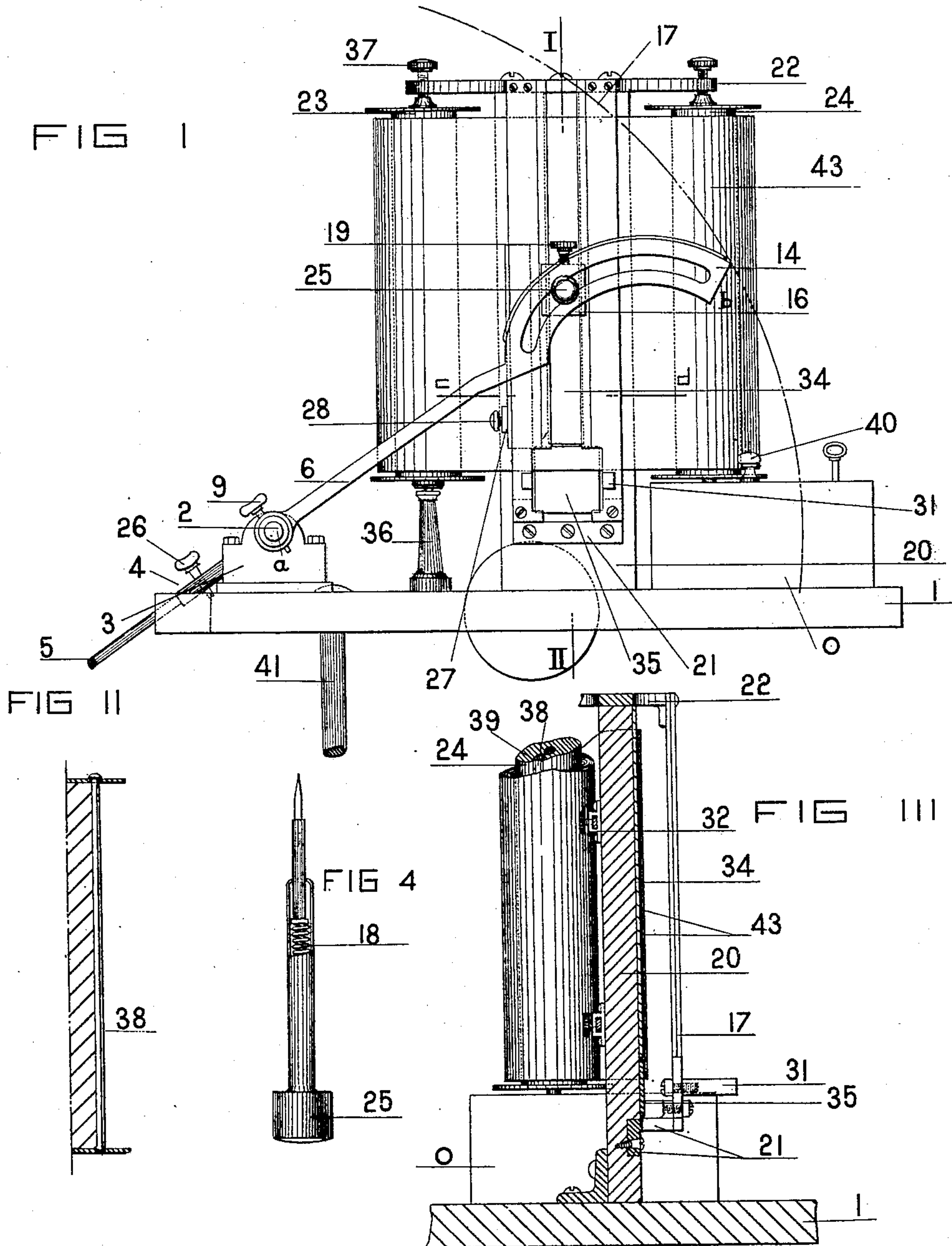


A. MERCAU.
HYDROMETER AND PROFILE RECORDING MACHINE.
APPLICATION FILED FEB. 24, 1908.

911,146.

