

No. 785,882.

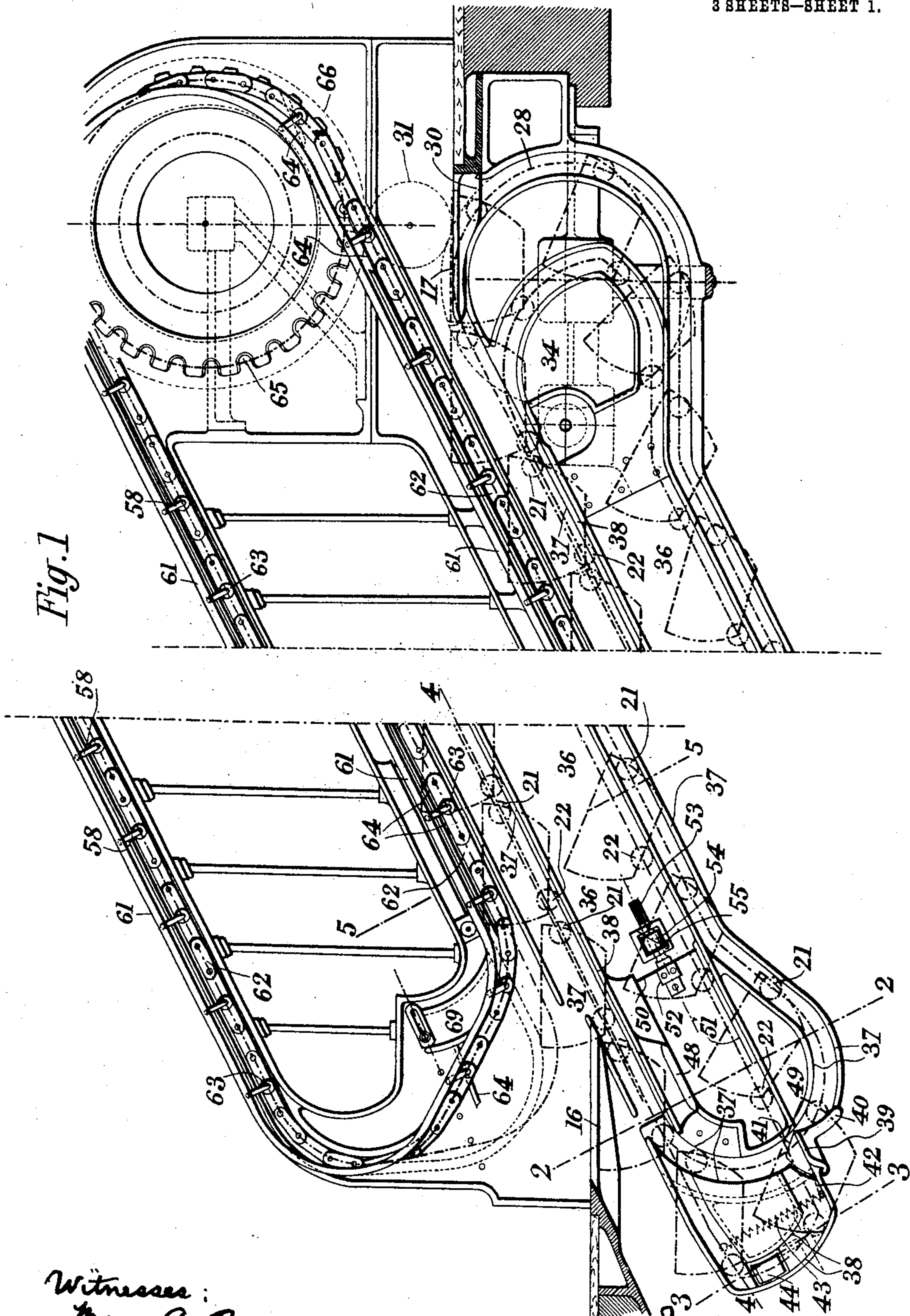
PATENTED MAR. 28, 1905.

E. L. HOCQUART.
TRAVELING STAIRCASE OR THE LIKE.

APPLICATION FILED MAR. 18, 1904.

