

No. 736,618.

PATENTED AUG. 18, 1903.

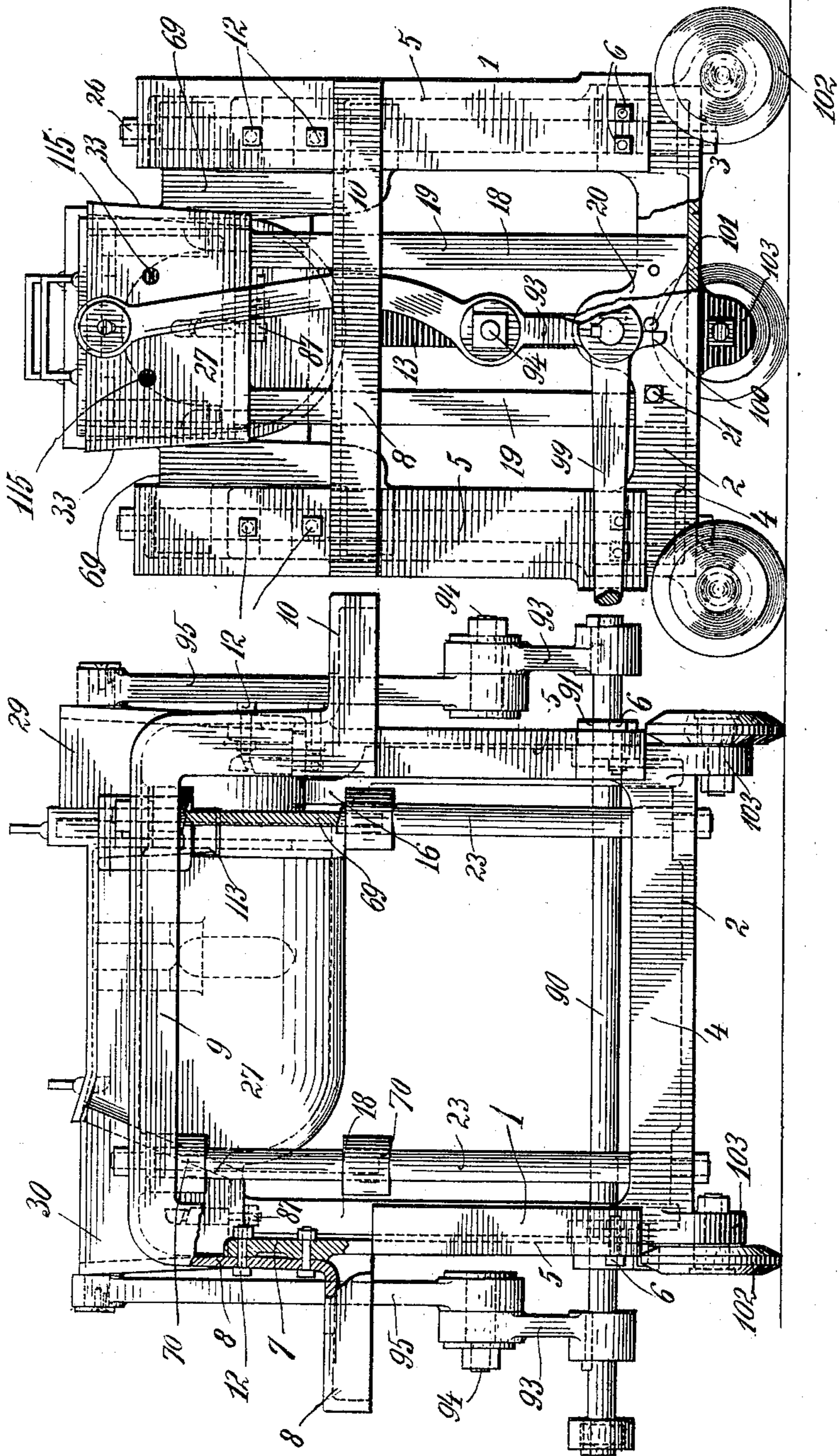
W. M. McCALLUM.  
CORE MAKING MACHINE.  
APPLICATION FILED MAY 19, 1903.

NO MODEL.

7 SHEETS—SHEET 1.

FIG. 2.

FIG. 1.



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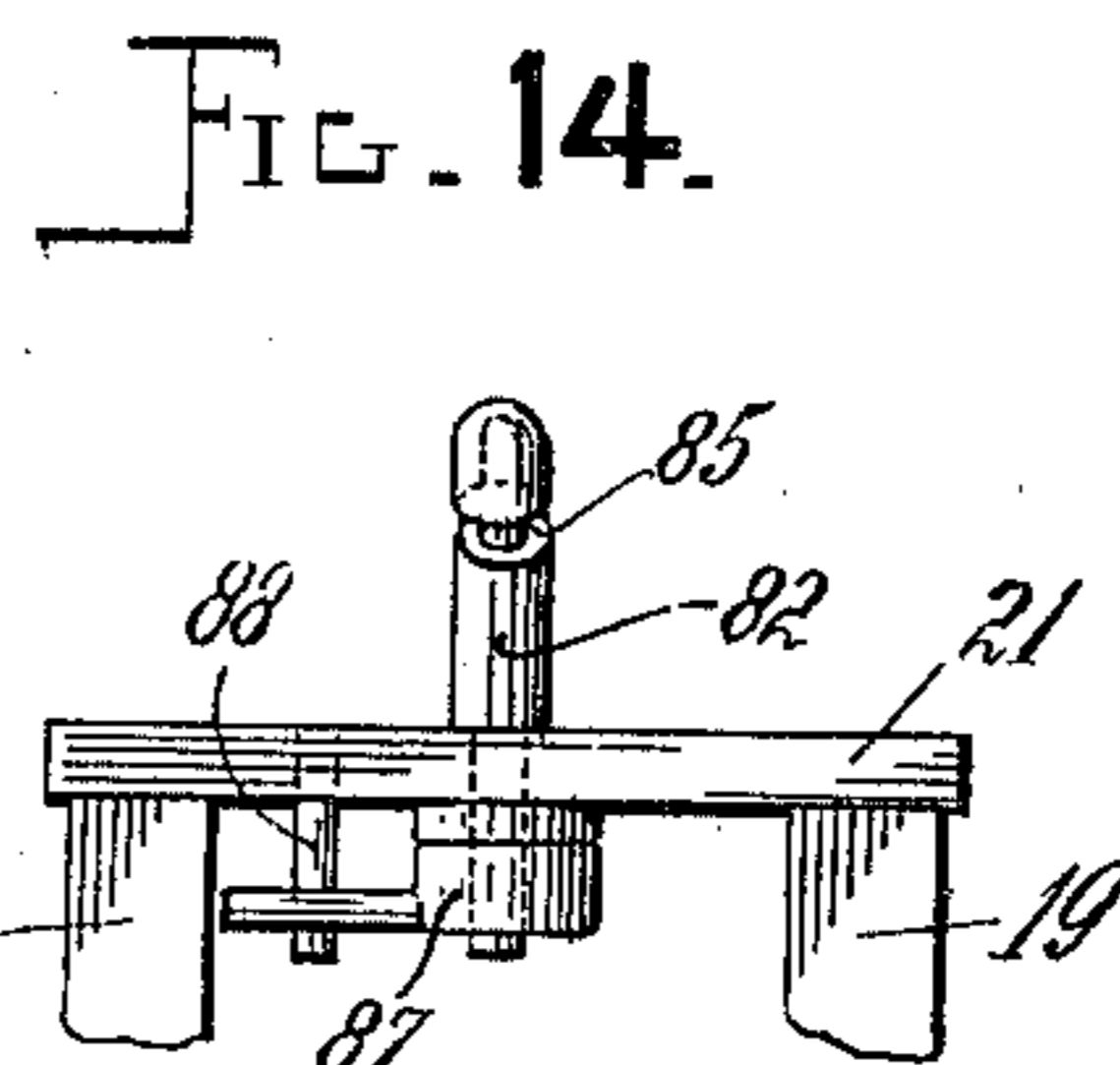
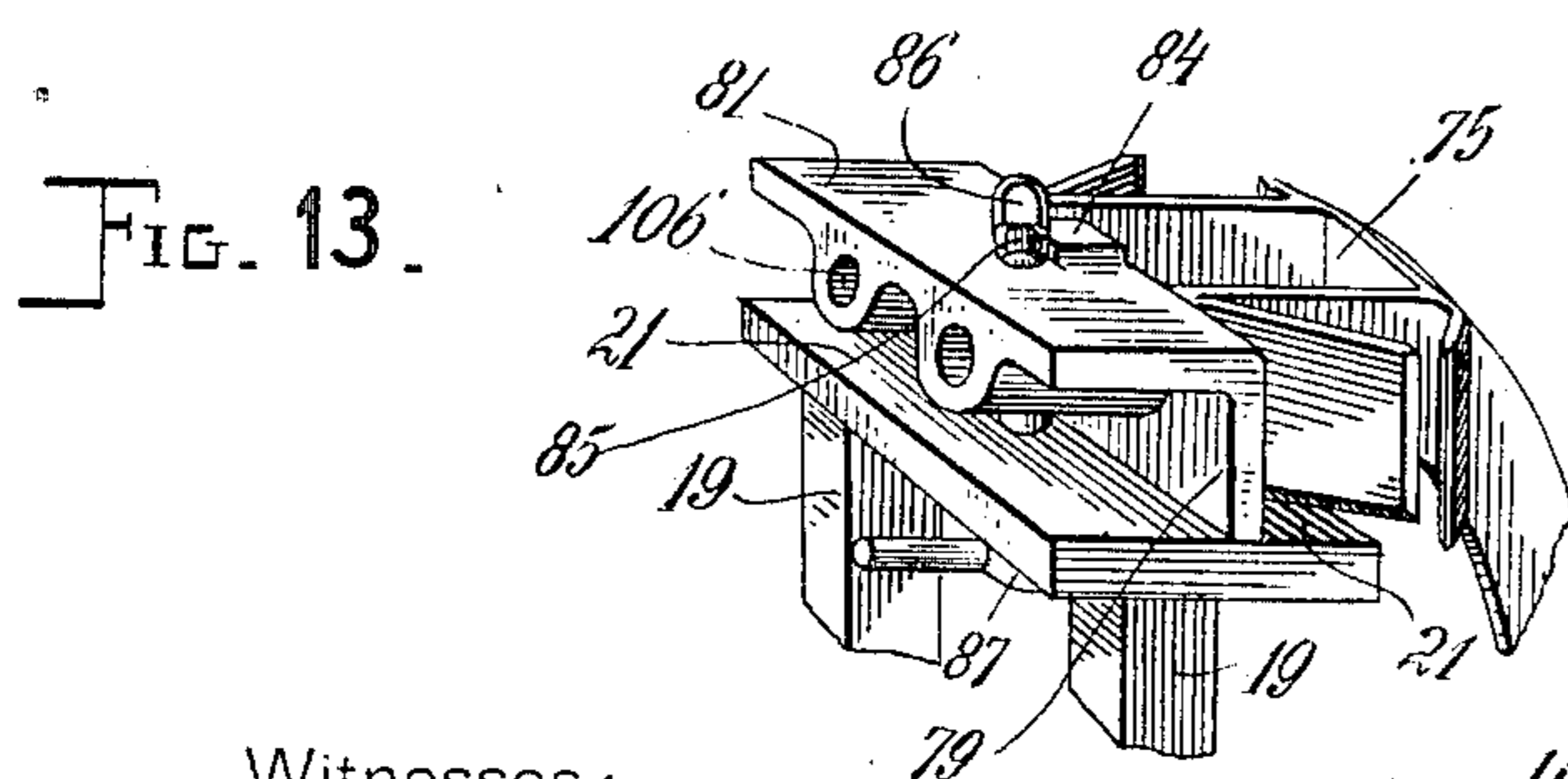
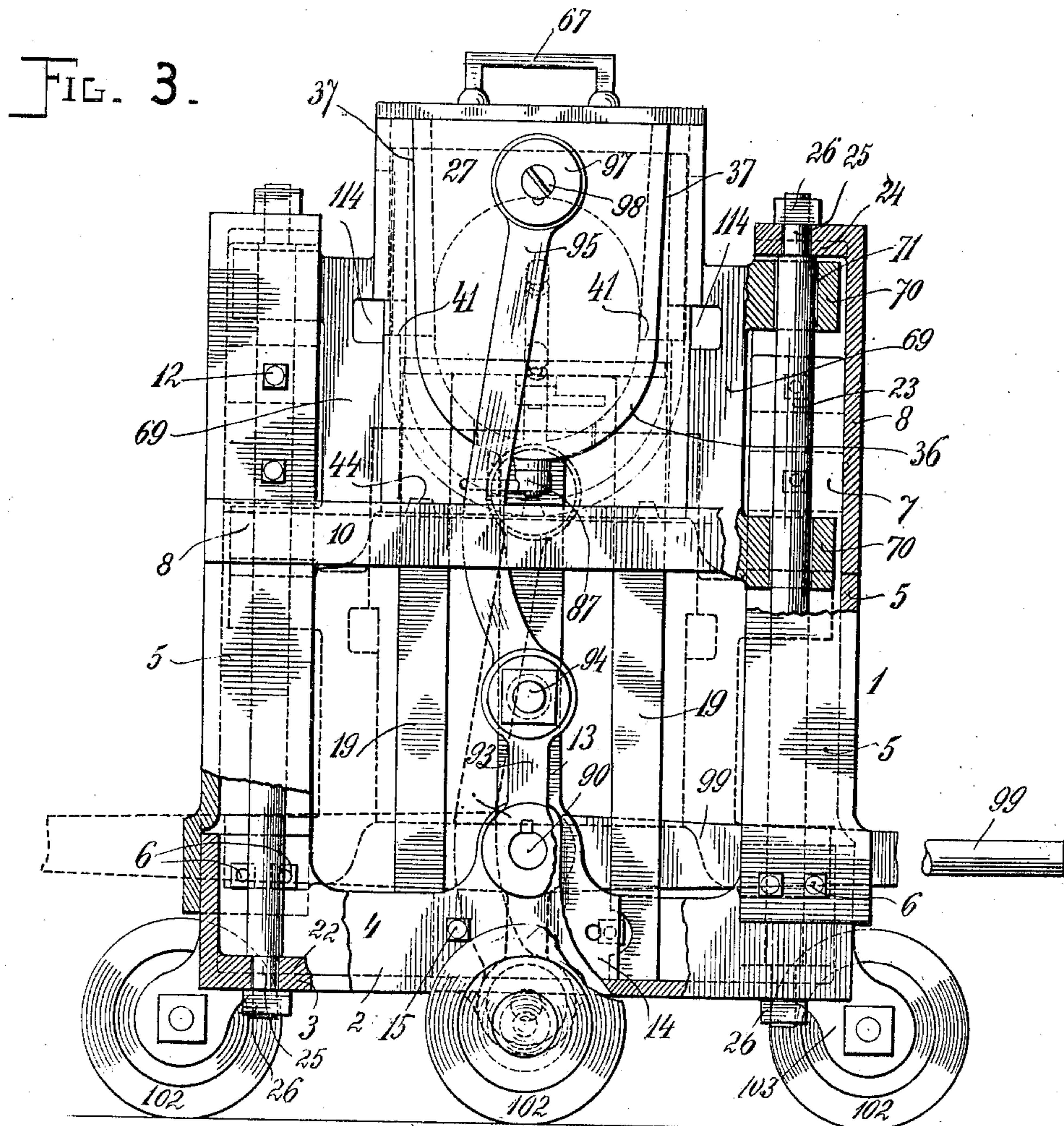
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7 SHEETS—SHEET 2.



