 1908.

6 SHEETS—SHEET 5.



Witnesses:

Max König
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 FORGING MACHINE.
 APPLICATION FILED MAR. 29, 1907.

908,187.

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6 SHEETS—SHEET 6.

Fig. 22

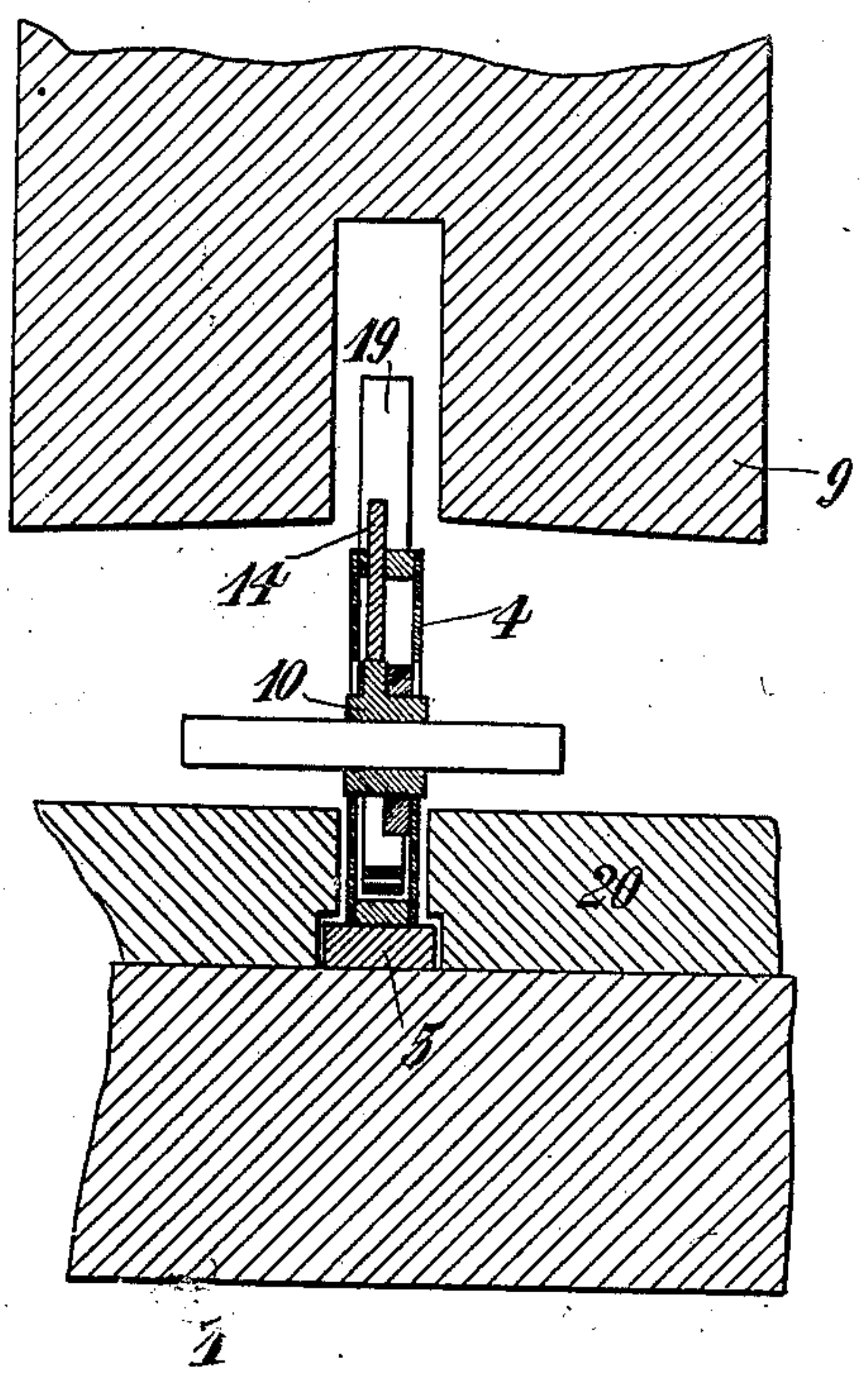


Fig. 23