Patented Feb. 2, 1909.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

FIG V

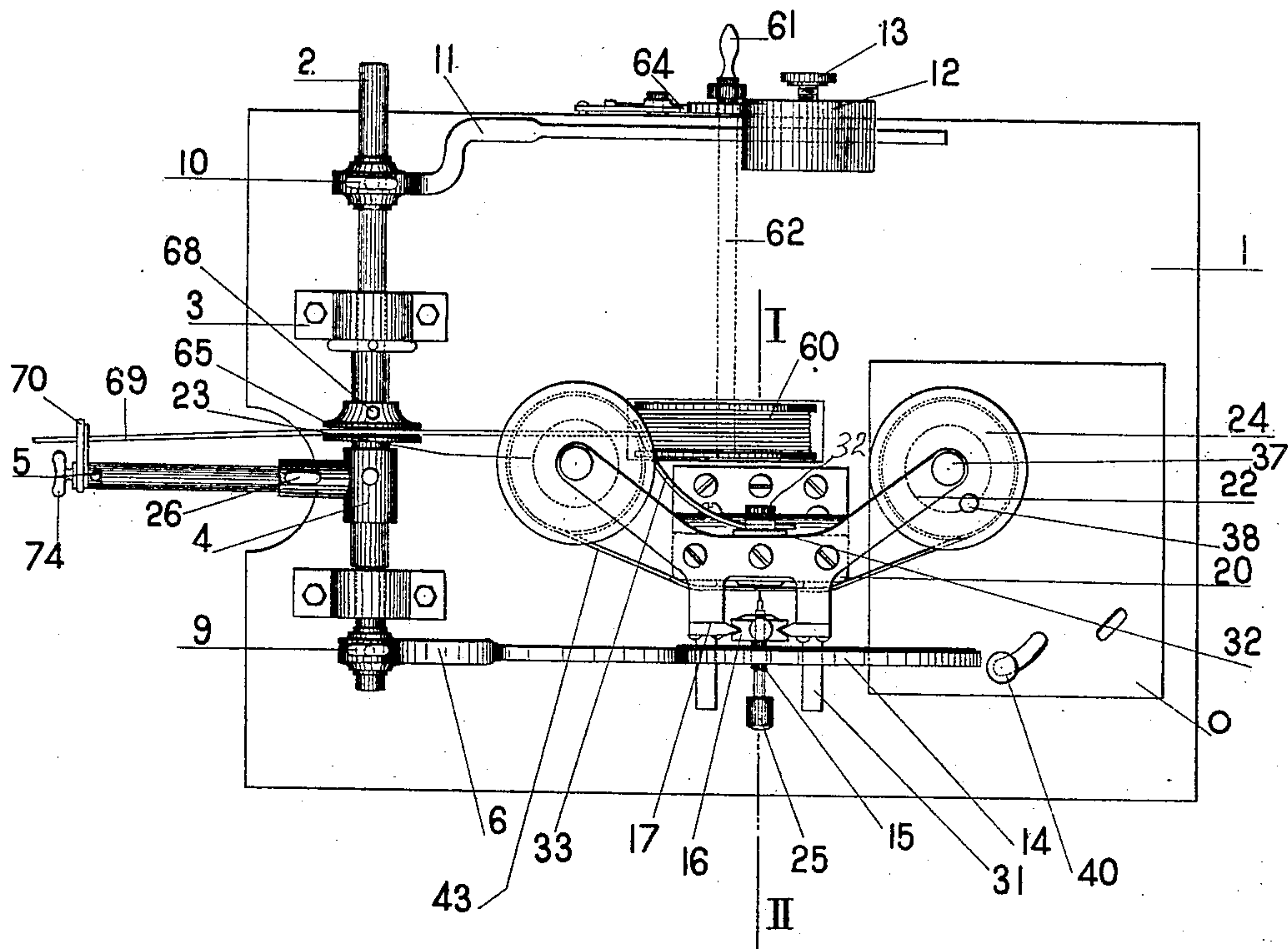