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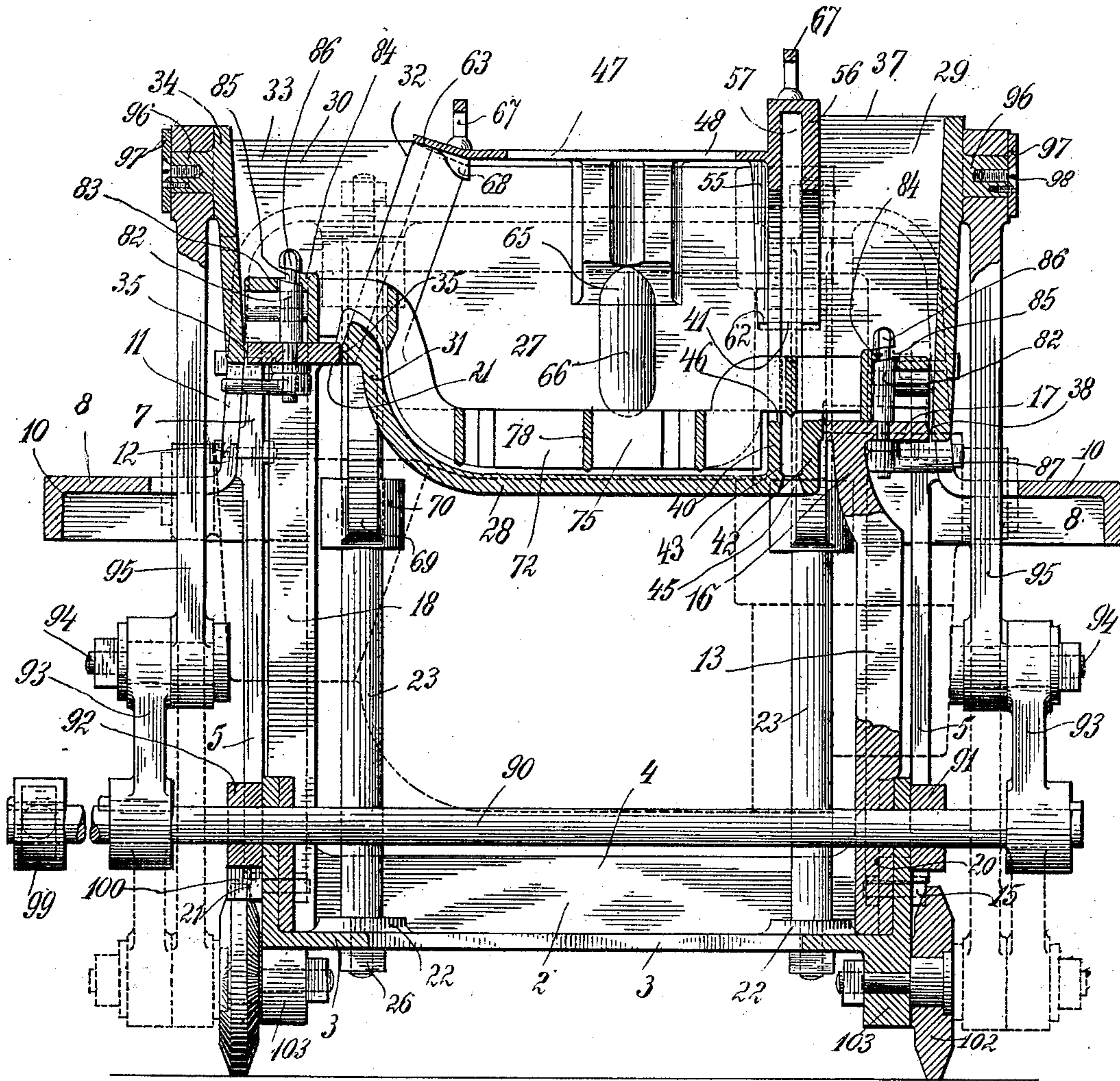
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7 SHEETS—SHEET 3.

FIG. 4.



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7 SHEETS—SHEET 4.

FIG. 5.

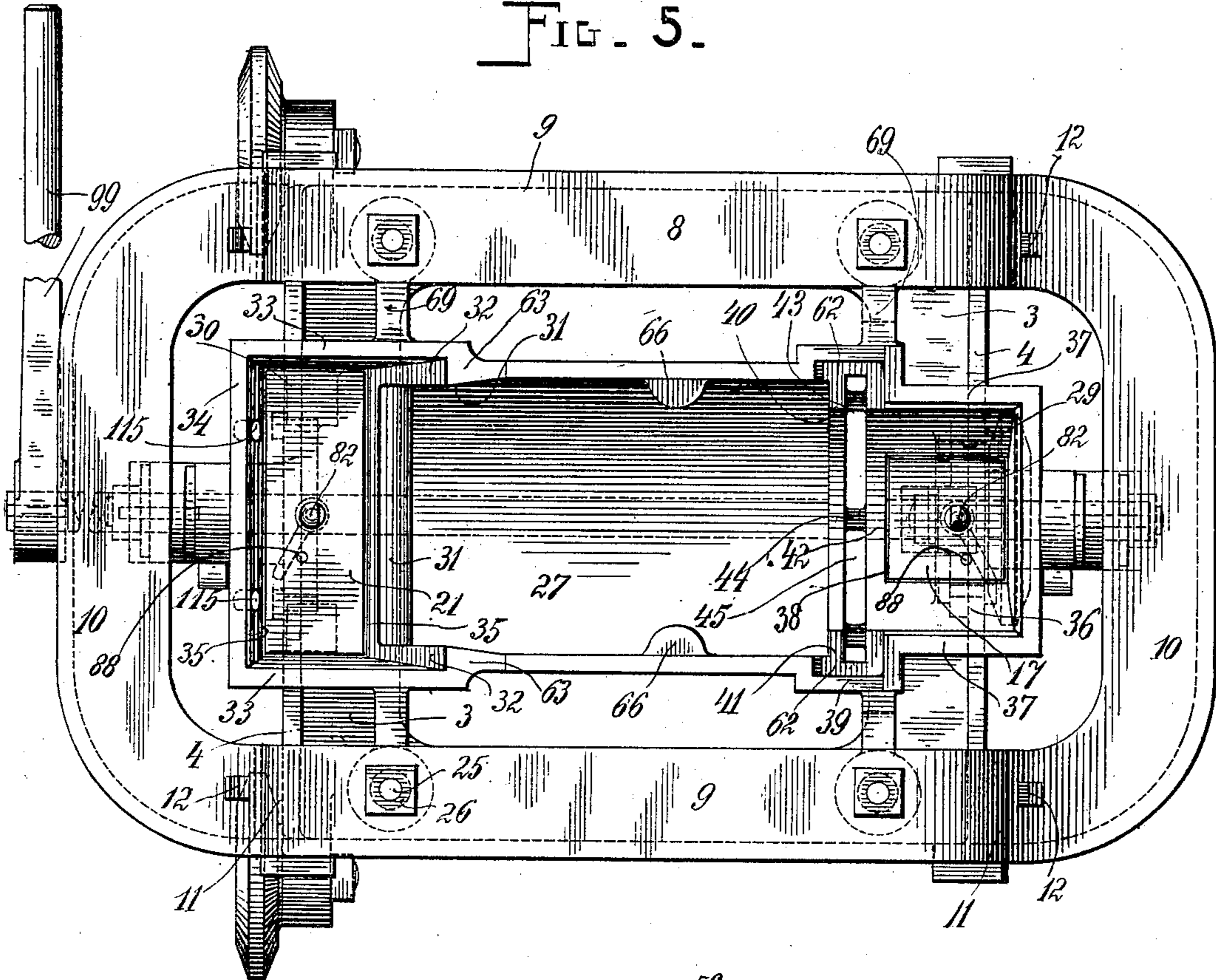
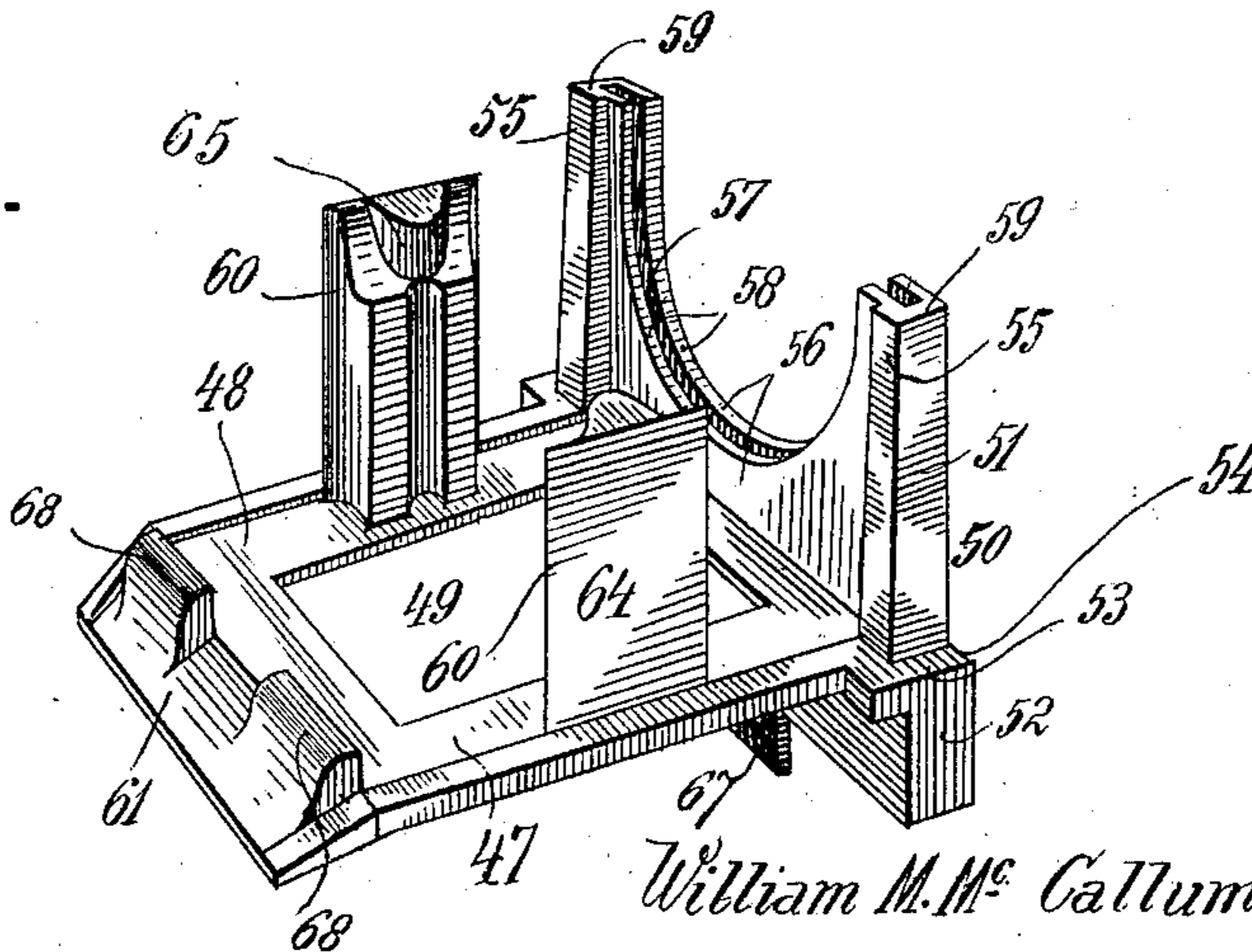


FIG. 6.