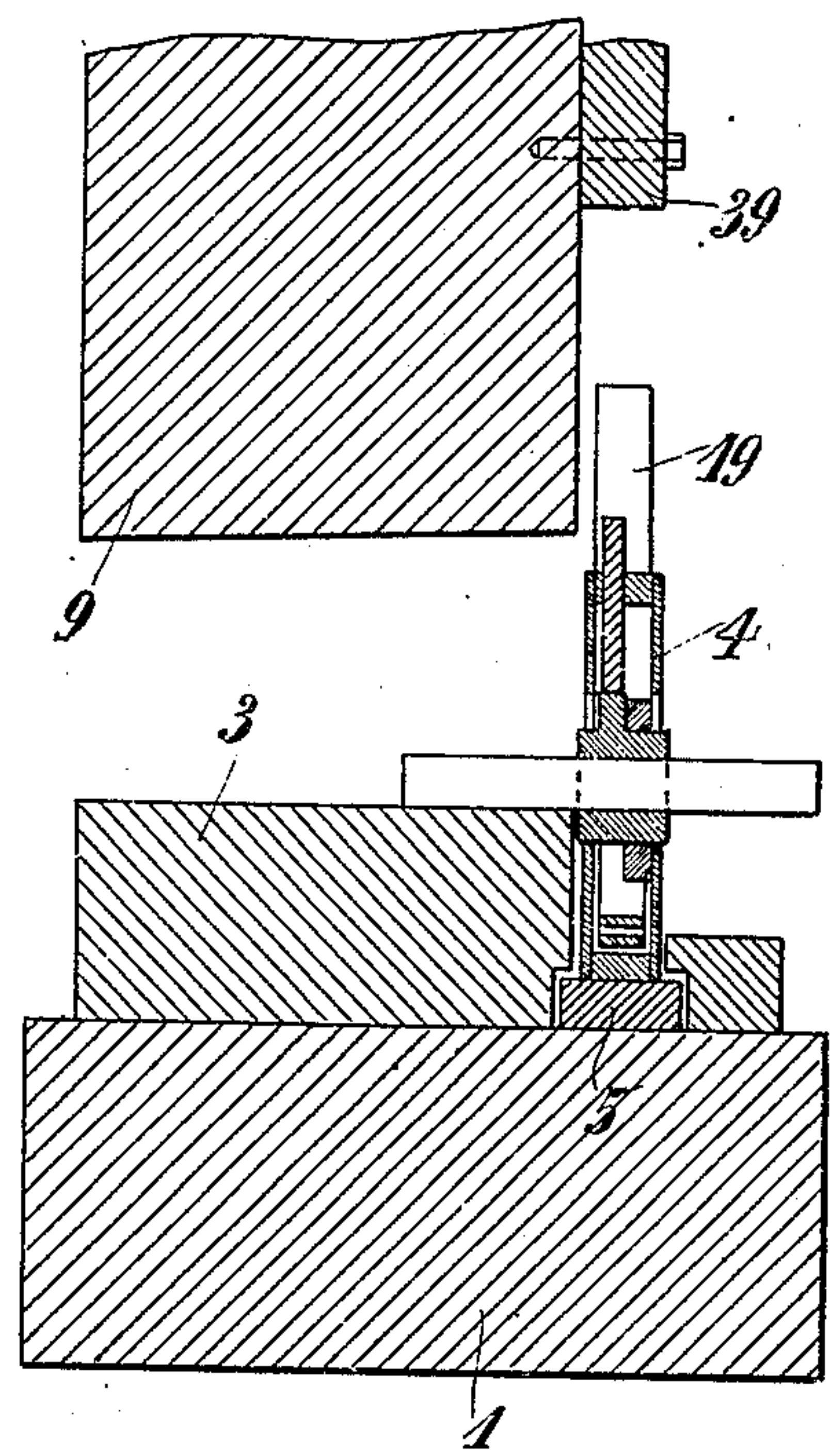
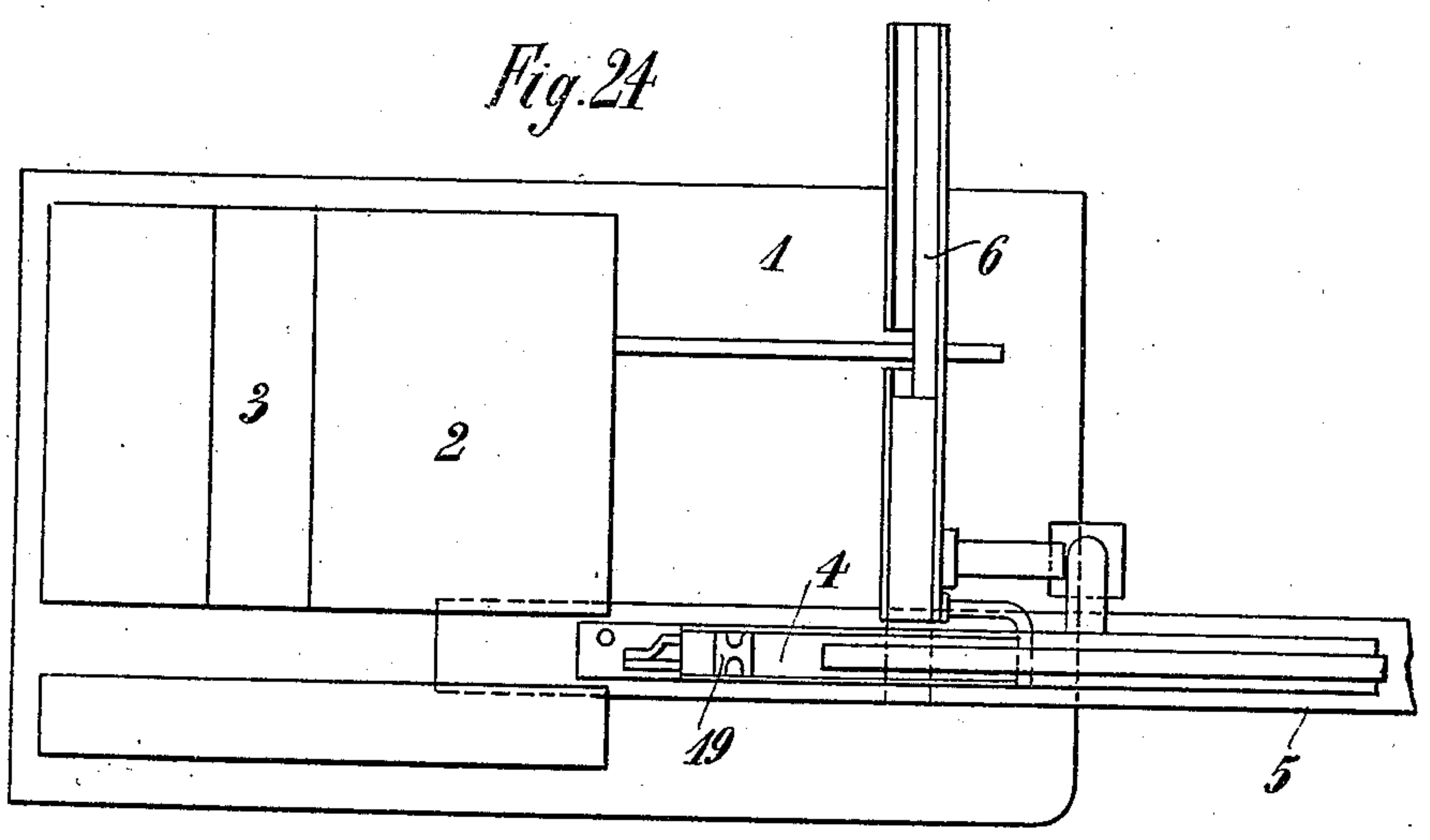


Fig. 24



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UNITED STATES PATENT OFFICE.