3 SHEETS—SHEET 1.

Fig. 1



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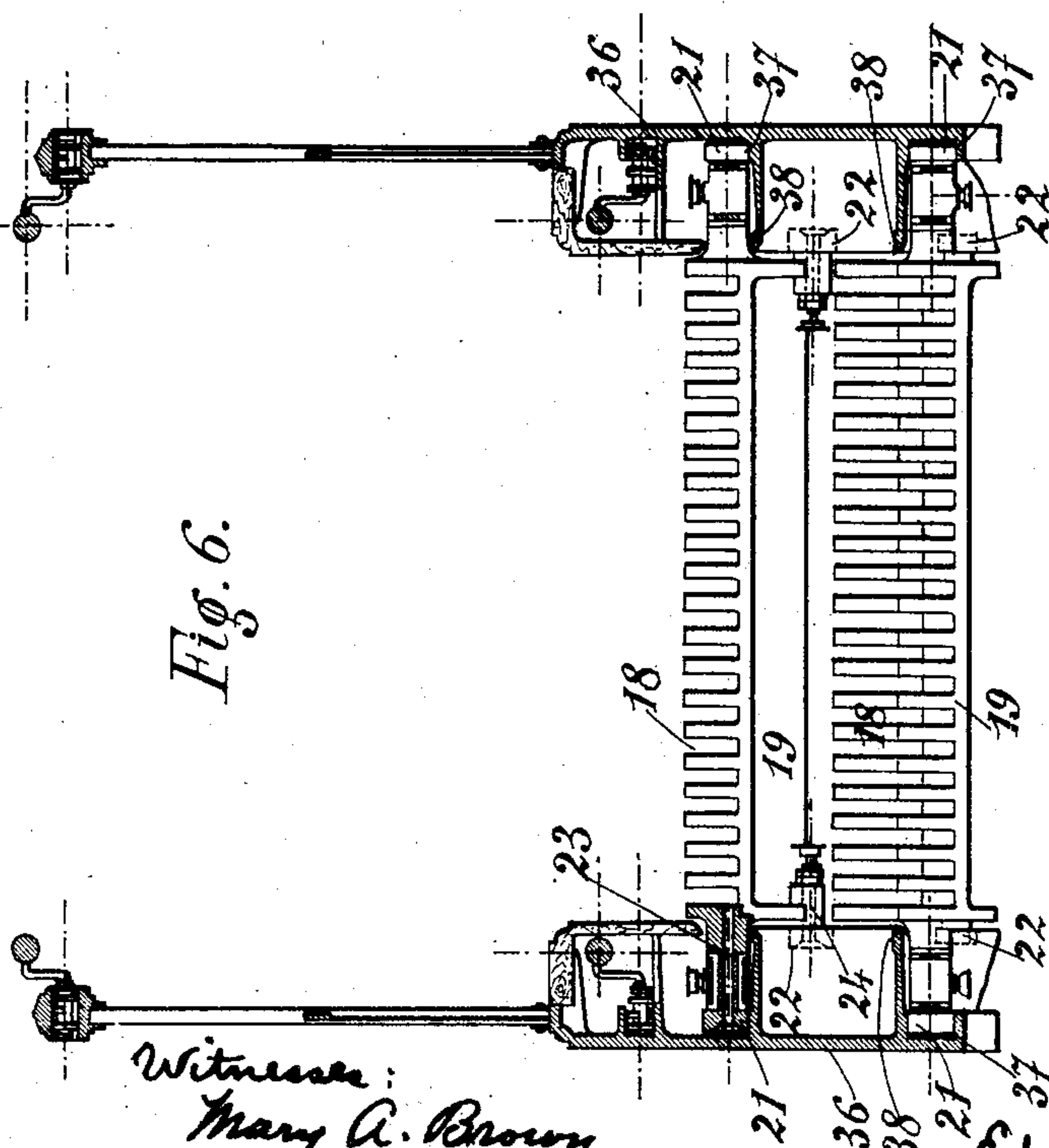