FIG 7

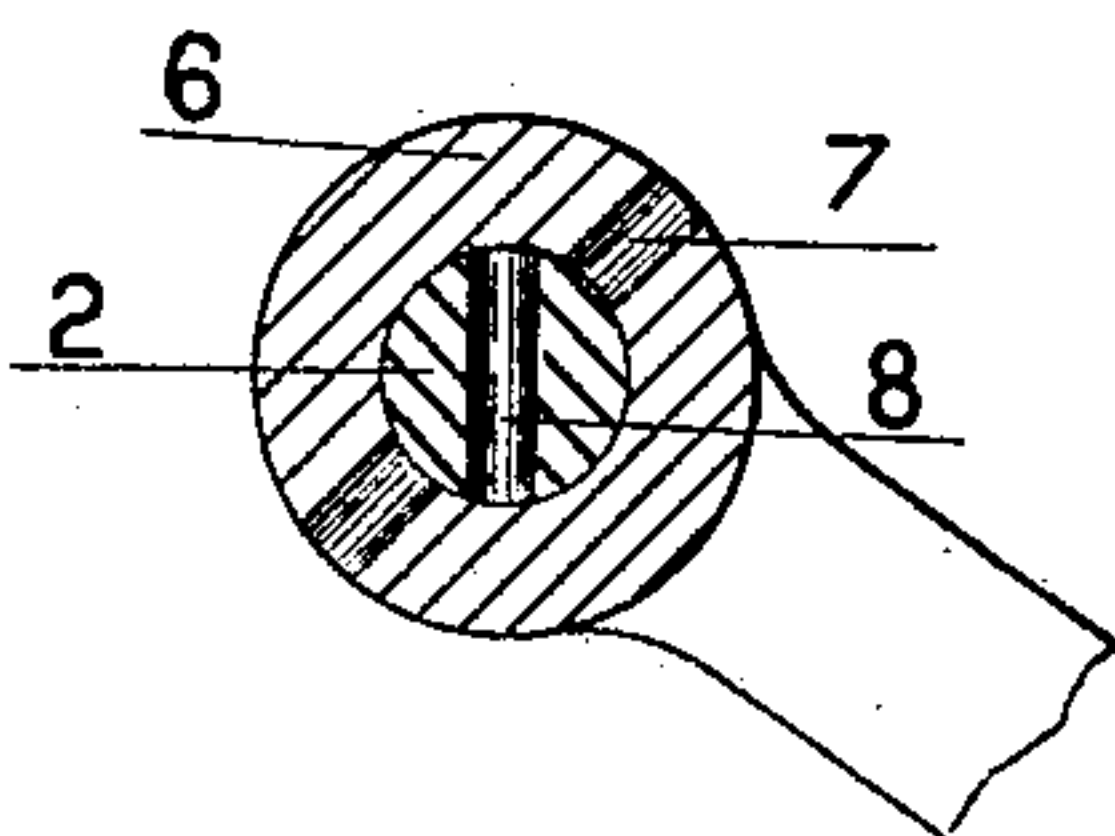
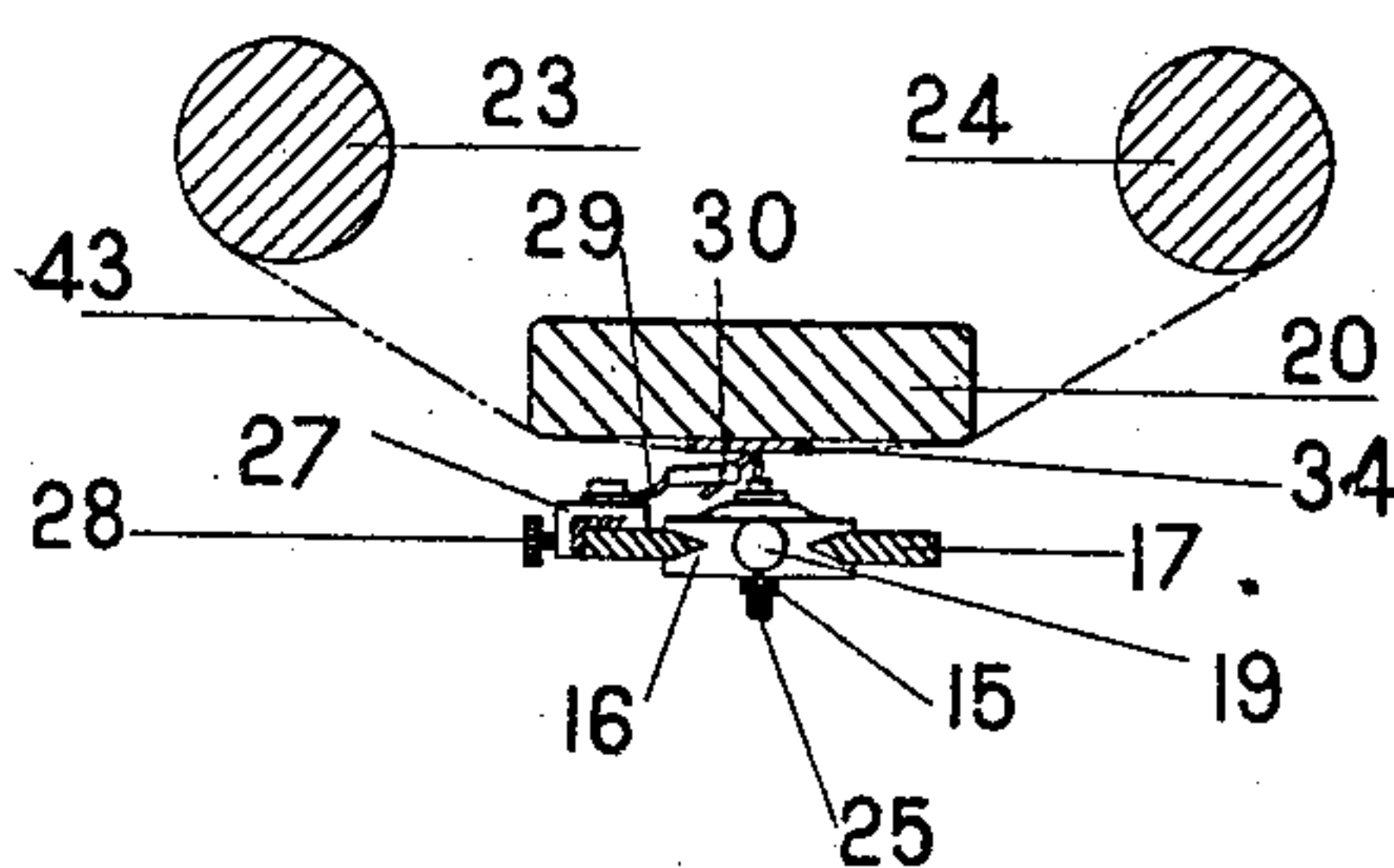