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FORGING-MACHINE.

No. 908,187.

Specification of Letters Patent.

Patented Dec. 29, 1908.

Application filed March 29, 1907. Serial No. 365,218.

To all whom it may concern:

Be it known that we, FRIEDRICH WILHELM WOLFF and EWALD WOLFF, citizens of the German Empire, both residing at Remscheid-Haddenbach, in the Province of Rhenish Prussia and Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Forging Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The subject-matter of the present application is a new improvement in forging machines.

It is intended for producing regular polygonal or even round articles, such as three-edged files, four-edged files and the like, these forgings being worked on several swages one after the other, for example, being rough forged on one swage and then being finished on another.

The essence of this new device consists in the piece of work, which has been suitably heated up and which consists of a piece of a suitable polygonal rod, being grasped by a holder which is displaceable with regard to the swages and which is revoluble about its axis, and in being brought to the swages one after the other and in being forged in them by the holder with the work held therein being turned after each stroke through an angle corresponding to the polygonal section to be produced at the time, and consequently by another side of the polygon being set opposite the hammer from time to time, said holder being operated through automatic ratchet mechanism.

The holder is advantageously provided with such a chuck or equivalent device as is automatically closed at the commencement of the forward action of the holder and automatically opened again shortly before the end of the return motion, so that it is necessary merely to push the finished forged article out of the holder by inserting a fresh piece to be forged in order for it to be possible to begin the forging operation again.

If this forging device is to be used to forge work which requires to be forged at both ends, the device is so arranged that the holder grasps the piece of work at its middle part and the work is then forged in suitable swages simultaneously at both ends.

Two embodiments of the present invention are illustrated in the accompanying drawings.

In said drawings:—Figure 1. is a perpendicular section through a form of the device intended for forging three-edged files, in which form the work is forged at both ends simultaneously; Fig. 2. is a plan; Fig. 3. is a view of a detail; Fig. 4. is a perpendicular section through the device on the line A—A, Fig. 5. is a plan of Fig. 4, the holder for the piece being worked being shown in a more forward position than that shown in Fig. 2; Fig. 6. shows the holder in side elevation, the casing being open and the hammer having fallen; Fig. 7. is a plan of the same, and Fig. 8. is an elevation similar to that shown in Fig. 6, but with the hammer raised; Figs. 9, 10, and 11 show details of the holder, these figures, as also Figs. 6 to 11 being on a larger scale than Figs. 1—5. Fig. 12. shows a perpendicular section through the device on the line C—C of Fig. 5. seen from the left; Fig. 13. shows a section on the line D—D of Fig. 12 seen from the left; Fig. 14. is a view similar to Fig. 12, the holder with the finished forged work therein being however moved partially backwards from the swages; Fig. 15. is a view from the right of Fig. 14; and Fig. 16. a section similar to that shown in Fig. 12. showing a new piece of work inserted in the holder; Fig. 17. is a plan of the under swage used in the forging of three-edged files; Fig. 18. is a perpendicular section through the upper and under swages on the line E—E of Fig. 17; Fig. 19. is a similar section on the line F—F of Fig. 17; Fig. 20. a section on the line G—G, and Fig. 21. a similar section on the line H—H, of Figs. 17, 18 and 19. Fig. 22. is a perpendicular section of this first embodiment on the line B—B of Fig. 5, Fig. 23. is a corresponding section of a second embodiment adapted for forging work at one end, while Fig. 24. shows this second embodiment in plan.