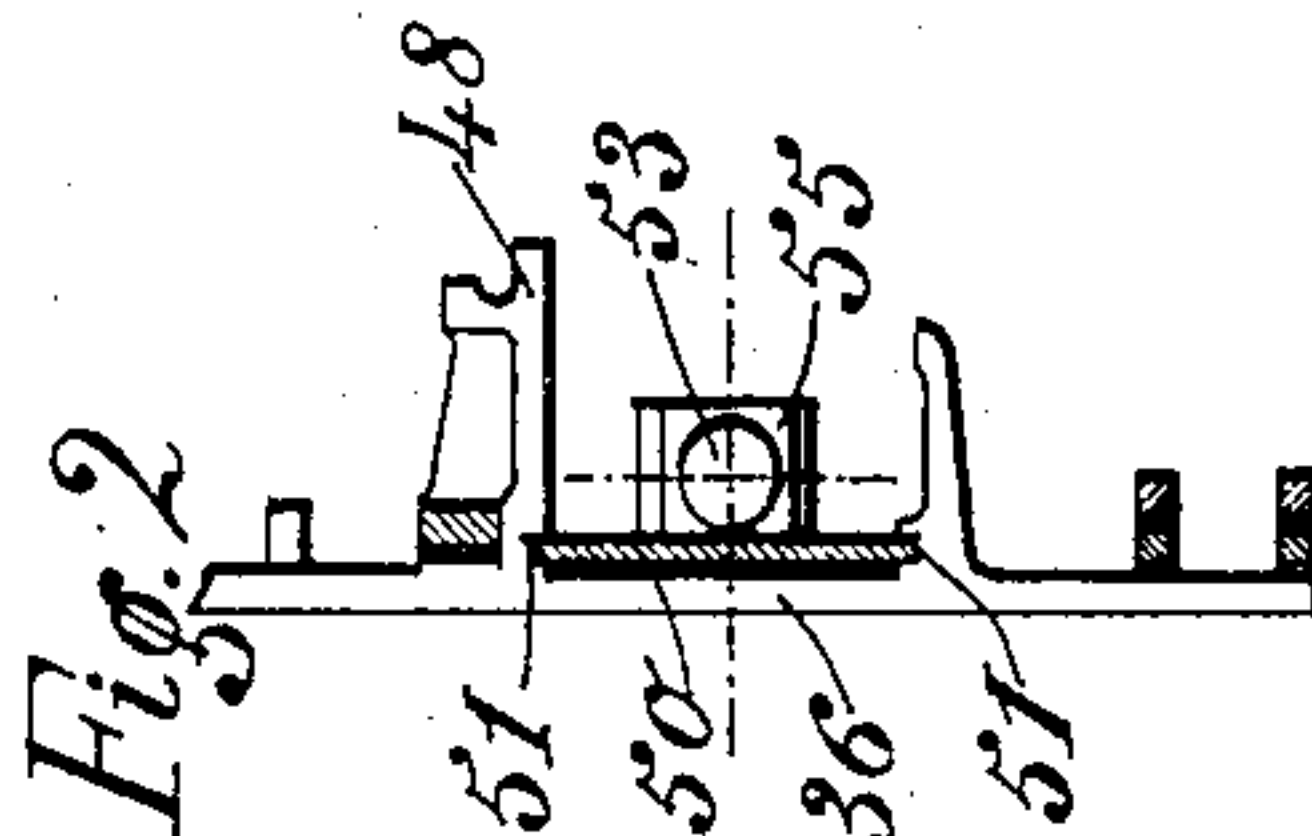
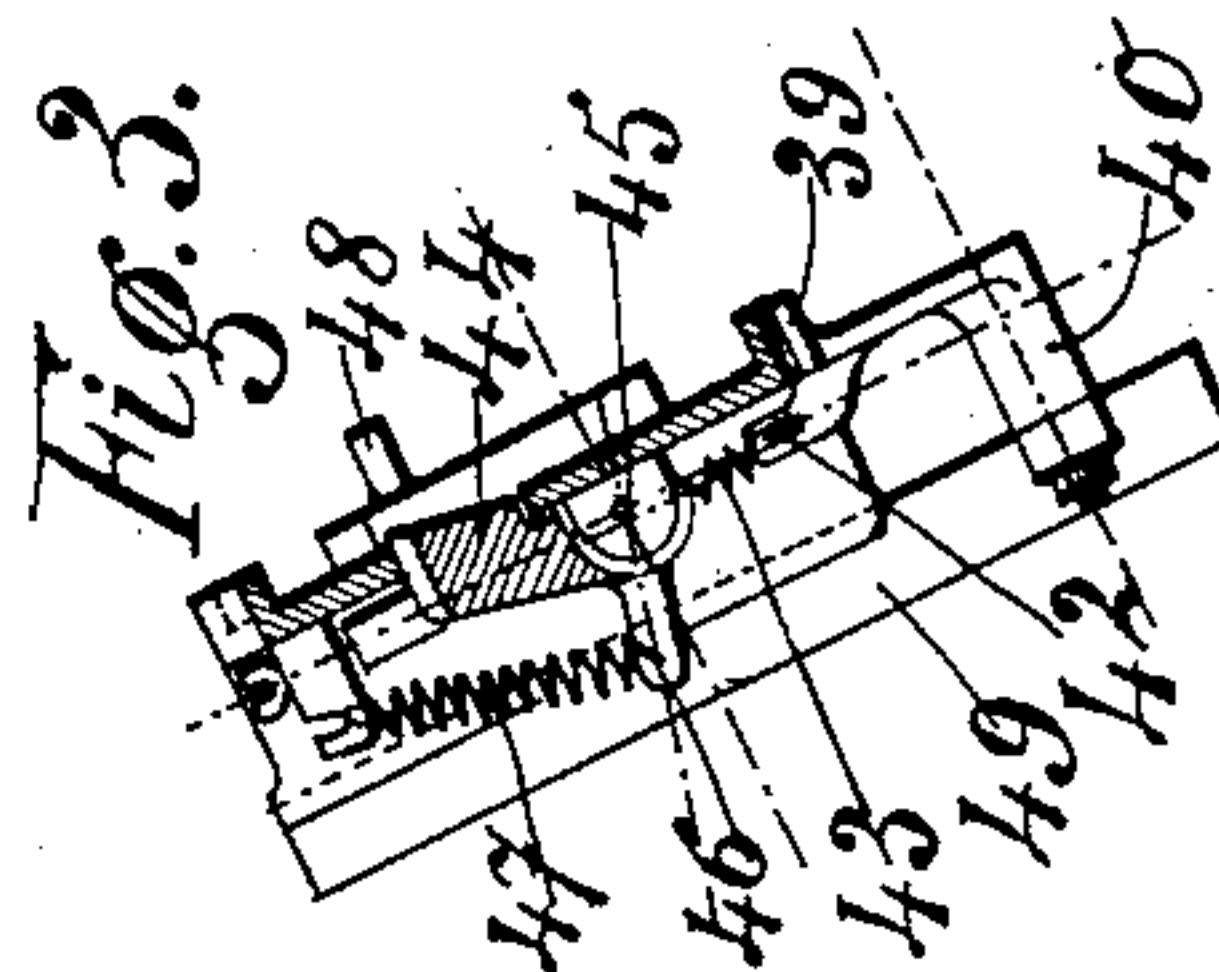
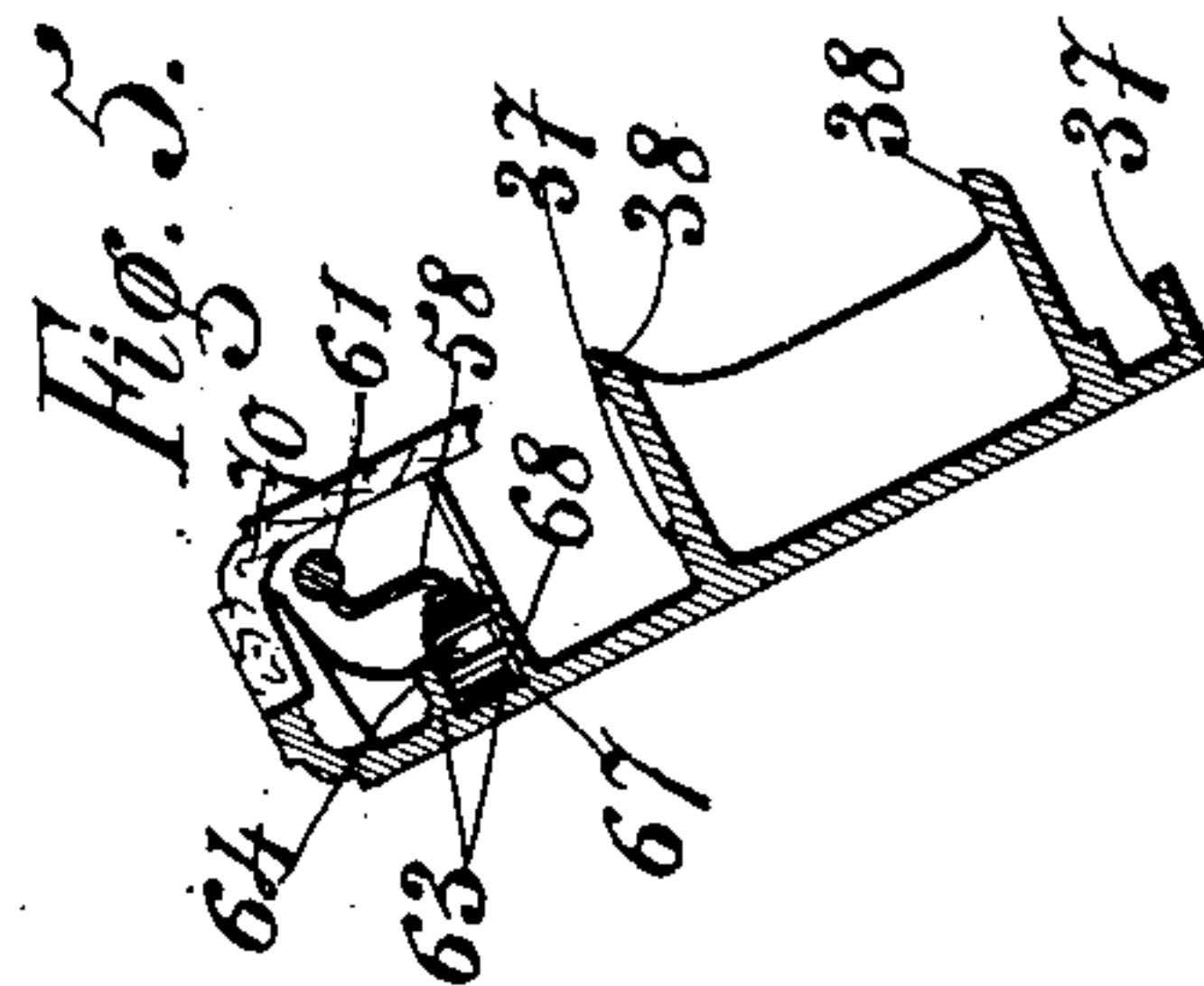
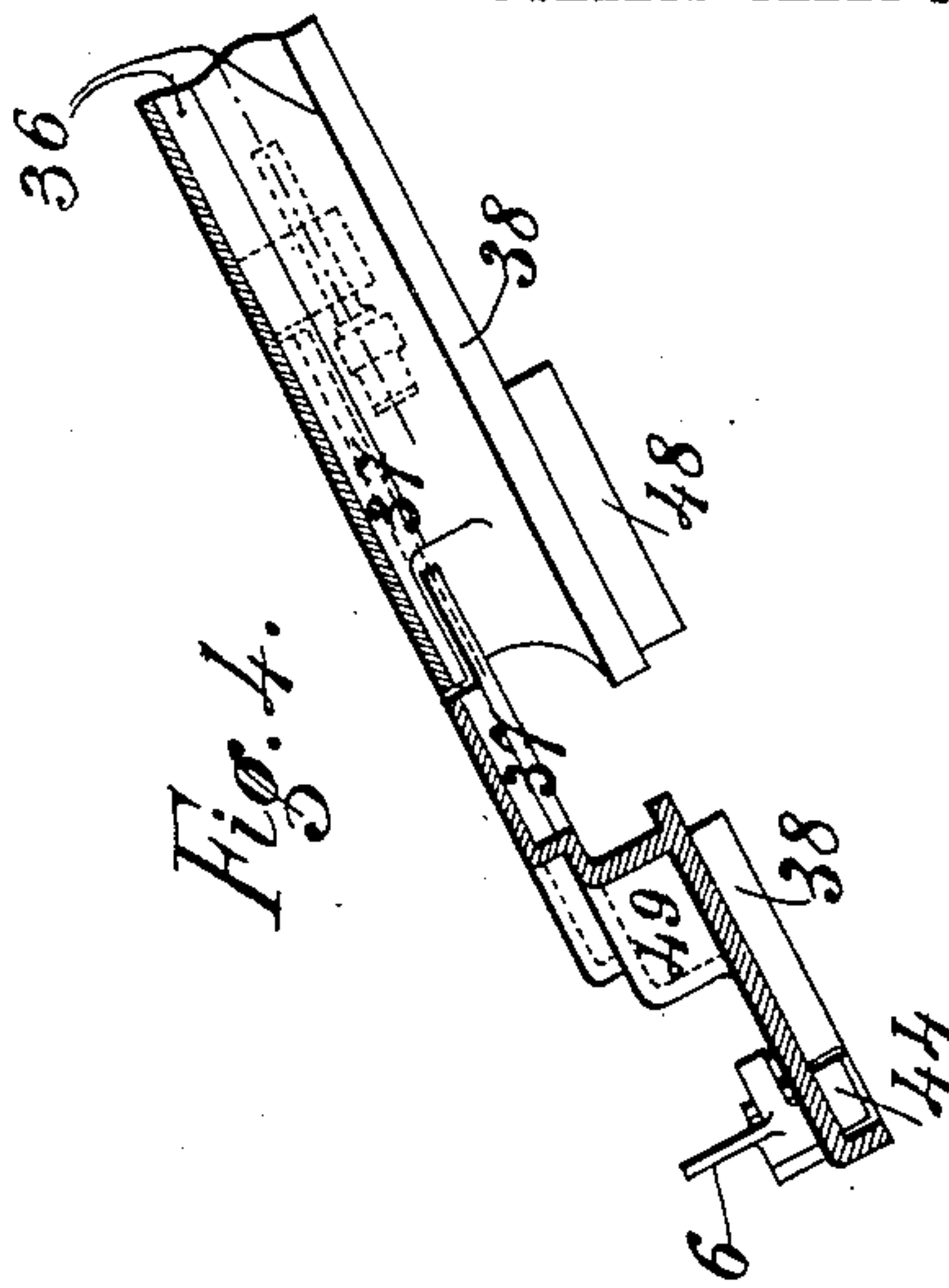