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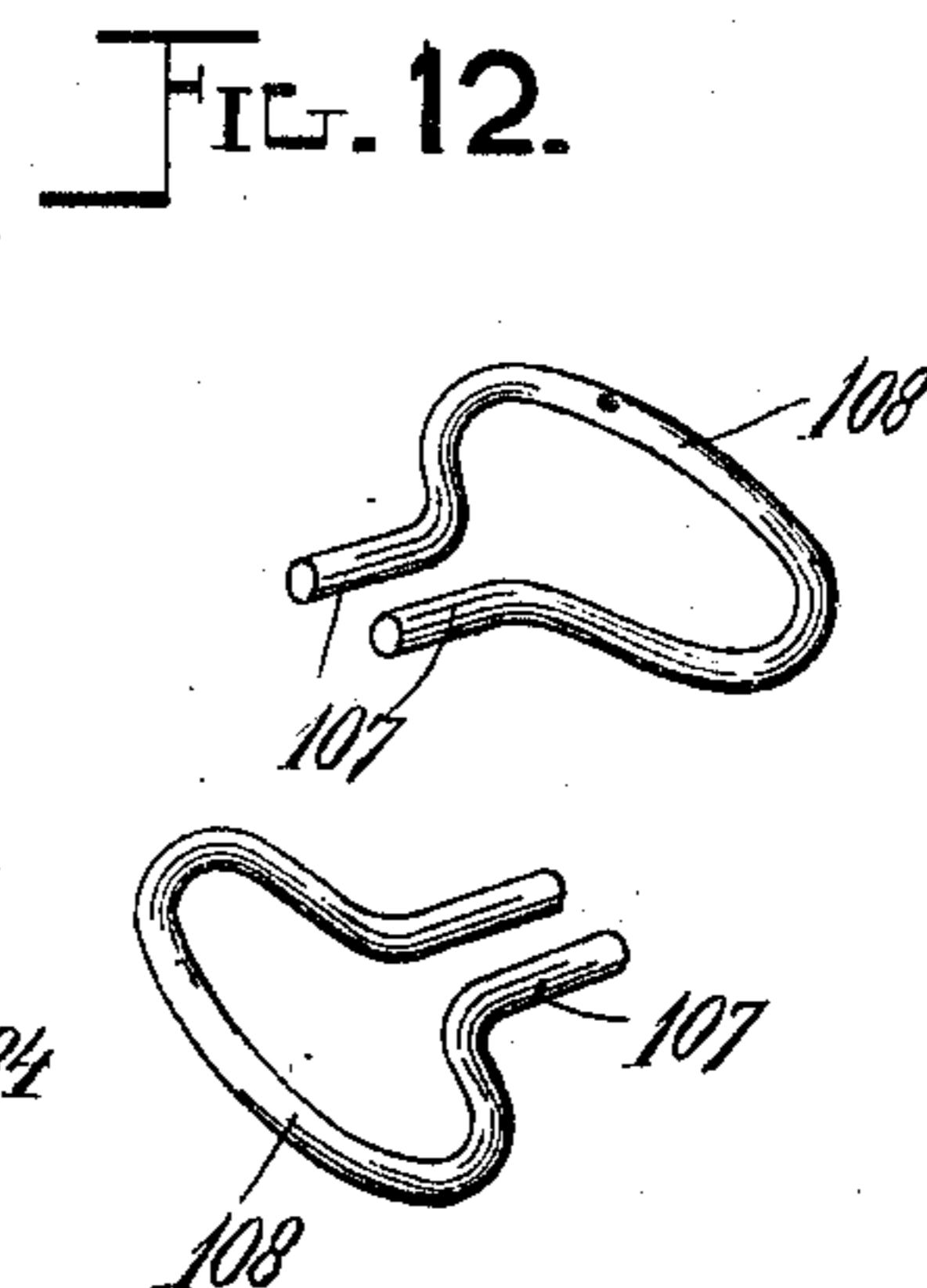
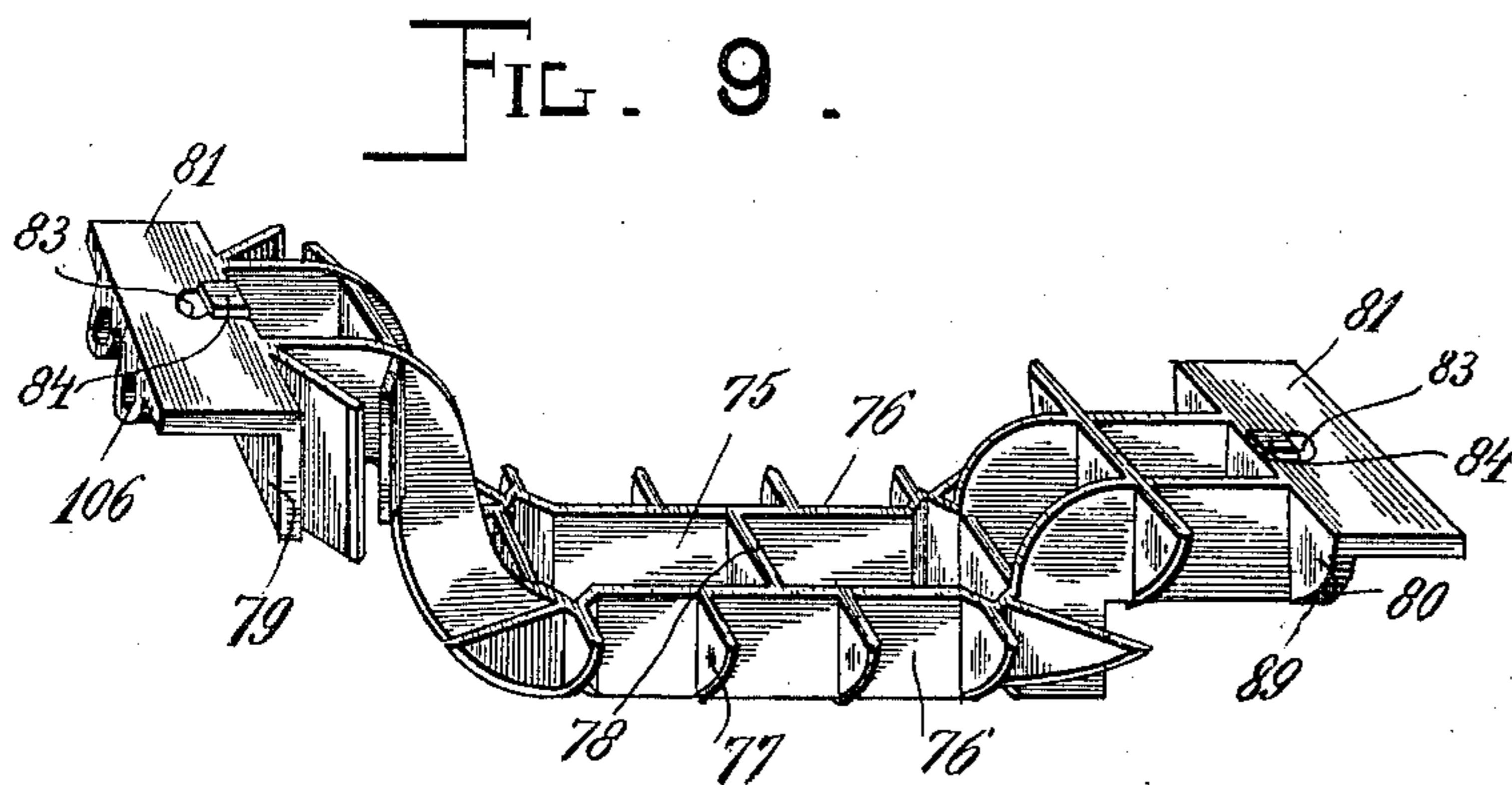
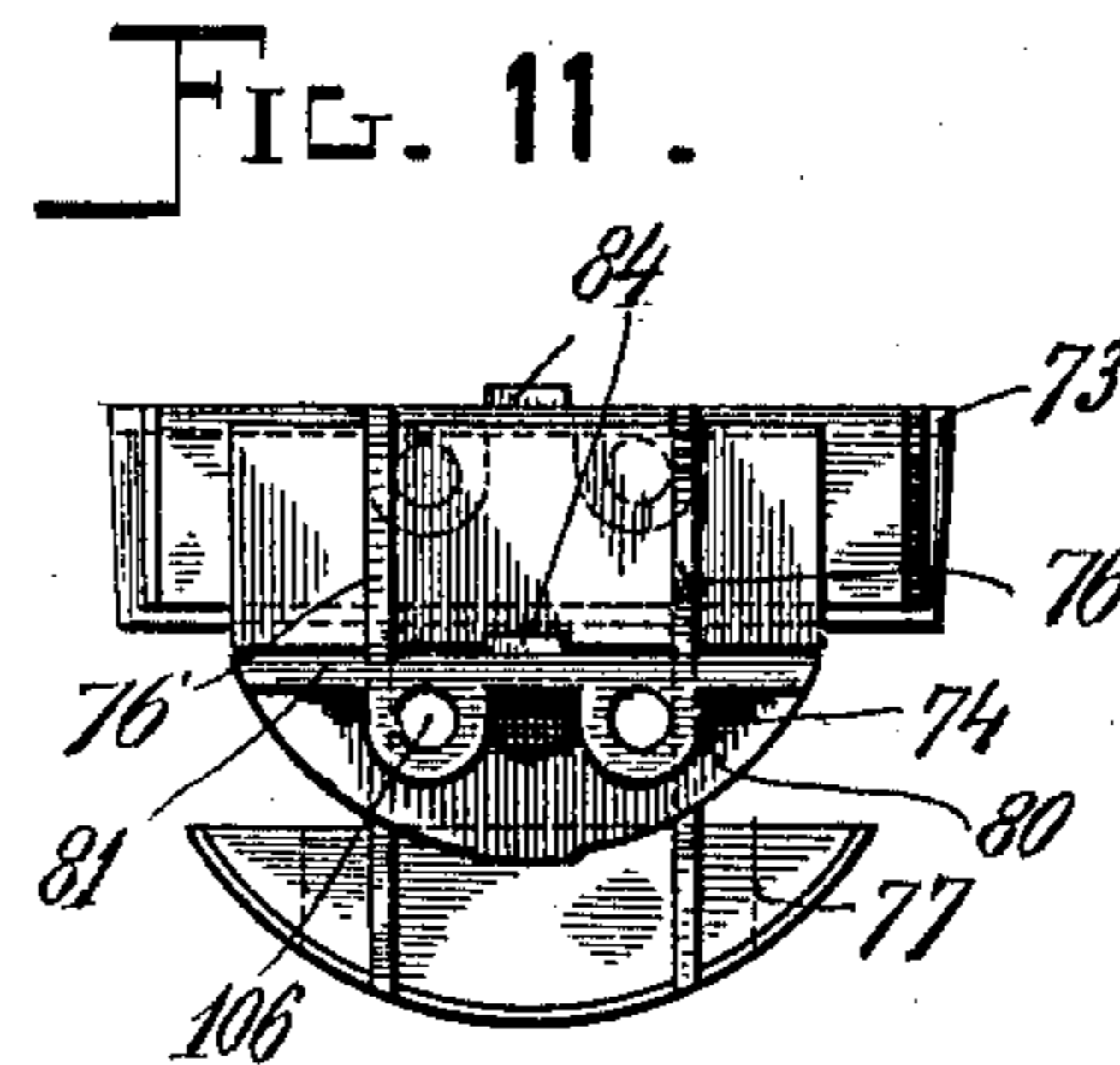