In the case of the first embodiment as shown in Figs. 1 to 22 of the drawings, 1 is the anvil of a suitable forging hammer, upon which anvil the two swages 2 and 3 are arranged side by side, the swage 2 serving for rough forging and the swage 3 being intended to impart the desired finished shape to the article or piece of work. The swages consist of two halves, separated by an in-

terval, in which the carrier 4 for holder 10 of the piece of work can be moved backwards and forwards opposite said swages. For this purpose the carrier is arranged on a slide 5, mounted displaceably on the anvil 1. Said slide may be moved either mechanically or by hand in such a way that the carrier 4 may be brought first opposite the one and then opposite the other of these swages or finally opposite a feed-channel 6. Stops or abutments 7 and 8 (Figs. 2 and 4) on the feed-channel and on the slide itself respectively limit the motion of the slide 5, so that the work mounted in the holder 10 comes opposite the feed-channel 6 in the one end-position and over the finishing swage 3 in the other end-position.

The hammer-ram 9 carries the corresponding upper swages 2^a, 3^a (Figs. 18 and 19), which likewise consist of two halves separated by an intermediate interval, so that the holder situated between the halves of the under swages is not struck by the hammer. The swages may be formed directly in the anvil or the ram. It is preferable however to fit them separately in the anvil and the ram, as is represented in the example illustrated. The Figs. 17-21 show by way of example the requisite forms which the under and upper swages possess for forging three-edged or three-square files. The holder-carrier 4 is provided with a casing or housing which is similar to that of a lock and which stands upright on the slide 5. In the walls of said casing a work-holder consisting of a journaled block or hub 10 is mounted revolubly and also so that it can move vertically up and down. Said hub has a hole 11 shaped to correspond with the polygonal or many-angled form of the work. The work is inserted in this hole in such a way that it is held at its middle portion and projects freely at both ends, so that the latter can be forged simultaneously, that is to say, in the case illustrated, the blade and the spike of three-square files can both be forged at the same time. On the hub a polygonal part 12 is provided corresponding to the shape of the work, with which polygonal part a presser 14 coöperates, said presser being arranged freely in the casing so as to be capable of reciprocating up and down and being subjected to the downward pressure exerted by the spring 13; Said presser 14 resting with its lower portion on an attachment in contact with one side of the said polygonal part which faces upwards guarantees that the work is in a proper position, that is, that it has one of the sides of said polygonal part facing upwards, or said presser tends to turn the work into such a position, when it is brought out of such a position by the rotation of the block or hub 10.

In order to secure the work in the work-holder 10, in the example illustrated a press-

catch 15 engages with it through the wall of the hub, which catch is integrally connected with a pin 16 traversing the said work-holder to the exterior of the hole, so that by pressing on the end of said pin 16 the catch can be forced out of the hole in the work-holder in order to release the work, whereas the latter is clamped firmly by pressing on the back of the catch. These movements of the catch 15 are brought about by a ring 17 revolubly mounted on the said work-holder, which ring possesses in its interior eccentric recesses 18 which coöperate with the catch 15 or with the pin 16, in such a way that when the ring 17 turns in the direction of the arrow (Fig. 10) the catch is pressed forwards so that the work is clamped fast, while when the ring turns in the opposite direction the work is unclamped.

In the casing of the holder there is a perpendicularly reciprocating plunger 19, which a strong spring 20 itself arranged in the casing in the example illustrated tends to maintain raised but which at each downward stroke of the hammer is forced downwards together with and by means of said hammer. On this plunger there is journaled at its upper end a pawl 21 which is pressed by means of the spring 22 with its lower hooked end against the polygonal part 12 which is also formed as a ratchet-wheel and consequently possesses a tooth-space 23 behind each corner. When the plunger 19 is pressed downwards the pawl 21 engages in the tooth-space round the corner of the polygonal part 12 which is below at the time, and then when the following upward travel of the stamp 19 takes place the polygonal part is turned round and consequently the work-holding hub or block 10 is rotated through the angle in question, that is, in the present case through 120°, the presser 14 again insuring that the work-holding hub or block with the work comes into exactly the right position. If the work were lying in a swage corresponding to its shape, for instance in the finishing swage 3 in the case shown, and were thereby prevented from turning, the work together with the work-holding hub or block is first raised to such an extent by the plunger 19 through the instrumentality of the pawl 21 in opposition to the presser 14 that it can rotate. Thus the ratchet-mechanism for rotating the work is actuated by means of the descending hammer itself and through the medium of spring 20 and consequently after each hammer-stroke rotation automatically takes place through an angle corresponding to the face of the polygonal part in use at the time.