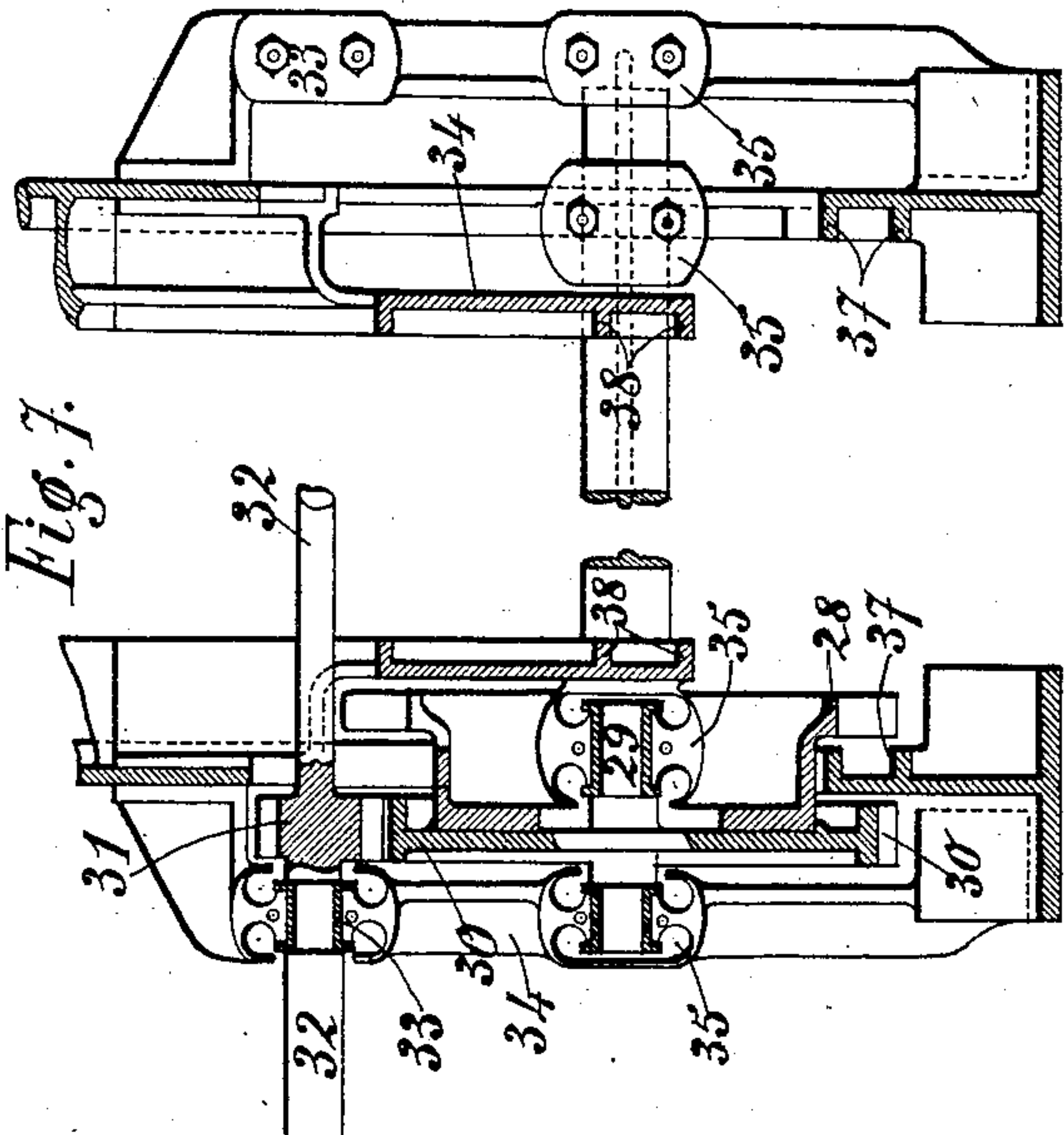
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3 SHEETS—SHEET 2.