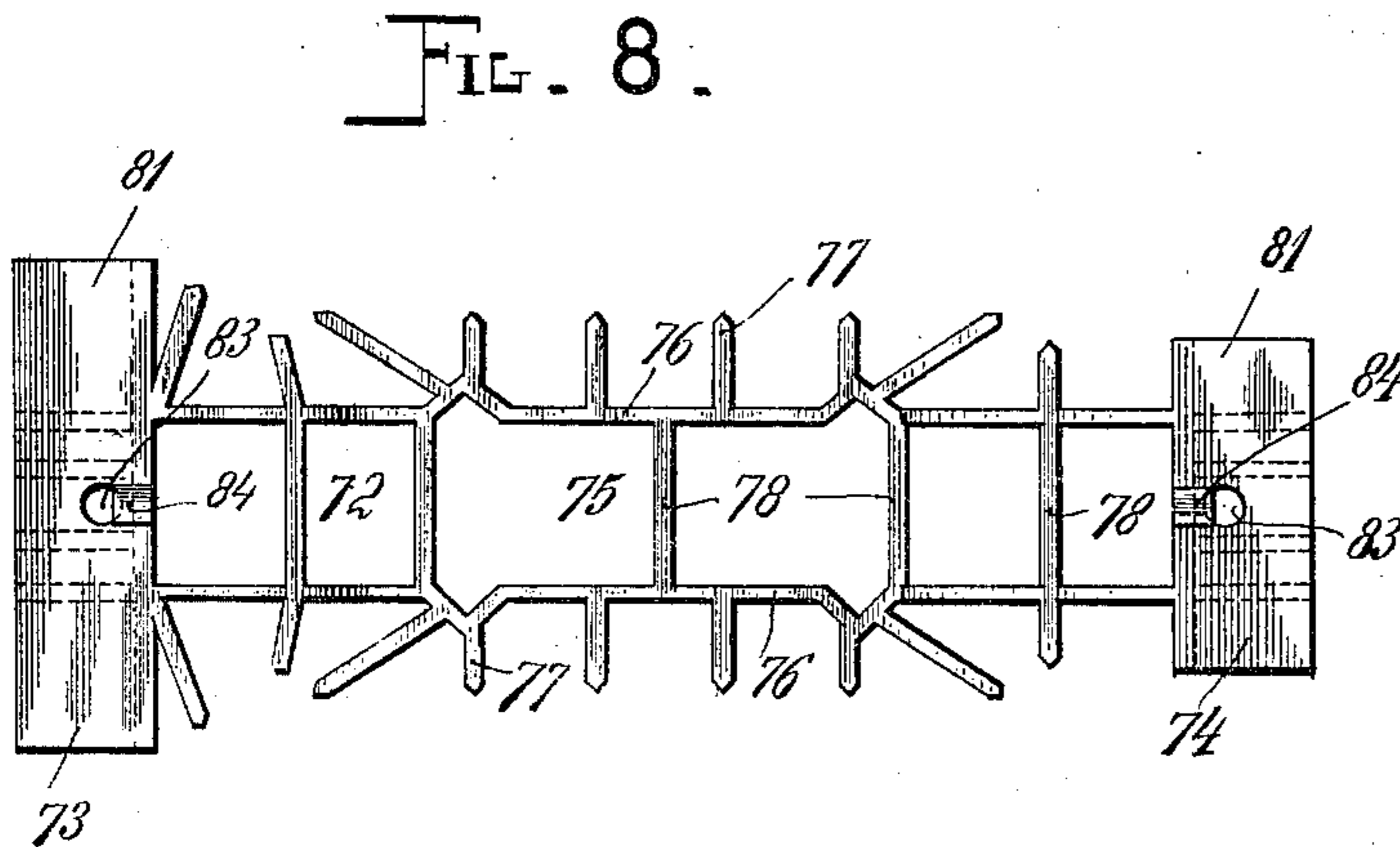
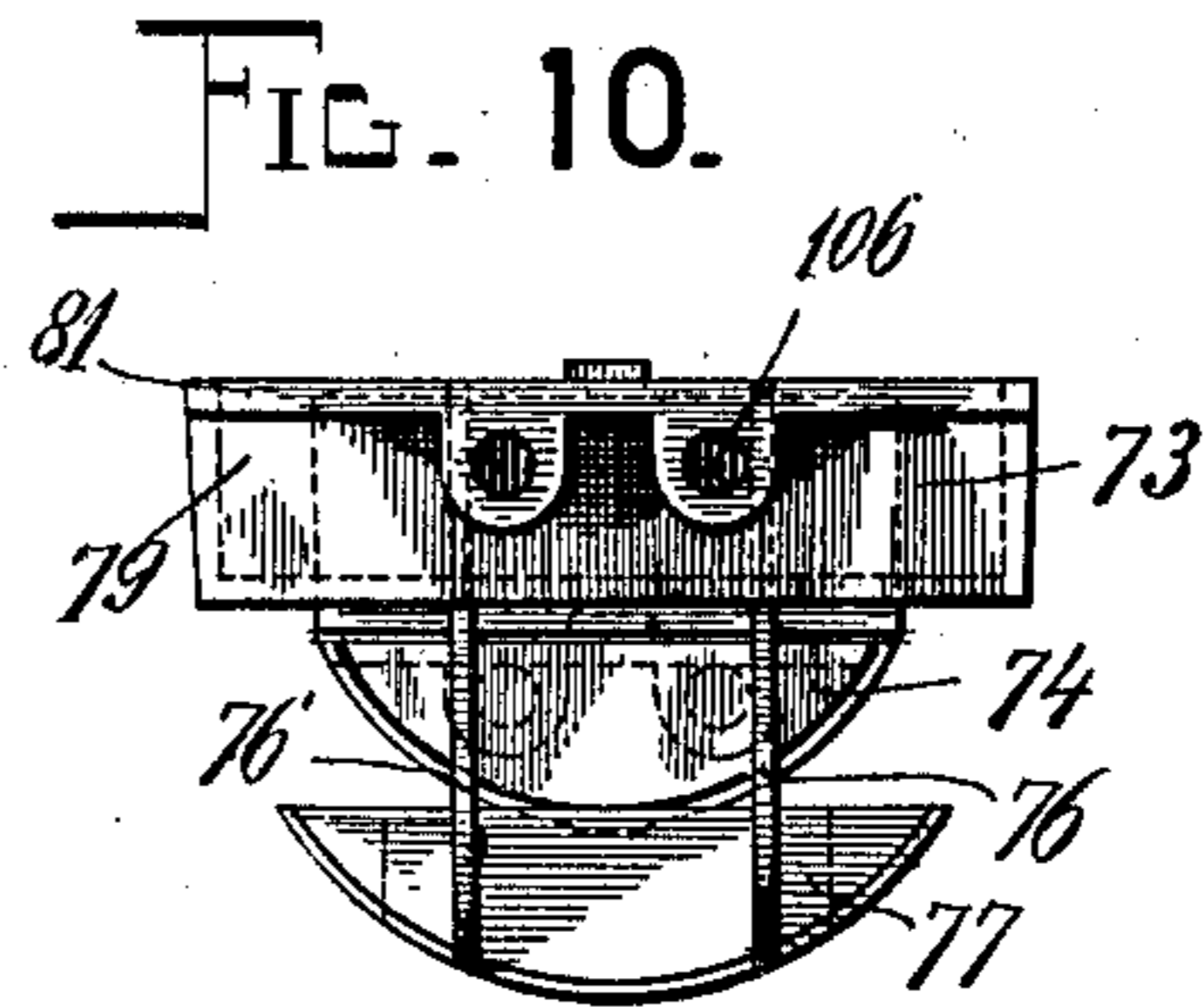
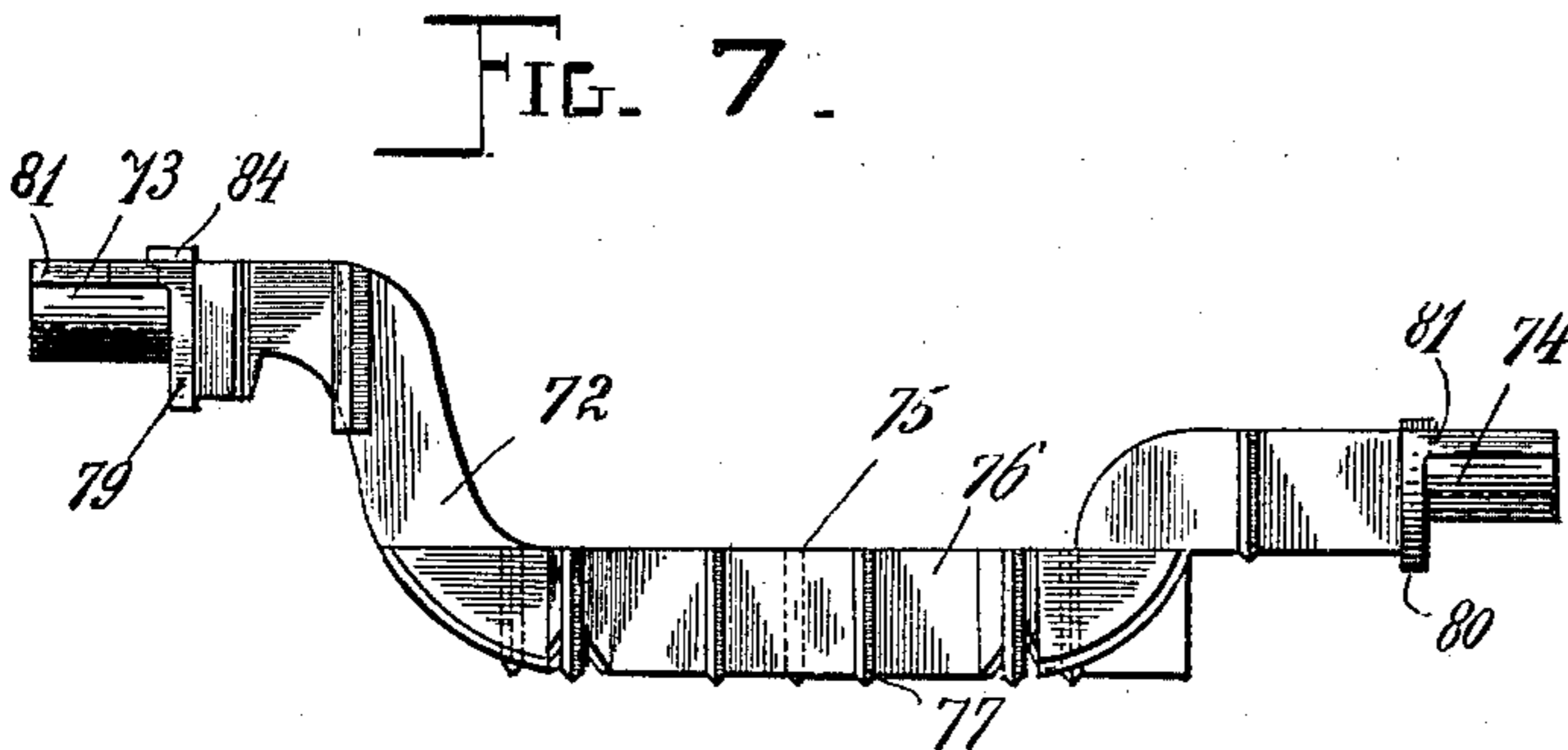
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7 SHEETS—SHEET 5.