In order to enable the holder to open automatically for the purpose of releasing the finished forged piece, as well as to enable the holder to close automatically after a fresh piece of work has been placed in it, a rod 26

having two teeth 25 on its under surface is arranged at the opposite end of the device to that at which the swages are situated, said rod being supported in a casing carried by the fork 24. The carrier 4 on returning from the swages to the feed-channel 6 is pushed over said rod so that its teeth 25 come in engagement with corresponding toothing 27 on the above-mentioned ring 17 which is revolutely arranged on the hub or work-holder 10 and which serves to adjust the position of the catch 15. Consequently on the return movement of the holder 10 this ring 17 is turned in the one direction and at the commencement of the forward movement in the opposite direction, so that in the first case the holder is opened and in the second case is closed. In order to render this mode of operation possible, the rod 26 at its end which is furthest from the swages is revolutely mounted on a pin 28 which passes through a slot in said end so that the rod is also longitudinally displaceable within certain limits, while at the other end of the casing a pin 29 engaging in a wedge-shaped recess in the under surface of the rod supports the latter which is pressed against said pin by means of a spring 30. A spring 31 tends to prevent the rod 26 from becoming longitudinally displaced in the direction of the forward movements of the carrier 4. In consequence of this arrangement of the rod 26 the latter can move upwards when the carrier 4 moves backwards so that the sets of teeth can come into engagement with one another, whereas when the carrier 4 moves forwards the teeth are disengaged by the rod being drawn along with the carrier 4 a short distance and thereby correspondingly raised at its free end by the cooperation of the surface of the wedge-shaped recess and the pin 29.

In order to prevent the work-holding hub or block 10 from being forced round together with the ring 17 when the latter is rotated, a second rod 32 is provided above the rod 26, which rod 32 prevents the presser 14 from moving upwards during the rotation of the ring 17 and so prevents the work-holder 10 from turning. In the majority of cases however it is not at all necessary to arrange a device for securing the work in the hub or block 10, as the work apart from such a device is sufficiently secure.

The feed-trough 6 is movably arranged, that is, it rests for example at its back end in a fork not shown in the drawings, so that at its front end it can be moved to and fro not only in the direction of the motion of the holder, but also up and down to a slight extent. At its front end it is carried by a piece of sheet or vertical plate 33 mounted on the anvil. Said plate 33 possesses an obliquely running slot 34 (Figs. 1 and 13) corresponding to the wall of the trough farthest removed from the swages, while the left wall of the same

possesses a slot 35 corresponding to the plate 33 (Fig. 5). Consequently the latter engages with its corner 33^a (Fig. 13) in the trough and prevents said trough from being longitudinally displaced. Moreover on the trough 6 a small arm 36 reaching into the path of the carrier 4 is provided, so that the carrier on being withdrawn from the swages strikes against this arm and thus drives the trough with it during the continuance of its motion, the trough sliding upwards in the slot 34 in the plate 33. By these means the following objects are attained, viz., the trough in no way impedes the movements of the carrier with the work which is held therein and which projects at both sides, because, after a fresh piece of work has been introduced into the carrier, the trough 6, during the new commencing movement of the carrier towards the swages (Fig. 16), is first driven along with the work and consequently slides downwards or sinks in the slot 34 of the plate 33, so that the work on continuing to move with the carrier can be moved out of the trough over the wall of the same. The reverse action takes place on the return of the finished forged work. In this case the finished article first moves over the wall of the trough (see Fig. 14) and not until then is the trough taken along with the carrier, which continues to move further, and simultaneously raised, so that in the end position of the holder the trough stands again exactly at the same height as the hole 11 in the carrier or hub 10 (see Fig. 16).