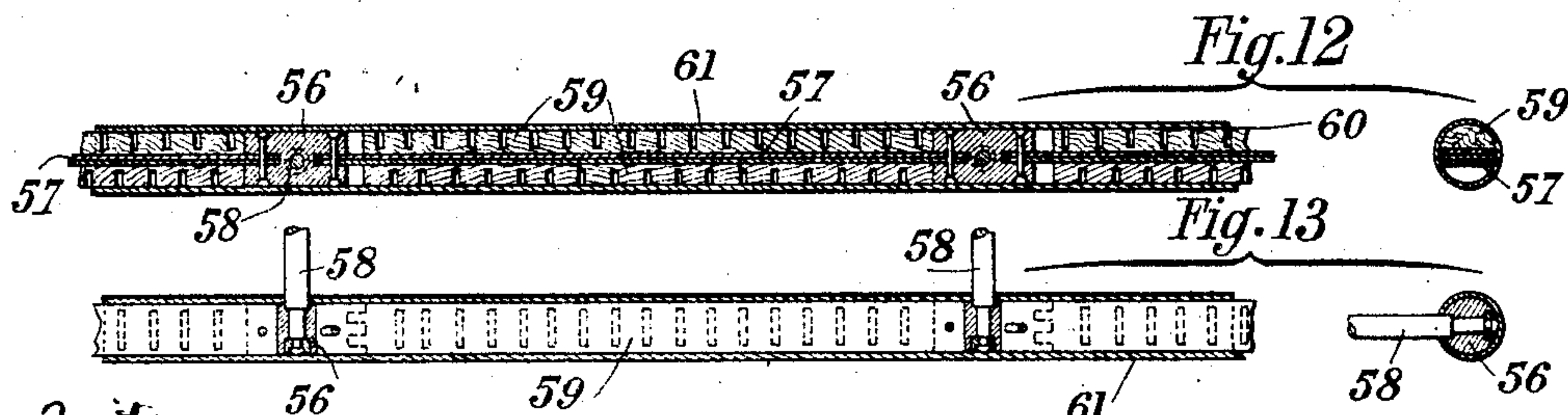
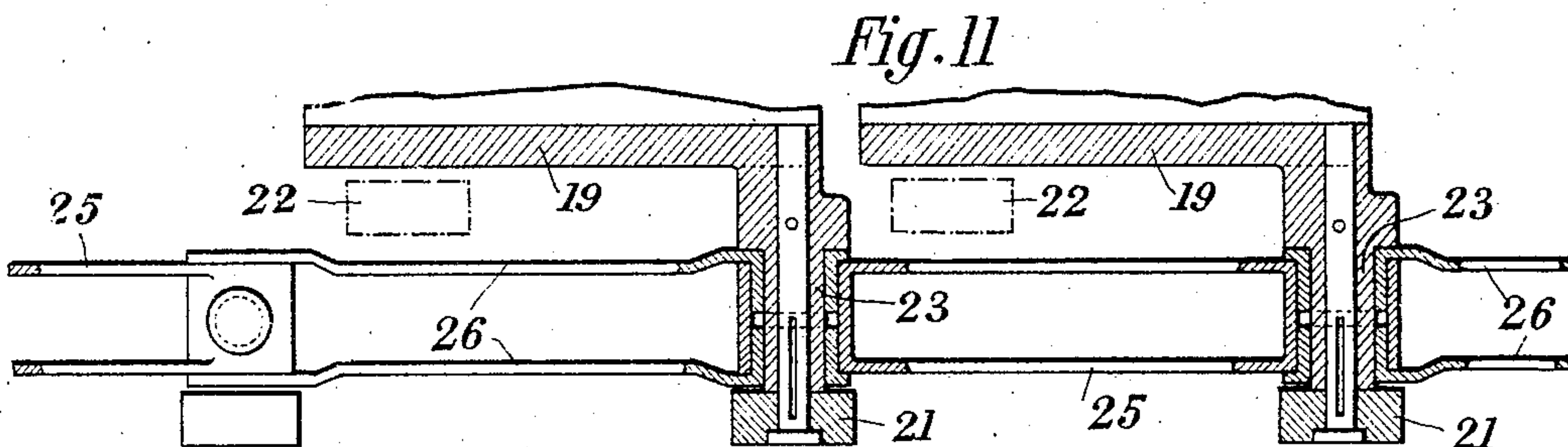
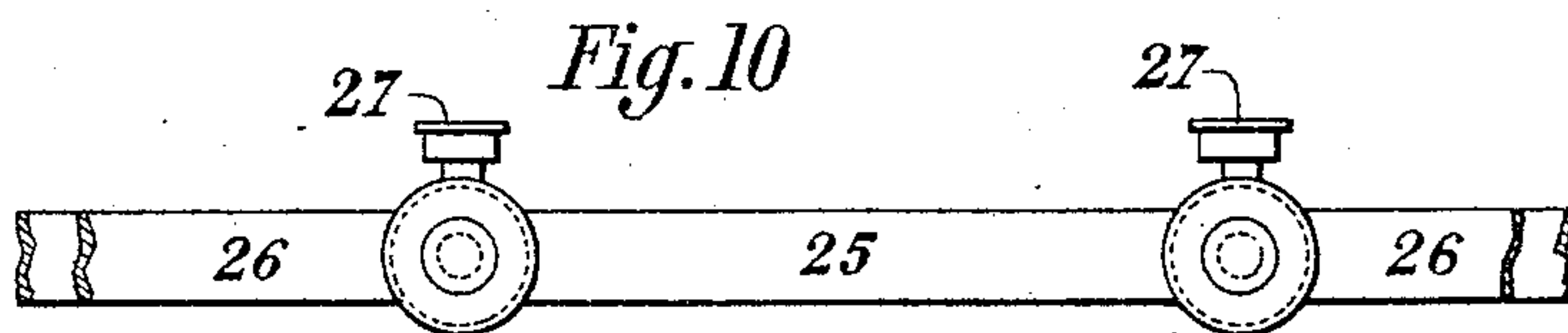