FIG 6



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4 SHEETS—SHEET 3.

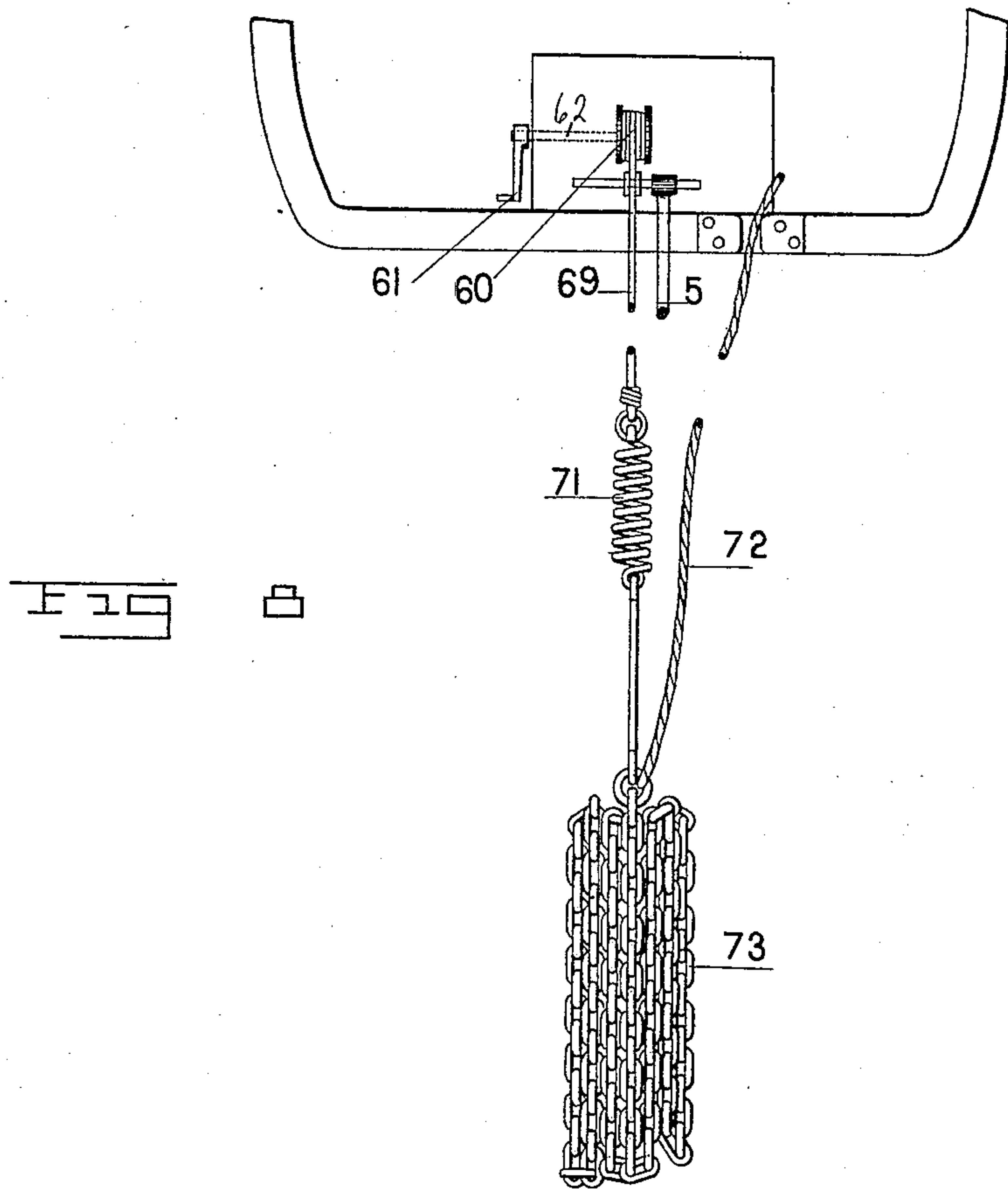
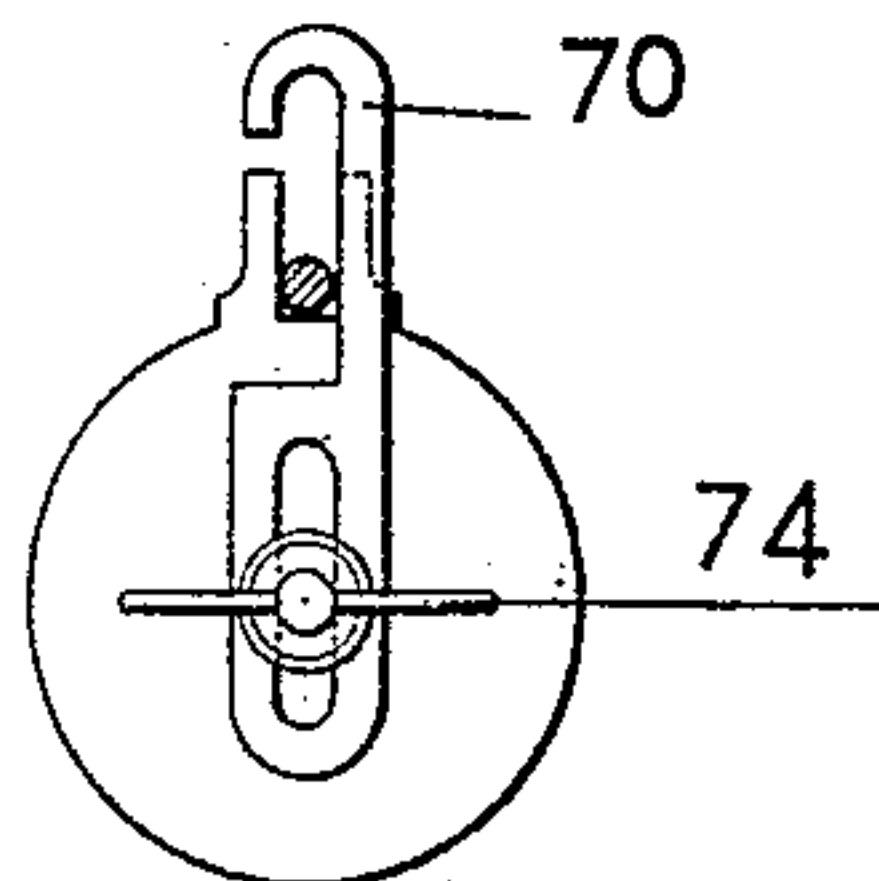