A flap 37 (Figs. 2, 3, 13 and 16) serves to limit the forward feed motion of the new piece of work to be introduced, said flap normally closing (see Figs. 3 and 13) an opening in a wall 38 which is opposite the trough and on which the flap is revolutely mounted at one of its ends. This flap is so shaped at its free end that it is automatically raised by the finished forged work, which has been increased in length, when the latter returns from the swages so that the finished work can be pushed out of the holder (see Fig. 15). After this has been effected, the flap falls down again in virtue of its weight and then limits the feed of the fresh unforged work when the latter is introduced into the holder, so that the work is clasped always at the same part by the holder 10 (see Fig. 16).

The mode of operation of this new device is as follows:—After the forging of the work in the holder 10 has been finished, the latter is brought by means of a suitable movement of the slide 5 into the position indicated in Fig. 1 by means of full lines, the holder being opened in the manner described above, the feed-channel being placed opposite the hole 11 and the flap 37 for limiting the forward feed of the new work being raised. A new piece of work is then placed in the channel 6 and is fed forward in the latter, and at the

same time the finished forged work is pushed out of the holder and the new work is introduced into the same. The flap 37 which in the meanwhile has fallen down causes the new work to be clasped at the correct part. After this has been effected, the holder together with the work held thereby and protruding from both sides of the same (see Figs. 1 and 6) is moved up to the swages. At the commencement of this movement the work is clamped in the holder in the manner described, if a device serving this purpose is provided, and the feed-channel sinks to such an extent that the motion of the holder can continue unimpeded. The work is now brought between the swages 2, 2^a, and then the hammer is set in action. During this action as explained above the work is turned through 120° after each hammer-stroke so that it assumes a triangular shape at both ends. In this case the surfaces of these swages are of such a shape, that the work, being fed forward gradually on the swages by a suitable motion of the slide 5, is continually more and more beaten out and distended and at the same time brought to a point. After it has been beaten out to the necessary length, it is placed between the swages 3, 3^a. The swages are shaped to correspond with the finished form of the work, so that the latter by being forged in them assumes the desired final shape, it being again automatically turned through a suitable angle after each stroke, for example through 120° if three-square files are being manufactured. After the forging of the work has in this way been completed, the holder is moved back again into its initial position, after which the described cycle of events commences anew.

Figs. 23 and 24 illustrate a still simpler form of the new device which is intended to serve only for working forgings at one end. In this case also as in the case of the first example the two swages 2 and 3 are arranged on the anvil 1 of the hammer, of which swages the former again serves for rough forging and the latter for finishing. In this case, however, each of these swages consists only of a single part and the holder 4 for the work is arranged on a slide 5 adapted to reciprocate in front of the swages, so that the piece of work can again be brought into the separate swages by shifting the holder and the holder also can be placed opposite the feed-channel 6 for the purpose of removing the finished forging and inserting a fresh piece of work. In correspondence with the lower swages the upper swages on the hammer-ram 9 also each consists of single undivided members. The work holder 4 may in this case also be constructed as in the first example described above, but the work instead of being grasped at its middle is grasped at one end. The plunger 19 producing a rotation of the work after each hammer-stroke is ar-

ranged in the same manner as before and is likewise actuated by a hammer-ram. For this purpose an abutment or stop 39 (Fig. 23) is fixed at a suitable height laterally on said ram, which stop strikes the plunger 19 on the descent of the hammer. Otherwise the mode of operation of this modified form of the device is the same as that of the example first described.

If pieces of work with a round cross-section are to be forged, they are first preliminarily forged into a polygonal shape and then their round form is imparted to them in the finishing swage.

What we claim as our invention and desire to secure by Letters Patents is:—

1. In a forging machine of the type described for forging regular polygonal and round pieces of work, the combination of a hammer, an anvil, a pair of swages on the hammer, a pair of corresponding swages on the anvil, each of said swages consisting of two portions separated by an interval, a revoluble work-holder adapted to vertically move opposite said swages and between the portions of the swages on the anvil and means for revolving the work-holder.