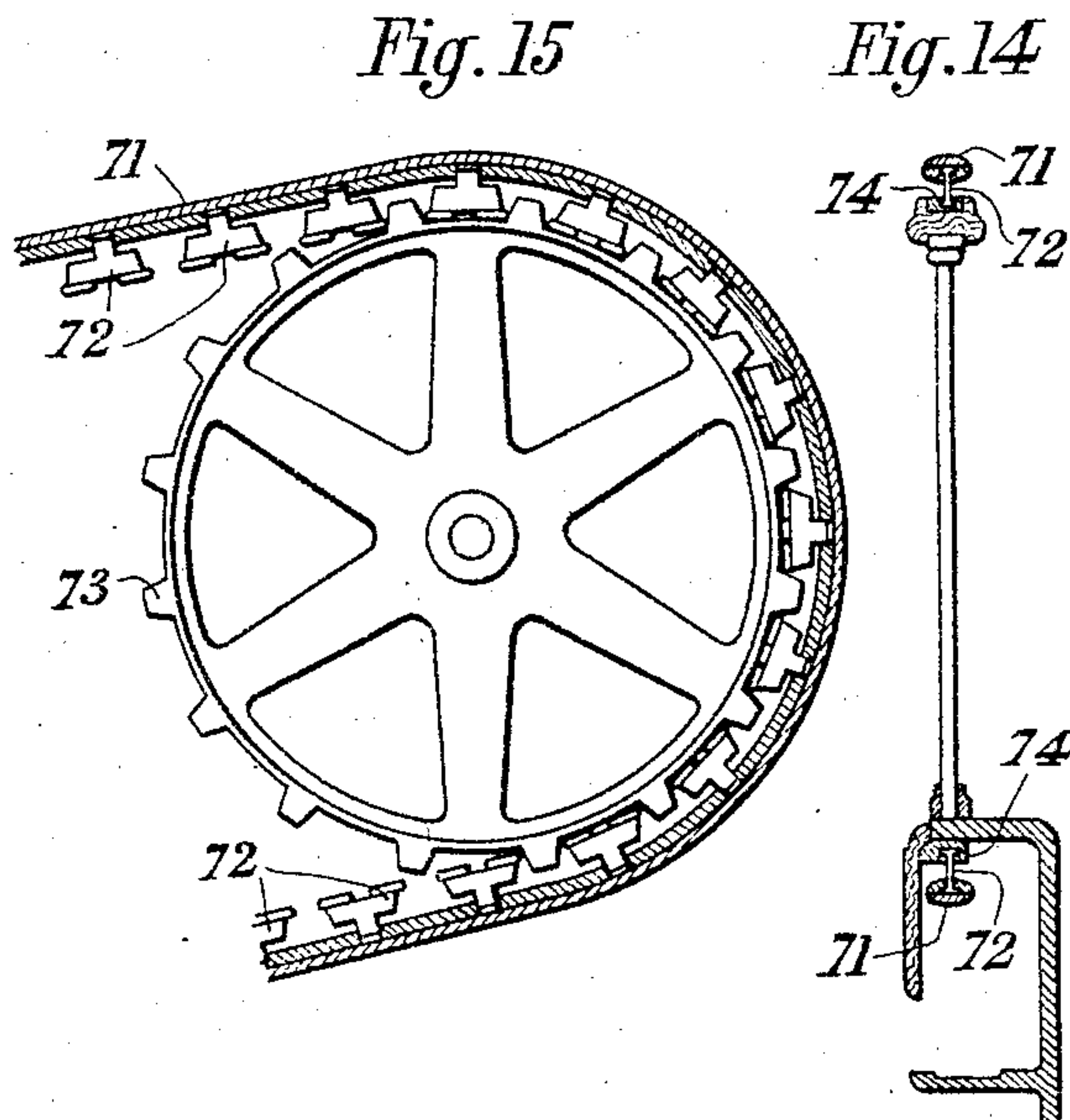
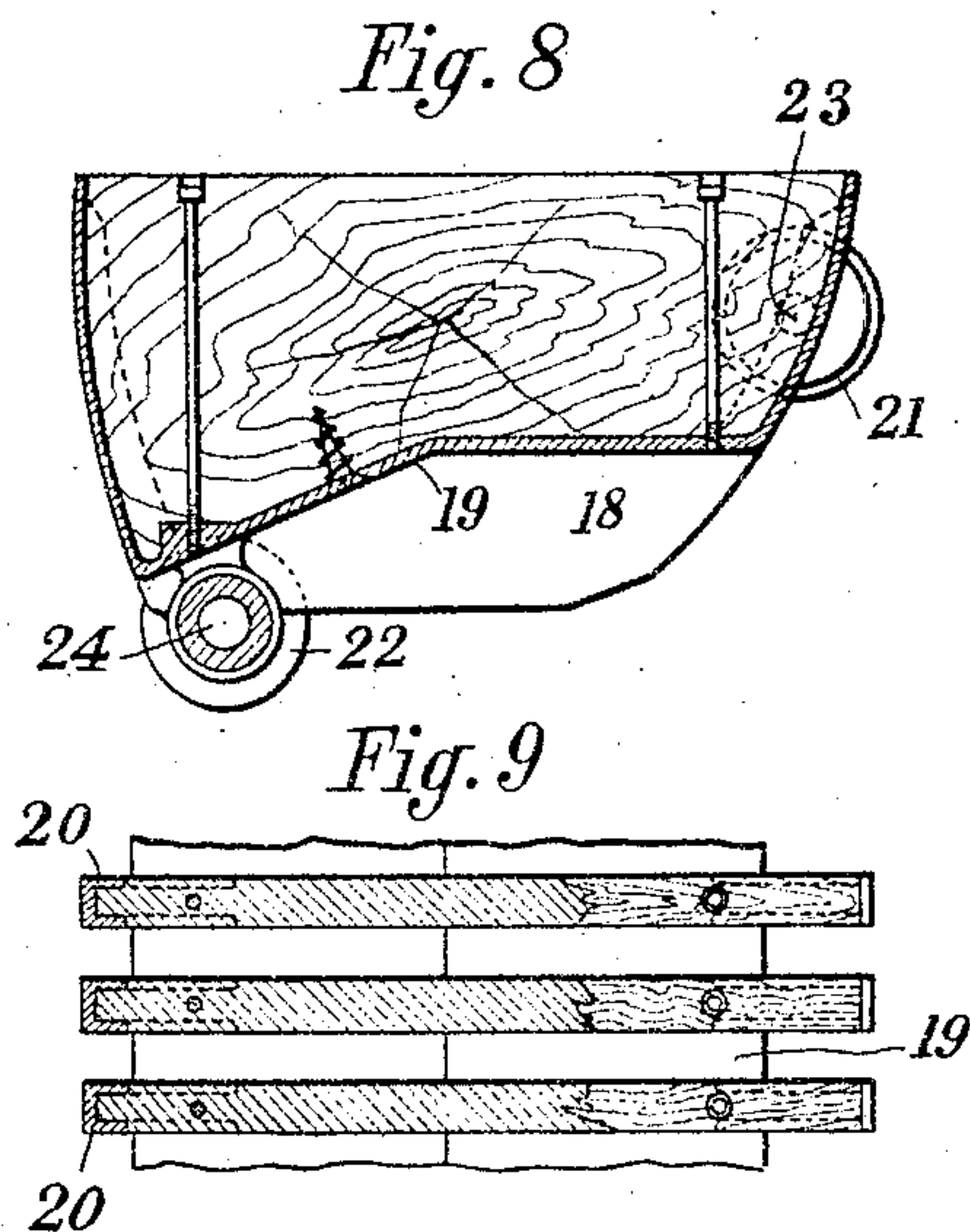
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