Fig 9



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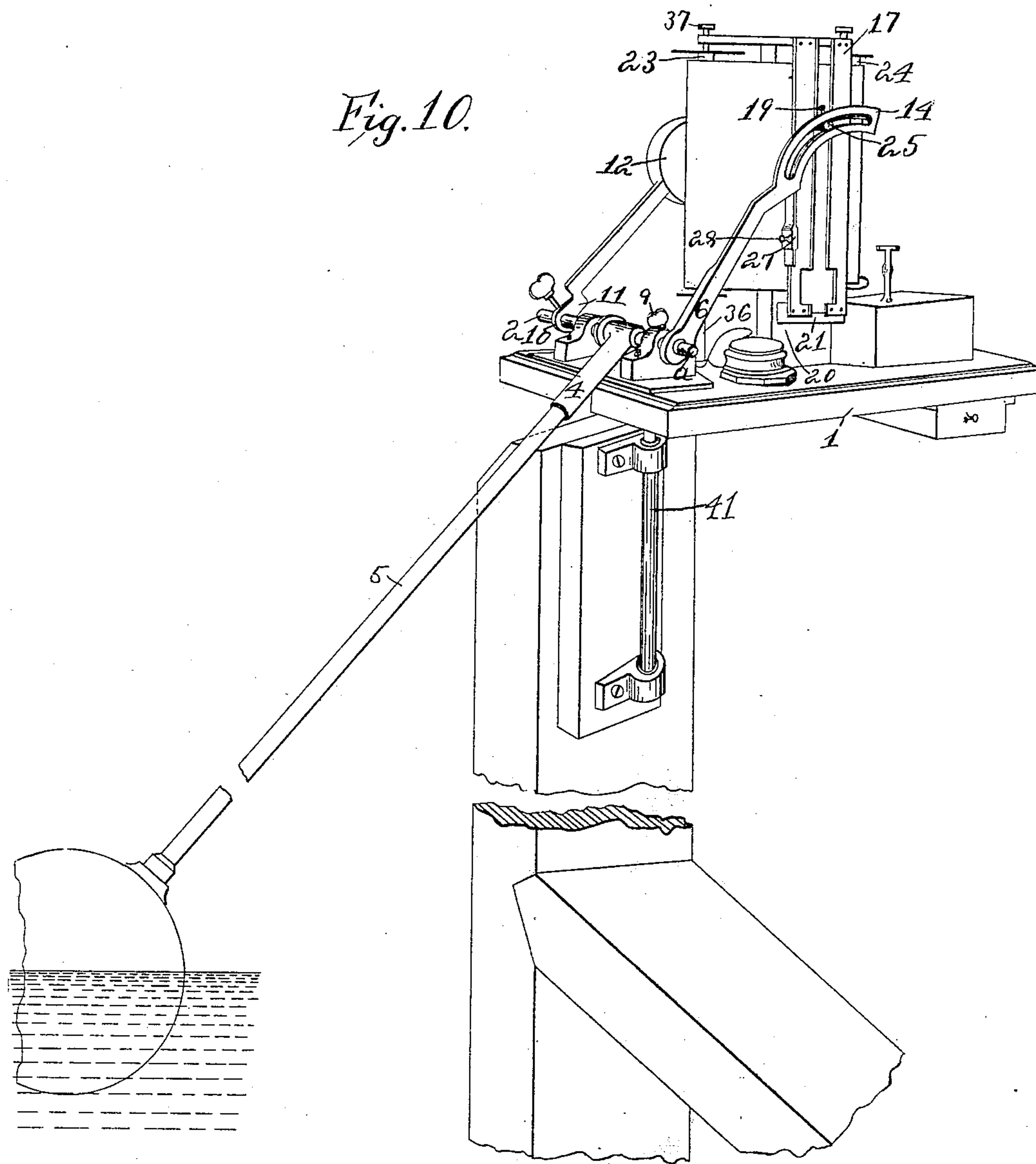
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

AGUSTIN MERCAU, OF BUENOS AYRES, ARGENTINA.

HYDROMETER AND PROFILE-RECORDING MACHINE.

No. 911,146.

Specification of Letters Patent.

Patented Feb. 2, 1909.

Application filed February 24, 1906. Serial No. 302,795.

To all whom it may concern:

Be it known that I, AGUSTIN MERCAU, civil engineer, citizen of Argentina, residing at 343 B. Mitre street, Buenos Ayres, Argentina, have invented new and useful Improvements in Hydrometers and Profile-Recording Machines, of which the following is a specification.

My invention relates to a novel apparatus designed to measure and record the oscillations of the water level and to draw automatically the profile of a river, stream, lake, or sea bed, &c.

In order that my invention will be more readily understood, I have illustrated it with drawings of which,

Figure 1, is a side view. Fig. 2, is a broken section showing means employed to fix the paper on the cylinder (24). Fig. 3, is a broken section taken on line I—II of Figs. 1 and 5. Fig. 4, is a view of the pencil holder (part in section). Fig. 5, is a plan view. Fig. 6, is a broken section taken on line c—d, of Fig. 1. Fig. 7, is a view of the head of the arm (6) and shaft (2). Fig. 8, is a schematic view of the device used in obtaining the profile of the bed of a river, stream, etc. Fig. 9, is a view of the clamp fixed to the end of the bar 5, for the purpose of holding and guiding the wire. Fig. 10 is a perspective view of the invention.