2. In a forging machine of the type described for forging regular polygonal and round pieces of work, the combination of a hammer, an anvil, a part containing work feed-channel, a pair of swages on the hammer, a pair of corresponding swages on the anvil, each of said swages consisting of two portions separated by an interval, a revoluble work-holder adapted to vertically move opposite said swages and between the portions of the swages on the anvil and also opposite said feed-channel and means adapted to be actuated by the hammer for revolving the work-holder.

3. A revoluble vertically movable work-holder for forging machines of the type described for forging regular polygonal and round pieces of work, in combination with a reciprocatory carrier, said holder having a hole through which the work can be inserted, a spring-controlled reciprocatory member arranged in the path of the hammer and adapted to move with the hammer during part of its stroke against its spring-control, and connecting means for transmitting motion from said member to the work-holder and revolving the latter after the working-strokes.

4. A revoluble work-holder for forging machines of the type described for forging regular polygonal and round pieces of work, in combination with a reciprocatory carrier, said holder being vertically movable, provided with an opening for insertion of the work and being also provided with a polygonal part, a spring-controlled presser resting on said polygonal part, a spring-controlled reciprocatory member arranged in the

path of the hammer and adapted to move with the hammer during a part of its stroke, and connecting means for transmitting motion from said member to the holder and revolving the latter after the working-strokes.

5. A revoluble and vertically movable work-holder for forging machines of the type described for forging regular polygonal and round pieces of work, in combination with a reciprocatory carrier, said holder having a hole through which the work can be inserted, a ratchet wheel connected with said holder, a spring-controlled reciprocatory member arranged in the path of the hammer and adapted to move with the hammer during a part of its stroke against its spring-control, and a pawl pivotally mounted on said member and adapted to engage with said ratchet-wheel.

6. A revoluble and vertically movable work-holder for forging machines of the type described for forging regular polygonal and round pieces of work, in combination with a reciprocatory carrier, the said holder having an opening for the insertion of the work and being provided with a polygonal part, a ratchet wheel connected with said holder, a spring-controlled presser resting on said polygonal part, a spring-controlled reciprocatory member arranged in the path of the hammer and adapted to move with the hammer during a part of its stroke, and a pawl pivotally mounted on said member and adapted to engage with said ratchet wheel.

7. A revoluble and vertically movable work-holder for forging machines of the type described for forging regular polygonal and round pieces of work, in combination with a reciprocatory slide 5, a carrier having a frame substantially in the form of a lock-casing mounted on said slide, said frame having a vertical slot, a holder 10 mounted revolubly

and so as to be vertically movable in said slot, said holder having a polygonal hole 11 through which the work can be placed and being provided with a polygonal part 12 having ratchet teeth, a spring-controlled presser 14 resting on said polygonal part, a spring-controlled reciprocatory plunger 19 arranged in the path of the hammer and adapted to move with the hammer during a part of its stroke against its spring-control, and a spring-controlled pawl 21 pivotally mounted on said stamp and adapted to engage with said ratchet teeth.

8. In a forging machine, the combination of a reciprocatory carrier and a work holder carried thereby with a feed trough V-shaped in cross section having a cut away portion in one side, a support having an oblique slot in which the wall of the trough opposite said cut away part rests and an arm on said trough extending into the path of said carrier whereby the trough is raised when the carrier moves said arm.

9. In a forging machine, the combination of a vertically movable revoluble work holder, having a hole through which the work may be inserted, a feed trough, a flap opposite said trough and serving as a stop for the work fed to said holder and means for carrying said holder to and fro, the said flap being adapted to be automatically raised by each piece of work after swaging as the holder recedes, to permit the expulsion of such piece of work, substantially as set forth.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

FRIEDRICH WILHELM WOLFF.
EWALD WOLFF.

Witnesses:

OTTO KÖNIG,
J. A. RITTERSHAUS.