EDOUARD LOUIS HOCQUART, OF PARIS, FRANCE.

TRAVELING STAIRCASE OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 785,882, dated March 28, 1905.

Application filed March 18, 1904. Serial No. 198,832.

To all whom it may concern:

Be it known that I, EDOUARD LOUIS HOCQUART, engineer, a citizen of the Republic of France, and a resident of 146 Rue du Bac, Paris, France, have invented certain new and useful Improvements in or Relating to Traveling Staircases or the Like, of which the following is a specification.

This invention relates to what are known as "traveling" or "moving" staircases as used for transporting persons from one floor of a building to another by mechanical means. In use a person wishing to be conveyed by the staircase stands on a grate-shaped platform at the lower end of the staircase and is lifted therefrom by one of the steps as it rises through the said platform and carried up by it to an upper platform, where the step disappears after having deposited the person upon the platform, without there being any necessity for the least movement on his or her part and without any sliding, owing to the fact that the step at first projects above the upper platform and then sinks with the person, who is thus left upon the said platform at the moment when the step disappears under it.

A staircase constructed according to this invention is illustrated, by way of example, in the accompanying drawings, in which—

Figure 1 shows the staircase as a whole. Figs. 2 to 5 are respectively sections on lines 2 2, 3 3, 4 4, 5 5 of Fig. 1. Fig. 6 is a cross-section of the staircase. Fig. 7 is a horizontal section through the spindle of the wheels for the chain which carries the steps. Figs. 8 and 9 are respectively vertical section and partial plan of one of the steps. Figs. 10 and 11 are respectively an elevation and a plan of the chain for the steps. Fig. 12 shows a part of the movable hand-rail for the staircase in sectional elevation and in cross-section. Fig. 13 shows the same part of the hand-rail in plan and in section through a joint. Figs. 14 and 15 show another construction of the movable hand-rail in vertical section and in elevation.

At the beginning and at the end of the staircase—that is to say, on the lower and on the upper floors to be connected—are arranged two

similar platforms 16 and 17, having the shape of gratings. The steps 18 18 form a succession of gratings, each consisting of a series of ribs attached to a common base. Each of these gratings is preferably constituted by a casting 19, provided with hollow ribs 20 20, filled with wood, which is maintained in place, because of the U-shaped form in cross-section of the ribs, Figs. 8 and 9, and by means of vertical screws with countersunk heads or by screws inserted from underneath or in other convenient way, which insures that there shall be no projections to catch in anything. Each step is provided with four wheels 21 21 22 22, arranged in twos at each side, and thus forms a kind of carriage absolutely stable on its track. The front wheels 21 21 are mounted on trunnions 23 23, secured to the part 19 of the step, and the back wheels 22 22 are also mounted on trunnions 24 24, secured to the part 19; but, as shown on the drawings, the front wheels 21 21 are arranged more widely apart than the wheels 22 22, for a purpose hereinafter specified. The trunnions 23 23 of the wheels 21 21 on one side of all the steps provide hinge-pins for a chain of the "Galle" type, in which the links are of two different forms connected two by two. One style of link, 25, is constituted by two flat strips connected at their adjoining ends by two cylindrical sockets. The other form, 26, is constituted by two similar and symmetrical flat parts provided at each end with a socket fitting with slight friction into one of the sockets of the preceding form 25, and the whole fits with slight friction on the trunnions 23 23, as shown in Figs. 10 and 11. The lubrication of each joint and wheel is insured by a lubricator 27, as will be clearly understood on examining the drawings. Owing to the above arrangement, each step is absolutely independent of the others and travels freely on its tracks, the chain alone transmitting the driving effort. Each chain is wound at the top of the mechanism on a toothed wheel 28, mounted on the spindle 29, and which carries another toothed wheel 30, engaging with a pinion 31. The pinions 31 31 are mounted on the same spindle 32, which

is driven from a suitable motor. The spindle 32 is supported in bearings 33 33, fitted in the brackets 34 34 of the frame, and the two spindles 29 29 are mounted in the same horizontal line in the bearings 35 35—two for each of them. These bearings are also formed in one with the frame. The brackets 34 34 are in the same plane with two other brackets 36 36, each of which is provided with two rolling-tracks 37 38, on which roll, respectively, the wheels 21 and 22. Each of these tracks comprises two parts—one for the ascent and the other for the descent—suitably arranged, so as to give the step the position that it ought to have at every point of its travel. The rising and the descending parts of each track are connected by suitable curves, as will be hereinafter described.

The lower part of the mechanism does not comprise wheels for driving or guiding the chain. As will be seen from Fig. 1, the tracks 37 and 38 meet at their lower part, and at that point the track 38 is discontinued throughout the whole width of the track 37, a switch 39, pivoted to a spindle 40, secured to the frame, being fitted at this position. This switch is provided at the top with a projection 41, the surface of which forms an inclined plane and carries an arm 42, to which is attached a spring 43, the other end of which is attached to a fixed point on the frame, as diagrammatically shown in Fig. 1.

At its lower end the rolling-track 38 is provided with a curved part connected at nearly a right angle to an inclined part which joins the rising portion of that track. It is therefore necessary that at that point the roller 22 should be retained in contact with the track, and for this purpose there is provided a switch 44, mounted on a spindle 45, having an inclined face and which projects into the interior of the curved portion of the track 38, Figs. 1 and 3, so that its upper face is flush with the inclined upper portion of that track. The switch 44 is provided with an arm 46, connected by a spring 47 to the frame, Fig. 3. After having passed the point in question the rollers 22 have again to pass the track 37. To allow of this, each bracket or side of the frame is provided with a flat inner projection 48, which supports the steps at that point at a suitable angle instead of the track 37, as clearly appears from Fig. 1. On arriving under the lower platform or grating 16 each step has its rollers 21 rolling on the tracks 37 37 of the two brackets 36 36; but the rollers 22 22 have left the tracks 38 38, and the step rests with its ends on the projections 48, on which it slides until the rollers 22 22 are again rolling upon the tracks 38 38. During that time the ribs of each step 18 pass between the ribs of the grate 16, and if anybody is standing thereon he is raised by the step and par-