The construction in its general sense consists of a table or platform 1, upon which is adjusted a shaft 2, by means of the bearers 3; on this shaft is placed a bushing 4, having a projection into which a bar 5, is inserted when desired; this bar is held in position in the projection by means of the peg 26. The arm 6, is also jointed to the shaft 2; and can move freely in order that when the machine is not to be operated, the said arm will be at rest, and in order that the said arm may be moved by shaft 2 through the action of bar 5, said arm is provided with diametrically placed holes 7 which, when placed in registering position with the hole 8 in shaft 2, allow arm 6 to be locked to shaft 2 by the insertion of a pin 9 in said holes 7 and 8. On this shaft 2, there is another arm 11, which can be locked to the shaft 2 by means of a peg 10, when the two diametrical holes are placed in registering position with two other such holes made in the shaft 2, which arm remains in its natural position when the peg 10 does not cross the holes of said arm 11 and shaft 2. This arm 11, has at one end a

counter-weight 12, which can be slid at will on said arm and fixed in a desired place by means of the screw 13. The object of this counter-weight arm is to counterbalance the weight of the bar 5, on the shaft 2.

The arm 6, ends in a curved enlargement 14, provided with a slot within which slides a pin 15, forming part of the pencil carrying block 16, which moves vertically through the action of the guides 17. The pin 15, is hollow, and the hole continues through the block 16, in order to admit the pencil holder 25, (Fig. 4). The pencil holder is provided with a spring 18, in order that the pencil will be in constant contact with the paper; and the block 16 carries a screw 19 which engages with the pencil holder to hold the same in the block. The guides 17, are fixed at their lower end to an upright 20, by means of a bracket 21, and at their upper end by means of a special piece 22, which at same time serves as a bearing to the upper ends of the shafts of the cylinders 23 and 24. In one of these guides 17, there is a small square frame 27, which can be slid vertically at will, and has a binding screw 28, in order to fix it at a desired place; this square frame carries a spring 29, which carries a pencil holder 30, designed to give a continued horizontal reference line, for the diagram, and at any desired height.

Regarding the upright 20, this carries on the side opposite to that occupied by the guides 17, two or more small bearers 32, across which are placed springs 33, which when effecting pressure on the cylinder 23, prevent the latter from having irregular speed when it is moved by the pull effected by the cylinder 24, upon being rotated by the watch mechanism situated at o. On the upright 20, and on the side of the guides there is a metal sheet 34, in order to give the paper a perfectly smooth and hard surface on which the diagram will be automatically drawn; there is also provided another sheet 35, for the purpose of affording a suitable surface for the automatic numerator.

The cylinders 23 and 24, may be of any suitable material, and are journaled at their upper end in the piece 22; and at their lower end the shaft of the cylinder 24, is connected to the watch motion o, and the other cylinder 23, rests upon the post 36. The resistance which these cylinders oppose to the motion derived from the watch mechanism apparatus may be regulated by means of the

thumb screws 37. The cylinder 24, is the one which effects the traction and in order to suitably fix the end of the paper thereon, possesses a small groove 39, into which is inserted the end of the paper, which is then clamped by the bar 38, which fits exactly into said groove 39, and the latter bar is held in return by a hole made in the upper disk of the cylinder, and by a small hollowing made in the lower disk thereof; by this means the paper remains securely clamped.

In order that said cylinder 34, may be set in motion or stopped when desired, there is provided a small stop 40, which according to the movement given, will release or set into motion the watch mechanism. The platform 1, and with it all the apparatus is supported by the vertical shaft 41, and the latter is in return provided with bearings, (not shown) which at same time serve as a socket; this device enables the platform 1, to rotate freely describing a horizontal plane. The bearings of the shaft 41, are in return fixed to a supporter, suitable for the purpose to which the apparatus is designed, which supporter, when the machine is to be used as a profile recorder, may be the edge of a boat.

At the free end of the arm or bar 5, may be fixed a floater, in case the apparatus be designed to indicate the oscillations of the water level, *i. e.*, when used as a hydrometer or mareograph; or else a weight of any shape, which may be formed by a simple coiled chain 73, in case the apparatus be designed to indicate the sinuosities of the bed of a river, canal, lake, etc., *i. e.*, when used as a profile recorder. In the first case the apparatus is steadily fixed, and in the second it must be conducted by a boat or otherwise.

When the apparatus is used as a profile recorder, and is to be operated in comparatively deep water, for the bar 5 is substituted a shorter one (say from one to two yards long) which bar is guided by a thin steel wire 69, formed by two pieces joined to each other by a spring 71, which wire has at its lower end a weight 73, already mentioned; the other end extends to the metal drum 60, where the wire 69, can be coiled in by means of the handle 61, directly connected to the shaft 62, of the drum, after passing from the loose pulley 65, and through clamps 70, which maintain said wire parallel to the bar 5. This clamp is adjusted to the end of the bar 5, and has a movable part provided with an aperture, which part may be easily slid and has a screw 74, for the purpose of fixing said movable part in a suitable place.