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7 SHEETS—SHEET 6.

FIG. 15.

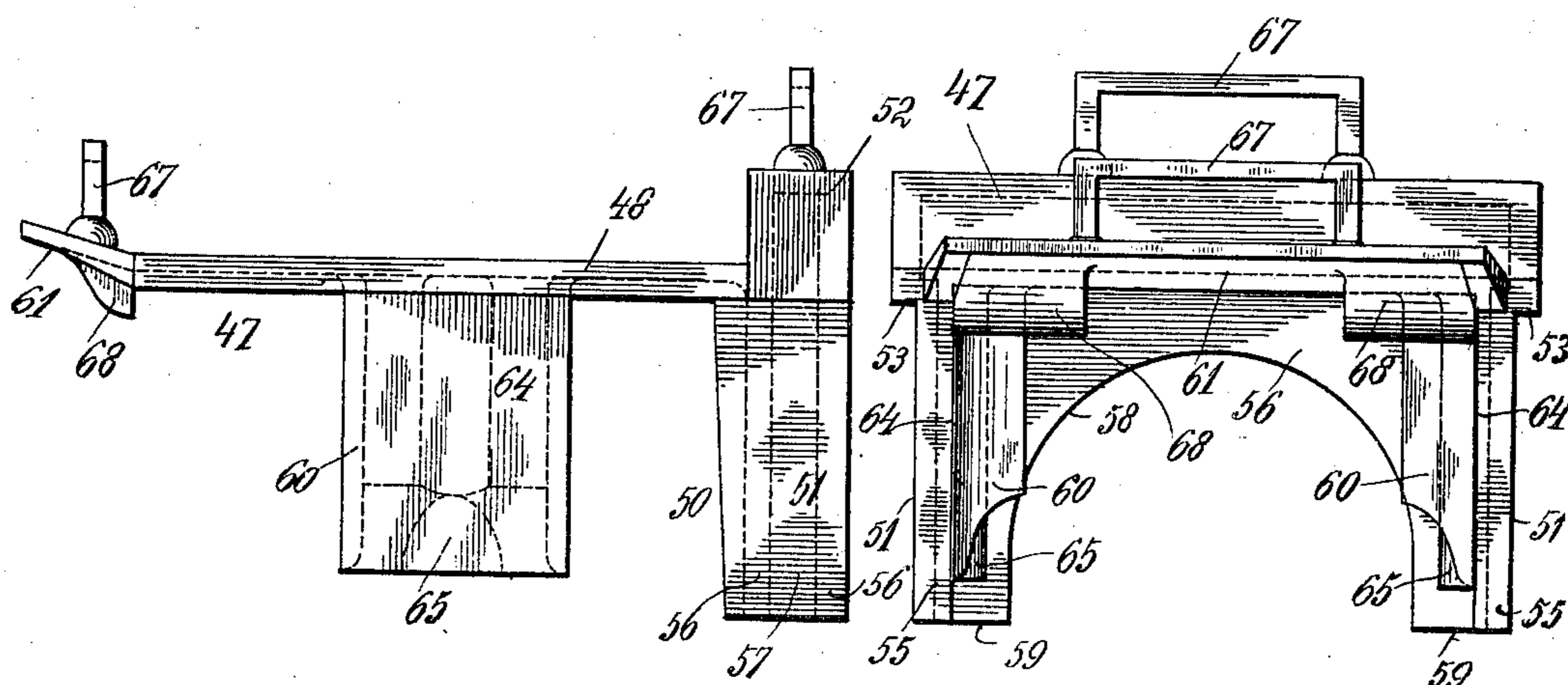


FIG. 16.

FIG. 17.

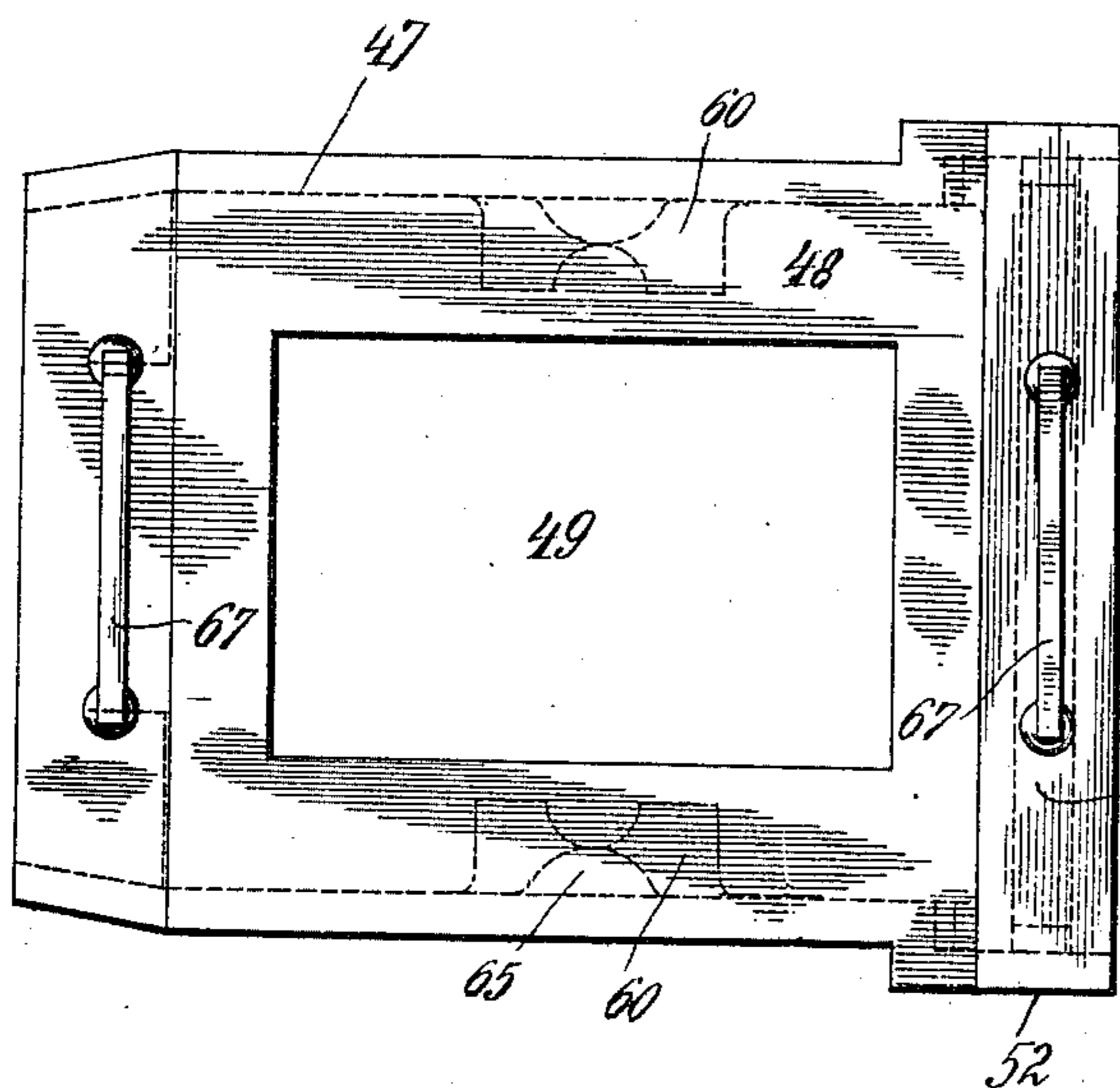
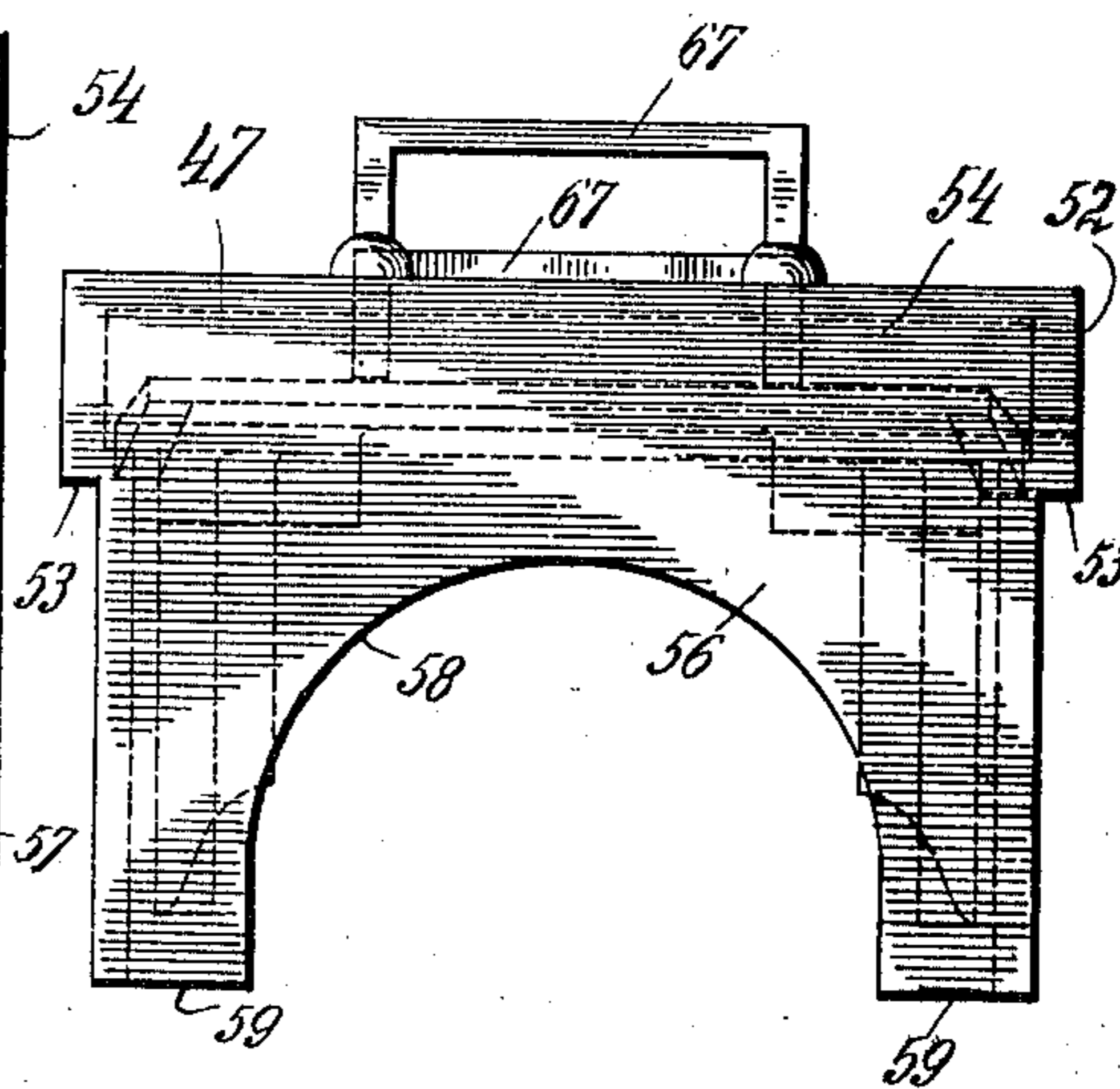


FIG. 18.



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7 SHEETS—SHEET 7.

FIG. 19.

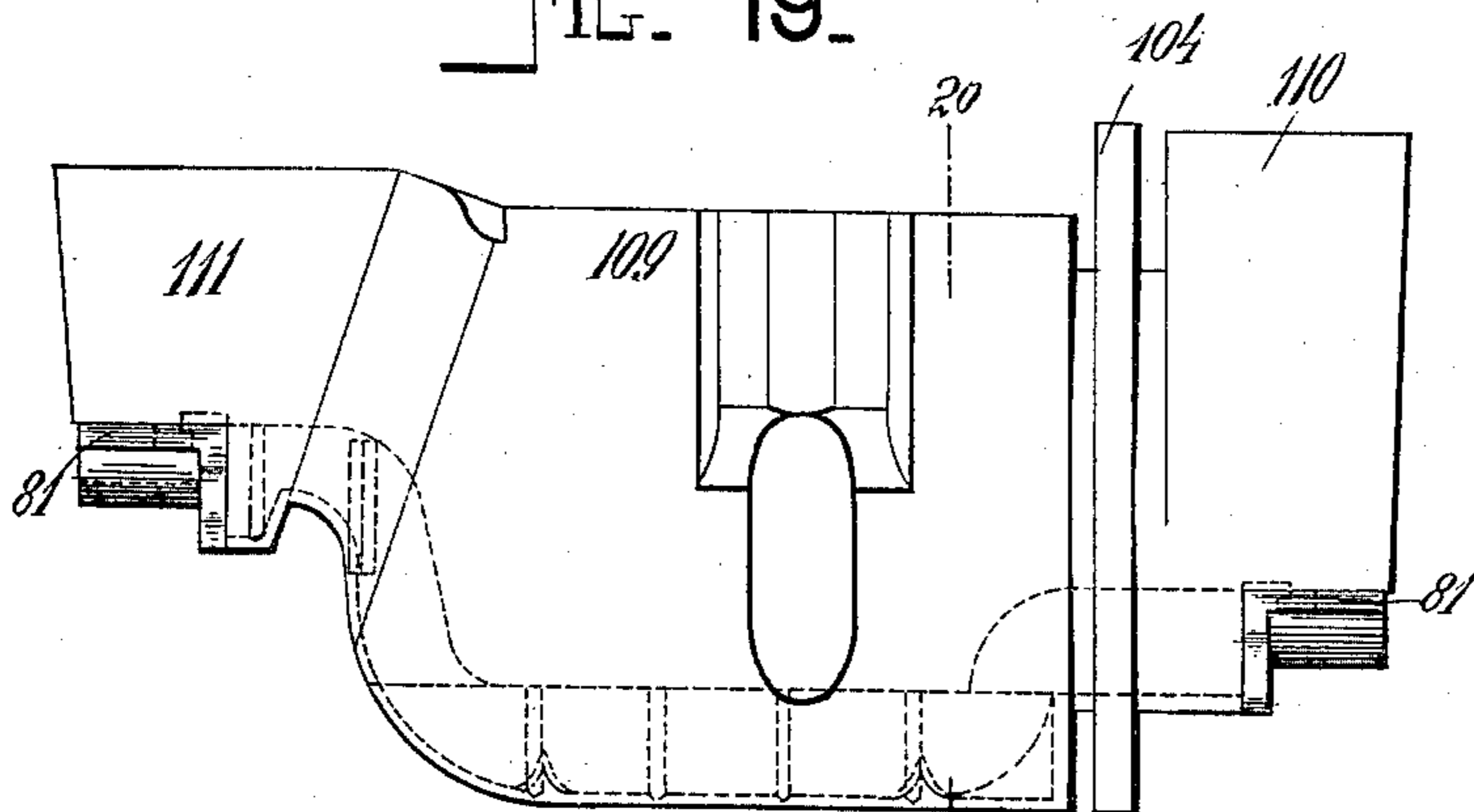


FIG. 20.