ticipates in its movement. The rollers of that step follow their rolling-tracks until the upper portion of the apparatus is reached. At that point the curves of the rolling-tracks 37 38 are such that the step 18 passes horizontally between the ribs of the upper platform or grating 17, but in such manner that its level is a little above that of the grating, as shown in Fig. 1. When the engagement in the horizontal direction of the step with the grating 17 is sufficient, the step immediately sinks, owing to the shape of the rolling-tracks, and it deposits the person standing on it upon the grating 17, the step then disappearing completely, while its rollers follow the descending portions of the rolling-tracks 37 and 38. There is no reason then for the upper face of the step to remain horizontal, and in the example illustrated the step assumes an oblique position, arranged so that the apparatus will occupy as little space as possible. When the step has arrived at the lower portion of the apparatus, the rollers 22 pass over the switches 39 39, and afterward the rollers 21, or rather their trunnions, meet the said switches 39 39, arranged opposite each other, causing the switches to swing to enable the pins or trunnions to pass. Then after their passage the surfaces 41 41 of the said switches come in contact with the said trunnions, which rise, and, owing to the inclination of the said surfaces and under the influence of the springs 43 43, the switches gradually return to their place, whereby shocks and noise which would have been caused otherwise are avoided. In their turn the rollers 22 meet the switches 44 44, which swing in order to enable them to pass, and then immediately return to their original positions under the influence of springs 47 47 to prevent the descent of the rollers 22 as they follow the tracks 37 37 until the bottom of the step returns to the projections 48 48, and the whole operation as described is recommenced.

It is indispensable to provide for the stretching of the two chains in consequence of the wear that may occur at the joints of the links 25 and 26, and to that end the extreme lower portions 49 50 of each side 36, with the parts of the tracks 37 and 38 are engaged, as may be clearly seen in Fig. 1. The part 49 is extended into the interior of the side 36 by means of a portion forming a slide 50, which can move in longitudinal direction in the guides 51 51, formed in the said side or bracket. The slide 50 is provided at the bottom end with a lug 52, which forms a stop for a screw 53, on which is mounted a nut 54, engaging between lugs 55, secured on the bracket or side 36. By turning the screw 53 in the suitable direction the slide 50 will be moved in its guides 51 and the corresponding chain be tightened as required.

As will be seen from Fig. 4, at the junction of the parts 50 and 36 one-half of the tracks for the steps is formed on each, the parts overlapping at the junction, so that in case of the parts moving apart the rollers will still find at the point of junction a rolling-track the width of which will be at least half the normal width.

It is essential that the hand-rail of such a staircase shall move with the staircase and at the same speed. According to this invention the hand-rail is made flexible and of cylindrical cross-section, easy to grasp, although its shape can of course be other than circular. The hand-rail is constituted by metal pieces 56, arranged at suitable intervals and connected by steel strips 57, Figs. 12 to 15. These parts are mounted on bent rods 58, which also form hinge-pins for the links of the driving-chain, as will be hereinafter explained. The parts 56 have the same section as that given to the hand-rail and are split longitudinally for the purpose of receiving the steel strips 57 57. Each of these strips is riveted to the part preceding it and connected to the part 56 which follows it by means of a connection which allows for a little play. Between the parts 56 are arranged below and above the strip 57 half-cylinders 59 59, of a suitable flexible material or, as shown in the drawings, of wood split at intervals, so as to give it the necessary flexibility. The whole is covered with a band 60, inclosed in a casing or sheath of cloth 61. The chain used for driving the hand-rail is an ordinary Galle chain 62, and the hinge-pins 58 of certain of the links carry the hand-rail. These pins also carry rollers 63 63. Between each pair of links the pins 58 carry a portion of square cross-section, to which a part 64 with two arms is secured. Each chain 62 is wound on a toothed wheel 65, mounted on the spindle of a toothed wheel 66, which engages with one of the driving-pinions 31, so that the hand-rail moves at the same linear speed as the staircase. Each chain 62 moves in a fixed track 67 of a U-shaped cross-section, the opening of which is arranged laterally in the interior of the staircase. The lower or descending portion of the said rolling-track 67 is cast in one piece with the corresponding side or bracket 36, and the upper or rising portion is mounted on the said side or bracket by means of vertical bars or rods similar to those used for the hand-rails of ordinary staircases. The track 67 is provided internally with a guiding-ridge 68, which being placed between the rollers 63 63, Fig. 5, prevents lateral shifting of the links of the chain 62. The inner sides of the said links are wider than those arranged at the side of the bottom of the track 67, so as to form the open portion of the said track. The arms of the parts 63 64 rest on the upper wall of the track 67. The hand-

rail thus constituted is complete and is moved simultaneously with the staircase; but it is necessary that the flexible hand-rail and its chain shall be exactly of the same length and parallel throughout the whole of their length, and this is insured by the parts 64. Each spindle 58 is maintained in its normal relation to the rolling-track 67 by the arms of the part 64, which move lengthwise of the said track. The hand-rail remains, therefore, necessarily parallel to its driving-chain in spite of any strain exerted on it by a person leaning against it; but at the upper and lower curved portions of the track 67 the chain only is guided, and the hand-rail will therefore assume a corresponding shape, and, owing to the movement of the parts 64, its curvature will be similar to that of the chain and of the same length. As the chain 62 is liable to stretch, the lower end 69 of the track is movable on the side 36 and held to it by bolts, which enables the said chain to be tightened to the desired degree. The flexible hand-rail can also stretch owing to loosening and wearing of the clamp of each bar 57 in the corresponding part 56. In its lower part the hand-rail is protected by a wooden casing 70, which completely hides it.

In the modification shown in Figs. 16 and 17 the hand-rail proper, 71, is constituted as in the preceding case as regards the obtaining of the desired flexibility; but it is provided internally with blocks 72 72, arranged at equal intervals, which engage in recesses on the periphery of the wheel 73 as the hand-rail is moved. Each block 72 is widened at the base, so as to form a skate, and slides on a fixed slide-track 74, suitably recessed according to a T-section to receive and guide the blocks 72.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a traveling staircase having laterally-disposed tracks for receiving the rollers of the movable steps, the combination with said tracks, of a lower plate carrying a portion of said tracks, a frame integral with said plate, guides integral with the tracks and means for shifting the plate in the guides, switches with springs actuated automatically by the passage of the rollers of the steps for the purpose of insuring proper direction of the same and of other tracks for the rollers of a movable hand-rail, substantially as and for the purposes specified.

2. In a traveling staircase of the class described a flexible hand-rail comprising metallic strips provided with elastic connections the whole being inclosed in a suitable covering, a driving-chain to which the hand-rail is connected, running in a track and driven at a linear speed equal to that of the staircase, and

devices for insuring that the hand-rail and the staircase shall remain parallel for use, substantially as described.

3. In a traveling staircase, a movable railing comprising a flexible portion provided with slides, gearings for engaging with said slides, and a stationary portion along which said slides are adapted to travel.

In witness whereof I have hereunto signed my name, this 5th day of March, 1904, in the presence of two subscribing witnesses.

EDOUARD LOUIS HOCQUART.

Witnesses:

PAUL BACARD,
JUSLIEN CAVERNE.