When the handle 61, is made to move conveniently, the wire may be given the length desired and then coiled. A jackscrew 64, facilitates this operation. As it is convenient that the wire 69, be very thin, (say from

0.7 to 1 mm. diameter), and the weight thereof comparatively heavy, more or less 200 lbs., and while this weight is less than the breaking weight, there is always a danger of this occurring through any other accidental cause. In order to prevent this, a spring 71, has been provided in its length, which will give or expand a certain distance, say two inches for instance, for a strain of 160 lbs.; on the other hand, extending also from the weight, there is a steel cable 72, called security cable, attached by its other end to the bearing shaft of the apparatus, said steel cable being approximately two inches longer than the wire and spring when unstretched, so that when the wire tension tends to exceed 160 lbs., (beyond the tension) it is supported by the safety cable preventing thereby the breaking of the wire. The safety cable may be provided of the strength desired.

As has been stated, the platform 1, may rotate freely by means of the vertical shaft 41; the object of this device is to prevent the drifting of the boat, through the action of the water current.

The curved guide 14, will cause the distance traveled by the pencil 25, to be proportional to the sines of the angles described by the bars, or to the sinuosities of the bed, as hereinbefore referred to. The definition of the curving 14, cannot be more completely and precisely explained than is done by the following equation, which I give in polar coördinates: (α being the anomaly; ρ the radius vector; τ the distance of the rotation center of the guide to the extremity thereof; and ρ_0 the maximum angle which is drawn in the curve): viz: $\rho = \tau \cos \alpha - \tau \cos \beta$.

The vertical scale of the diagram obtained, depends upon the relation between the length of the bar 5, or wire substituting same, as has been stated, and the distance of the rotation center of the guide, to the extremity thereof.

As will be seen, this specially curved piece is completely general, and therefore applicable to all recording apparatus, which require similar transformation, and it will also be seen that taking instead of the angle, the complement thereof: the co-sine of the variable angle, may be equally recorded.

To set the apparatus into operation, or in readiness therefor, care should be taken that the cylinder 23, be provided with paper, and that the latter will pass over the plate 34, of the upright 20, that the watch mechanism be sufficiently wound, that the whole apparatus be on an even level, and that the arms 6 and 11, be jointly secured to the shaft 2, by means of the pegs 9 and 10. Under these circumstances, the machine will be able to work, and with what has been set forth, the operations will be readily understood. When the bar 5 be provided with

its angular motion, said motion will also be transmitted to the arm 6, and the pencil holder 16, carrying the pencil, will also have its motion transformed into rectilinear, alternative and vertical, so that the pencil will draw a continued line, representing the profile of the bed of a river, lake or the like, or the oscillations of the water level, as the case may be. The vertical scale of the diagram thus obtained, will depend upon the relation between the length of the bar 5, and distance to b , the horizontal scale will depend upon the speed at which the paper band slides, when the apparatus is used as hydrometer or mareograph, and when used as profile recorder, the horizontal scale will also depend upon the rotation speed of the paper and of the boat, but in this case it must be obtained directly by calculating simultaneously—and from time to time the position of the boat and of the pencil on the diagram, as is usually done in all hydro-metrical operations known. I may finally add, that when the apparatus is not in use, the pegs 9 and 10, should be withdrawn, in order to leave the arms 6 and 11, in a resting position; the table or platform may besides be provided with a compass, levelers, etc.

Having now fully described and ascertained the nature of my said invention and the manner in which it is to be performed, what I claim is:—

1. An apparatus for measuring and recording the oscillations of the water level and to draw automatically the profile of the bed of a river or the like comprising a base,

a horizontal shaft thereon, a downwardly inclined bar having its upper end adjustably secured to said shaft, means connected to the free end of the bar for imparting movement thereto, said means contacting with the surface to be measured, an adjustable counter-weight connected to the horizontal shaft for counterbalancing the said bar, an upwardly inclined bar 6 having its lower end adjustably connected to the shaft and having an enlargement at its upper end, said enlargement having a curved slot therein, an upright having slides thereon, a block vertically movable between said slides, a pencil holder carried by said block and having a part engaging with the curved slot and means for passing a sheet of paper horizontally in proximity to the pencil holder.

2. An apparatus of the class described comprising a recording device including an oscillating arm, a wire connected to said arm and formed of two pieces, a spiral spring joining the two together, a weight connected to the lower end of the wire, and a safety cable connected to the weight and having a length equal to that of the wire plus the length corresponding to the greatest expansion of the spring.

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

AGUSTIN MERCAU.

Witnesses:

JUAN AUT CARVAL,
I. E. MILLER.