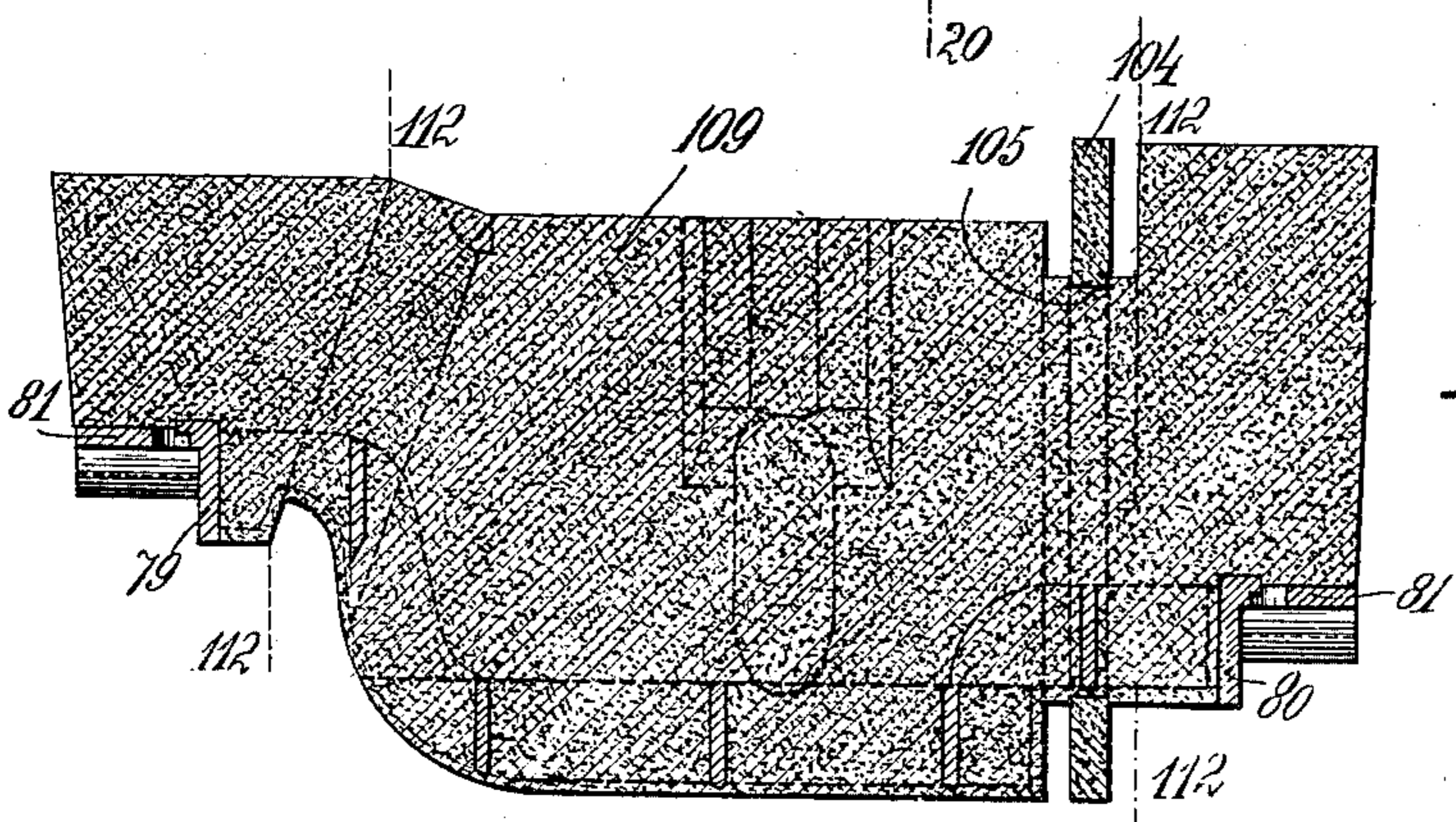
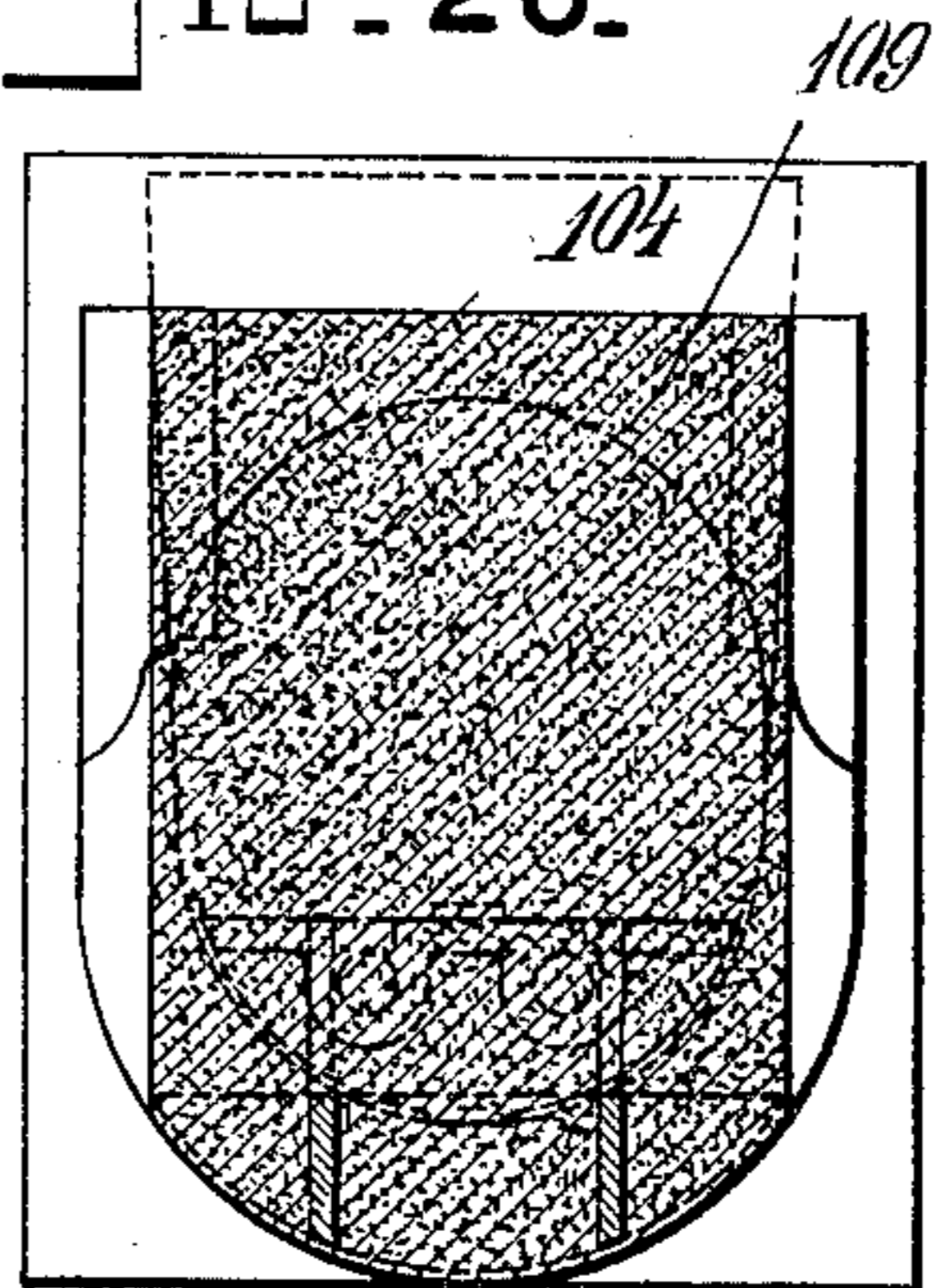


FIG. 21.

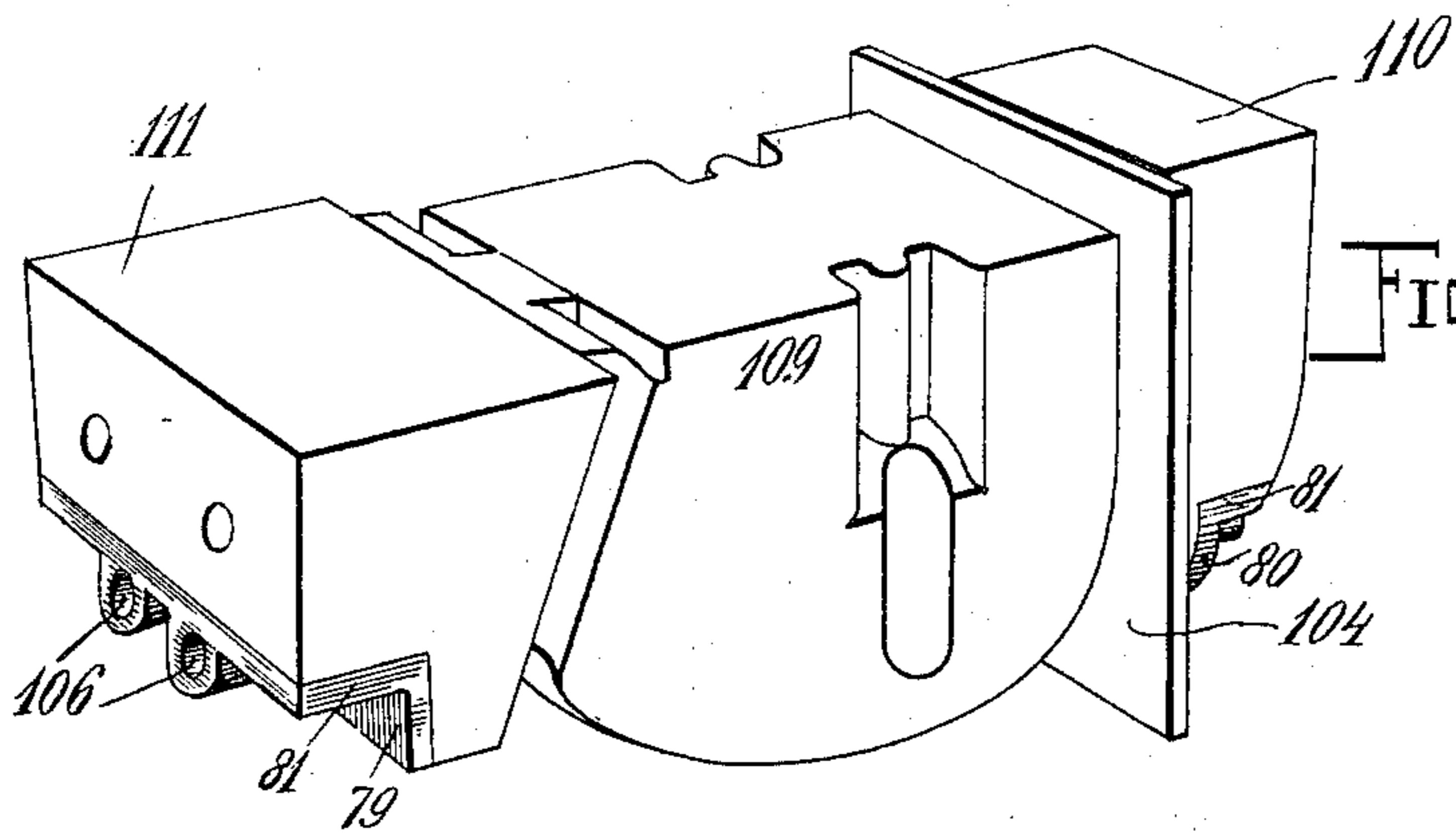


FIG. 22.

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# UNITED STATES PATENT OFFICE.

WILLIAM M. MCCALLUM, OF AMHERST, CANADA.

## CORE-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 736,618, dated August 18, 1903.

Application filed May 19, 1903. Serial No. 157,887. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. MCCALLUM, a subject of the King of Great Britain, residing at Amherst, county of Cumberland, Province of Nova Scotia, Canada, have invented certain new and useful Improvements in Core-Making Machines; and I do hereby declare that the following is 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.

My invention relates to machines for making cores, and is especially adapted for producing the cores which are used in molding axle-boxes or journal-boxes for railway rolling-stock.

The object of the invention is to provide a simple machine for the purpose mentioned which will enable well-formed cores to be produced with great rapidity.

In its general construction the invention comprises a frame upon which there is mounted a movable mold in which the core is formed and certain other movable parts which cooperate with the said movable mold, so as to enable a complete core to be formed therein. An arbor or grid is used in connection with this mold in forming a core, which arbor is embedded in the sand of the core and constitutes a support or frame for the core. An improved arrangement is made for facilitating the removal of the core from the machine and for facilitating its transportation from place to place in the foundry.

The invention consists in the construction and combination of parts to be more fully described hereinafter and definitely set forth in the claims.

In the drawings, which fully illustrate my invention, Figure 1 is substantially a side elevation of the machine, certain parts being broken away, as will appear, to more fully disclose the construction. Fig. 2 is an end elevation of the machine, a portion being broken away, as in Fig. 1. Fig. 3 is an elevation of the end of the machine opposite to that shown in Fig. 2, this view being upon a somewhat-enlarged scale. Certain parts are broken away also in this view, as will appear, to disclose more fully the construction. Fig. 4 is a longitudinal vertical section of the machine upon substantially the same scale as

Fig. 3. Fig. 5 is a plan, a portion of the operating-handle being broken away. Fig. 6 is a perspective representing a movable part of the machine and constituting a portion of the mold in which the journal-box core is formed. Fig. 7 is a side elevation of the aforesaid arbor. Fig. 8 is a plan of this arbor. Fig. 9 is a perspective of the arbor. Fig. 10 is an end elevation. Fig. 11 is an elevation of the end opposite to that shown in Fig. 10. Fig. 12 is a perspective view showing a pair of handles which are used in moving the core after it is finished. Fig. 13 is a perspective of a portion of the machine and a fragment of the said arbor, this view being for the purpose of illustrating the manner in which the arbor is supported when the core is being removed from the machine. Fig. 14 is an elevation of the portion of the machine shown in Fig. 13, as will appear. Fig. 15 is a side elevation of the movable part of the mold shown in Fig. 6. Fig. 16 is an end elevation of this part. Fig. 17 is a plan of this part. Fig. 18 is an elevation of the end of this removable part, showing the end opposite to that shown in Fig. 16. Fig. 19 is a side elevation of the finished core. Fig. 20 is a cross-section of the finished core, taken substantially on the line 20 20 of Fig. 19. Fig. 21 is a longitudinal section of the core. Fig. 22 is a perspective of the core.

Throughout the drawings and specification the same numerals of reference denote like parts.

Referring more particularly to the parts, and especially to Figs. 1 to 5, inclusive, 1 represents the frame of the machine. In its general form this frame constitutes the skeleton or outline of a rectangular box. It comprises a rectangular base 2, of open angular form, as shown, having a horizontal flange 3, and a vertical web 4, passing continuously about its four sides. At the corners of this base there are attached four standards or uprights 5, which are attached, by means of the bolts 6, to the base. These standards are also of angular form, as shown. Their upper extremities terminate in heads 7, and to these heads there is attached a yoke 8. The construction of this yoke should appear most clearly from an inspection of Fig. 5. It should be understood that it consists of an elongated rectangular open member or frame

comprising a pair of oppositely-disposed sides 9 and depressed ends 10, substantially vertical integral extensions 11 lying between the parts 9 and 10, as will appear. It will be observed that the aforesaid vertical extensions 11 are attached to the aforesaid heads 7 by means of suitable bolts 12, and it should also be stated that the corners of the member 8 are preferably rounded, as shown, upon a suitably large radius.

At one side of the base 2 and substantially near the middle point thereof there is attached a column 13, which column is formed below into an expanded foot 14, which affords means for attaching the same to the aforesaid vertical web 4 by means of suitable bolts 15. This column is offset inwardly for a purpose which will appear hereinafter, and it terminates above in an expanded substantially square head or plate 17, the purpose of which will also appear more fully hereinafter. At a point substantially opposite to this column 13 there is attached to the aforesaid base 2 a column 18, which column consists of two upright members 19, which are connected integrally by a web 20, which web affords means for attaching the said column to the aforesaid web 4 of the base by means of suitable bolts 21, as indicated, the manner of attaching this column being substantially the same as that of attaching the column 13, which has just been described. Likewise this column 18 terminates above in a substantially flat horizontally-disposed head 21; but this head differs from the head 17 aforesaid in that it is rectangular in form, as shown, being elongated in a direction transversely of the machine. The purpose and the details of the construction used in connection with these heads 17 and 21 will be described more fully hereinafter. However, it may be stated briefly at this point that these heads afford means for supporting the core when the same is about to be removed from the machine.

At oppositely-disposed points, preferably four in number, as shown, the aforesaid flange 3 of the base 2 is provided with bosses 22, in which are mounted vertical guide-bars 23, the said vertical guide-bars being received above upon bosses 24, which are substantially similar to the bosses 22 and formed upon the under side of the aforesaid yoke 8. It should appear that the said guides 23 are provided with reduced extensions 25, upon which nuts 26 are mounted, as shown. It should be understood that the guide-bars 23 afford means for guiding in a vertical direction the mold 27. The construction of this mold should appear most clearly from an inspection of Fig. 4, where it should appear that it comprises a body 28, which is open above, but which is formed at its sides and bottom on its interior, so as to give the desired shape to the body of the core which is to be formed therein. At its extremities this body 28 is formed integrally with an inner core-print mold 29 and an outer core-print

mold 30. It should be understood that the body of the core is formed within the body 28 of the mold, while the prints of the core are formed in the print-molds 29 and 30 just mentioned. As stated above, the interior of the body 28 is of a form adapted to give the desired shape to the core formed therein, and it should appear that for this purpose the outer portion of the body, near its point of connection with the print-mold 30, is formed into a contracted neck 31, and, further, it should appear that at this point the mold is formed internally, so as to produce two oppositely-disposed inclined shoulders 32 in the manner indicated most clearly in Figs. 4 and 5. The print-mold 30 is of substantially rectangular form, as shown, comprising inclined side walls 33 and an inclined end wall 34. It should appear that this print-mold 30 is formed without any bottom, there being an opening 35 at its lower portion, which opening is adapted to receive nicely the aforesaid head 21 in the manner indicated. The construction of the print-mold 29 is somewhat different from that of the print-mold 30, this difference residing principally in the fact that the bottom 36 of the mold is substantially cylindrical in form, as indicated most clearly in Fig. 3. The sides 37, however, flare or incline outwardly in the same manner as the sides 33 of the print-mold 30. It should appear also that the print-mold 29 is of reduced width, as indicated. It is formed with a square opening 38 in its bottom, which receives nicely the aforesaid head 17, and it will be observed that the said head 17 is given a concave form, so as to conform to and complete the bottom wall of the print-mold, as will be readily understood.

It should appear that just at the point of connection of the inner print-mold 29 with the body 28 of the mold the said body is enlarged laterally, as indicated at 39, at which enlargement the lower portion of the body 28 is provided with an annular flange 40, which projects inwardly therefrom and extends continuously across the bottom thereof. This flange ends abruptly at each side in substantially horizontal faces 41. It should appear also from Figs. 4 and 5 that this flange 40 is disposed so as to cooperate with the end wall 42 of the body 28 in such a manner as to form a deep recess 43 at this point, the bottom of which recess is substantially in alinement with the bottom of the aforesaid body 28, as indicated in Fig. 4. This recess is for a purpose which will appear hereinafter. It may be stated, however, at this point that it is formed without a bottom. Instead of a bottom it is provided with preferably three transverse webs 44, between which are openings 45 for a purpose which will appear hereinafter. It will be observed that the edge 46 of the aforesaid flange 40 is in substantial alinement with the curved bottom of the print-mold 29, being curved to conform to the same, as indicated in Fig. 5.

In conjunction with the mold constructed substantially as described there is employed a removable member 47, which constitutes, as it were, a cover for the mold. This cover is shown very clearly in Fig. 6 in perspective; but it should be stated that this view represents construction, it should appear that this the cover in an inverted position. As to its cover comprises a substantially flat plate 48, having an opening 49 therethrough, the said plate and opening being of substantially rectangular form, as shown. At its inner edge this plate is formed with a laterally-projecting head 50, a portion 51 of which lies below the plate when in its normal position and a portion 52 of which lies above the plate when in its normal position. It should be observed that the width of this plate is enlarged adjacent to the location of its head, as indicated at 53, the said enlargement 53 being for a purpose which will appear hereinafter. It will also be observed that the width of the portion 51 of the head is somewhat less than the width of the head 52, whereby oppositely-disposed shoulders 54 are formed. The opposite upright edges of the portion 51 of the head are reinforced or enlarged, as indicated at 55, and this head is formed therebetween with two webs 56, disposed close together in such a manner as to form a deep recess 57 between them. It should be stated that the edges 58 of these webs 56 are formed substantially upon a curve, which is preferably an arc of a circumference. The lower portion 51 of the head 50 terminates in the flat oppositely-disposed substantially horizontal faces 59, as indicated. At oppositely-disposed points the plate 48, substantially at its middle portion, is provided with extensions 60, which are of the form shown, and at the outer edge the plate 48 is provided with an upwardly-turned extension 61. It should be understood that the cover 47 is intended to be applied to the body 28 in the manner indicated in Fig. 4, and when applied in this manner it will appear that the aforesaid portion 51 of the head 50 is adapted to be received in the recesses 62, which are formed in the aforesaid enlargements 39 of the body. This portion of the head projects downwardly within the recesses, as will be readily understood, the faces 59 aforesaid resting upon the aforesaid faces 41 of the body. When applied in this manner, it should be understood that the recess 57 is brought into alinement with the recess 43, which latter recess is formed within the body of the mold in the manner already described. In this way it will appear that the recesses 43 and 57 unite to form an enlarged recess, and the recess which they form, it should be understood, is intended to receive a dry-sand core member which is used in making the core. This member will be described later. It will be observed that the shoulders 54 aforesaid are directly above the enlargements 39 of the body, and it should be stated

that in its outline the cover 47 conforms substantially to the outline of the upper portion of the mold-body 28. In this connection it should appear that the upturned edge extension 61 also conforms to the upper edges of the mold-body, which are inclined upwardly at this point, as indicated at 63. As shown in Fig. 4, the extensions 60 after the cover is applied project downwardly within the mold-body 28, and it should appear that these extensions are formed with flat outer faces 64, which faces rest against the inner sides of the walls of the mold, as will be readily understood. It should be stated that these extensions are for the purpose of shaping the core at this point so as to form lugs which will afford means for holding the brasses of the journal-box in position within the box. As indicated in Fig. 4, they terminate below in bosses 65, which bosses when the cover is in place are adapted to lie above and conform in outline with a pair of bosses 66, which are disposed oppositely within the body 28 in the manner shown. It should be stated that these bosses 66, together with the bosses 65, are for the purpose of producing corresponding bosses in the journal-box in order to receive the bolts which will secure the axle-box to the truck-frame. For the purpose of facilitating the removal and the placing of the cover 47 the said cover is provided upon its upper side with handles 67, as indicated. The upturned edge 61 aforesaid is provided on its lower side with a pair of oppositely-disposed lugs 68, which are for the evident purpose of shaping the core so as to form means at this point for attaching the cover of the axle-box.

As stated above, the aforesaid guide-bars 23 are for the purpose of vertically guiding the aforesaid mold 27. To this end the body 28 of the mold is provided at opposite points with webs or wings 69, which wings project laterally from the body, as shown, and terminate, respectively, above and below in bosses 70, which bosses have openings 71, through which the aforesaid guide-bars 23 pass. The manner of supporting the mold and of operating the same in order to make and remove the core therefrom will be described hereinafter.

It should be understood that when the core is to be made the grid or arbor 72 is brought into use. The construction of this arbor is very clearly shown in Figs. 7 to 11, inclusive. It should be stated that it is preferably made of iron or similar material and of the form shown, it appearing that it comprises heads 73 74, formed integrally with a body 75, as shown. This body consists of two oppositely-disposed parallel webs 76, from the outer side of which spurs 77 project, and these webs 76 are connected by shorter webs 78, disposed at suitable distances apart in the manner indicated.

It should be understood that the arbor 72 is intended to be placed within the mold in the manner shown in Fig. 4, the heads 73 and

74 of the arbor being supported upon the heads 17 and 21 aforesaid, and it should appear that when set in the mold in the manner indicated the body 75 of the arbor is adapted to conform substantially to the shape of the interior of the adjacent parts of the mold. The heads 73 and 74 of the arbor comprise vertical webs 79 and 80, having integral flanges 81, which flanges are substantially horizontal, as shown. Arrangement is made for securing the arbor 72 in position upon the aforesaid heads 17 and 21. To this end the said heads are provided with locking-studs 82, which studs project upwardly above the heads, as shown, and the flanges 81 aforesaid are provided with openings 83, which are adapted to receive the studs 82 in the manner shown in Fig. 4, and it will appear that on their inner edges these openings are provided with inwardly-projecting lips 84, which lips, it may be stated, are instrumental in enabling the studs 82 to lock the arbor 72 in position. For this purpose the upper extremities of the said studs are provided with helical grooves 85, which are adapted to receive the aforesaid projecting edges of the lips 84 in the manner indicated. It will be observed that the diameter of the said studs 82 is substantially the same as the openings 83, and for this reason in order to enable the upper extremities of the studs to pass the lips 84 the upper extremities of the said studs are mutilated, as shown, in such a manner as to produce the flat faces 86. It will be understood that when the studs are turned into such position as will throw the said faces 86 into substantial parallelism with the edges of the lips 84 the studs will then pass through the openings, after which when the studs are rotated the inclination of the helical grooves affords means for clamping the heads 73 and 74 in position. The parts contiguous to those which have just been described and the parts themselves are most clearly shown in Figs. 13 and 14. It will appear that the said studs 82 are provided below with handles 87 for the purpose of turning the same. In this connection stop-pins 88 are provided, which are adapted to arrest the handles 87 in the proper position to allow the passing of the studs through the openings 83, as will be readily understood. It should appear that while the lower edge of the web 79 is substantially straight, so as to conform to the upper surface of the head 21, it will be observed that the web 80 is rounded or curved, as indicated at 89, so as to conform to the aforesaid concave shape of the upper face of the head 17.

As stated, the aforesaid arbor 72 constitutes a support or body for the core when the same has been formed, it being understood that the arbor lies within the body of the core, as indicated most clearly in Figs. 19 to 22, inclusive. The manner of filling the mold to form the core will be described later; but it should be stated at this point that after the core is completely formed the cover 47 aforesaid is

removed from the mold, whereupon the inner mold is then disposed in such a manner as to leave the arbor supported between the heads 17 and 21. The arbor and core may then be removed and are ready for use in the operation of molding the axle-box.

The arrangement for depressing the mold in the manner indicated and also for supporting the same in its normally elevated position comprises a shaft 90, disposed longitudinally of the machine and rotatably supported in the base 2 of the frame. As shown, this shaft passes through the webs 4 at opposite points, which webs are expanded at this point to receive the same in the manner shown. The shaft 90 is fixed against longitudinal movement by means of a collar 91, disposed at one side of the base, and a collar 92, disposed at the opposite side of the base, as shown. Near its extremities the shaft 90 carries rigidly the arms 93, which are attached, by means of suitable pins 94, to pitmen or connecting-rods 95, which pitmen are pivotally mounted at their upper extremities upon studs 96, which studs are integral with and project laterally over the end walls of the aforesaid print-molds 29 and 30. Cap-plates 97 may be used in connection with the studs, being held in place by machine-screws 98, as indicated. At one extremity the aforesaid shaft 90 carries rigidly a handle 99, which handle is for the purpose of raising and lowering the mold in a manner which will be readily understood. Evidently by moving this handle the shaft 90 could be rotated so as to swing the arms 93 downwardly in such a manner as to depress the mold. The dotted lines shown in Fig. 4 indicate the parts in the position which they would assume when the mold is depressed. As shown in Fig. 2, the collar 92 aforesaid is provided with a dog 100, which dog is adapted to rest against a fixed pin 101 when the handle or lever 99 has been thrown into the position which it would assume when the mold is elevated, it being understood that in this manner the pin 101 prevents further rotation of the handle, so that the arms 93 afford means for supporting the mold upon the pitmen 95, as will be readily understood. It should appear that the pitmen 95 are laterally curved or bent, as shown in Figs. 2 and 3.

The entire machine is suitably supported upon three wheels or rollers 102, two of which are disposed on the same side of the machine, as indicated, all of the said rollers being properly mounted in bosses or lugs 103, provided for that purpose. There being three of these wheels, the stability of the machine is insured whatever be the condition of the floor upon which it rests.

The manner of making the core will now be described. This operation involves the use of an auxiliary core 104, which is made previously of dry sand. As indicated in Figs. 19 to 22, this auxiliary core consists, substantially, of a rectangular piece having an opening 105 formed through the body of

the same. The arbor 72 having been removed from the mold and the mold being in its elevated position, as shown in Fig. 4, this auxiliary core 104 is placed in the aforesaid recess 43. Then the head 74 of the arbor is passed through the opening 105 and the arbor is secured in position upon the heads 17 and 21 in the manner indicated in Fig. 4. The cover 47 is now applied to the mold in the manner which was described very fully hereinbefore. After the parts of the mold have been placed together in the manner just described the inner mold is then rammed up with green sand, and after this operation is complete the handles 87 are operated so as to release the arbor and so as to carry them out of the path of the print-molds 29 and 30 as the mold descends. The cover 47 of the mold is then removed and the lever 99 operated so as to depress the mold. This leaves the completely-formed core supported between the heads 17 and 21, and the core may now be removed. For the purpose of facilitating the removal of the core the aforesaid flanges 81 of the arbor are provided with horizontal openings 106, which openings are adapted to receive the shanks 107 of handles 108, as will be readily understood, in such a manner as to enable the arbor and the core formed upon and around it to be carried with facility. It should be stated that the peculiar form of the core produced by the auxiliary core 104 is for the purpose of forming a deep recess in the axle-box casting, which recess is intended to receive a dust-guard ring. It should appear from an inspection of Figs. 19 to 22, where the form of the finished core is fully illustrated, that it comprises a body 109, which is formed by the body 28 of the mold, and beyond this body 109 it comprises the prints 110 and 111, which would be formed, respectively, by the print-molds 29 and 30. It will appear from Fig. 21 that the body 75 of the arbor is completely enveloped by the material of the core and that the heads 73 and 74 only are exposed. It should be understood from this arrangement that the molten metal does not come into contact with the arbor, because when the core has been placed within the mold the metal does not touch the core at points beyond the dotted lines 112. In this manner while the body of the arbor constitutes a substantial support or backbone, as it were, for the body of the core it is safely shielded from contact with the molten metal for the reason stated. At a point adjacent to the aforesaid horizontal faces 41, which faces, it will be remembered, support the lower extremities of the head of the cover 47, there are provided openings 113, which are formed in the side walls of the body 28, as shown in Fig. 1, and adjacent to these openings there are openings 114, formed through the wings or webs 69. The presence of these openings 113 facilitates the insertion of a brush or similar instrument for the purpose of cleaning the

faces 41 from sand which may fall thereon and permit the nice positioning of the cover of the mold. This is desirable, for it is well known to molders that where a bad connection is made at the part of the mold fins are produced.

It should be stated that in connection with the operation of making the core vent-holes may be formed within the core by inserting rods through the openings 115, which are formed in the end wall 34 of the aforesaid print-mold 30.

It should be stated that the openings 45 are formed in the bottom of the recess 43 for the purpose of preventing the accumulation of sand in such a manner as to prevent the placing of the auxiliary core 104 in position.

While I have shown in the accompanying drawings the preferred form of my invention, it will be understood that I do not limit myself to the precise form shown, for many of the details may be changed in form or position without affecting the operativeness or utility of my invention, and I therefore reserve the right to make all such modifications as are included within the scope of the following claims or of mechanical equivalents to the structures set forth.

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

1. In a machine of the class described, in combination, a frame, a movable mold, means for guiding said mold upon said frame, said mold having openings in the wall thereof, members rigid with said frame, which may occupy said openings, an arbor, and means for attaching the same to said members, said arbor being adapted to have a core formed thereupon.

2. In a machine of the class described, in combination, a mold adapted to have a core formed therein, and having openings in the wall thereof, fixed members adapted to occupy said openings, an arbor adapted to have a core formed thereupon, means for attaching said arbor to said fixed members, and means for depressing said mold.

3. In a machine of the class described, in combination, a mold adapted to have a core formed therein, and having openings in the wall thereof, fixed members, said mold having an elevated position in which said fixed members occupy said openings, an arbor adapted to have a core formed thereupon, said arbor being adapted to rest upon said fixed members and lie within said mold, means for depressing said mold, and a removable cover for said mold.

4. In a machine of the class described, in combination, a mold adapted to have a core formed therein, and having openings in the bottom wall thereof, fixed members which may occupy said openings, an arbor adapted to be placed within said mold, and resting upon said fixed members, said arbor conforming substantially with the outline of the lower

portion of said mold, a movable cover for said mold, and means for depressing said mold.

5. In a machine of the class described, in combination, a frame, a mold adapted to have  
5 a core formed therein, means for vertically guiding said mold upon said frame, said mold having openings in the bottom wall thereof, members rigid with said frame, and adapted to occupy said openings when said mold is in  
10 an elevated position, said members being adapted to support a core formed within said mold, when said mold is depressed.

6. In a machine of the class described, in combination, a movable mold having open-  
15 ings in the wall thereof, fixed members which may occupy said openings, a member adapted to be supported between said fixed members, said last member having openings there-through, and locking-studs carried by said  
20 fixed members, and cooperating with said latter openings.

7. In a machine of the class described, in combination, a movable mold having open-  
25 ings in the wall thereof, fixed members which may occupy said openings, studs projecting into the interior of said mold from said fixed members, an arbor adapted to be received within said mold, and means for attaching said arbor to said studs.

8. In a machine of the class described, in combination, a mold having openings in the wall thereof, fixed members which may oc-  
30 cupy said openings, studs carried by said fixed members, said studs having mutilated heads and helical grooves, an arbor carried between said fixed members, and adapted to have a core formed thereupon, said arbor having openings adapted to receive said mu-  
35 tilated heads, said studs being rotatable, whereby said grooves afford means for lock-  
40 ing said arbor to said fixed members.

9. In combination, a member constituting the body of a mold, and adapted to have a core formed therein, a removable member co-  
45 operating with said body and constituting a portion of said mold, said body and said removable member having abutting faces within the interior of said mold, there being open-  
50 ings through said mold adjacent to said abutting faces, whereby said faces may be cleared of sand.

10. In combination, a member constituting the body of a mold, a removable member coop-  
55 erating therewith, and constituting a portion of said mold, said body and said removable member having inwardly-projecting portions extending toward the interior of said mold and having faces adapted to abut, said body having an opening in the wall thereof adja-  
60 cent to said abutting faces.

11. In a machine of the class described, in combination, a frame, vertical guide-bars car-  
ried thereby, a mold movably mounted upon said guide-bars, a shaft, means whereby ro-  
65 tation of said shaft may depress said mold, said mold having openings in the bottom thereof, and columns carried by said frame, the upper extremities whereof may occupy said openings.

12. In a machine of the class described, in combination, a frame, substantially vertical  
70 guide-bars carried thereby, a mold movably mounted thereupon, means for raising and lowering said mold, said mold having open-  
75 ings in the bottom thereof, and columns carried by said frame, the extremities whereof may occupy said openings.

13. In a machine of the class described, in combination, a substantially rectangular  
80 frame comprising standards, an upper frame member attached to said standards, vertical guide-bars, the upper extremities whereof are attached to said upper frame member, a mold movably mounted upon said guide-bars, and  
85 having openings in the bottom wall thereof, columns constituting a portion of said frame, and adapted to occupy said openings, and means for raising and lowering said mold.

14. In a machine of the class described, in combination, a substantially rectangular  
90 base, standards attached substantially at the corners thereof, a yoke attached to said standards, and extending continuously about said machine, substantially vertical guide-bars at-  
95 tached to said base and yoke, a mold movably mounted upon said guide-bars, and having openings in the bottom wall thereof, columns attached to said base, the extremities where-  
100 of may occupy said openings, and means for raising and lowering said mold.

15. In a machine of the class described, in combination, a frame, a mold, means for  
guiding said mold substantially vertically upon said frame, said mold having openings  
105 in the bottom wall thereof, fixed members constituting a portion of said frame and which may occupy said openings, an arbor adapted to be supported upon said fixed members, means for attaching said arbor thereto, and  
110 removable handles adapted to be attached to said arbor for removing the same, said arbor being adapted to have a core formed thereupon.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WILLIAM M. McCALLUM.

Witnesses:

JAMES W. McCALLUM,  
DAVID WHITE.