

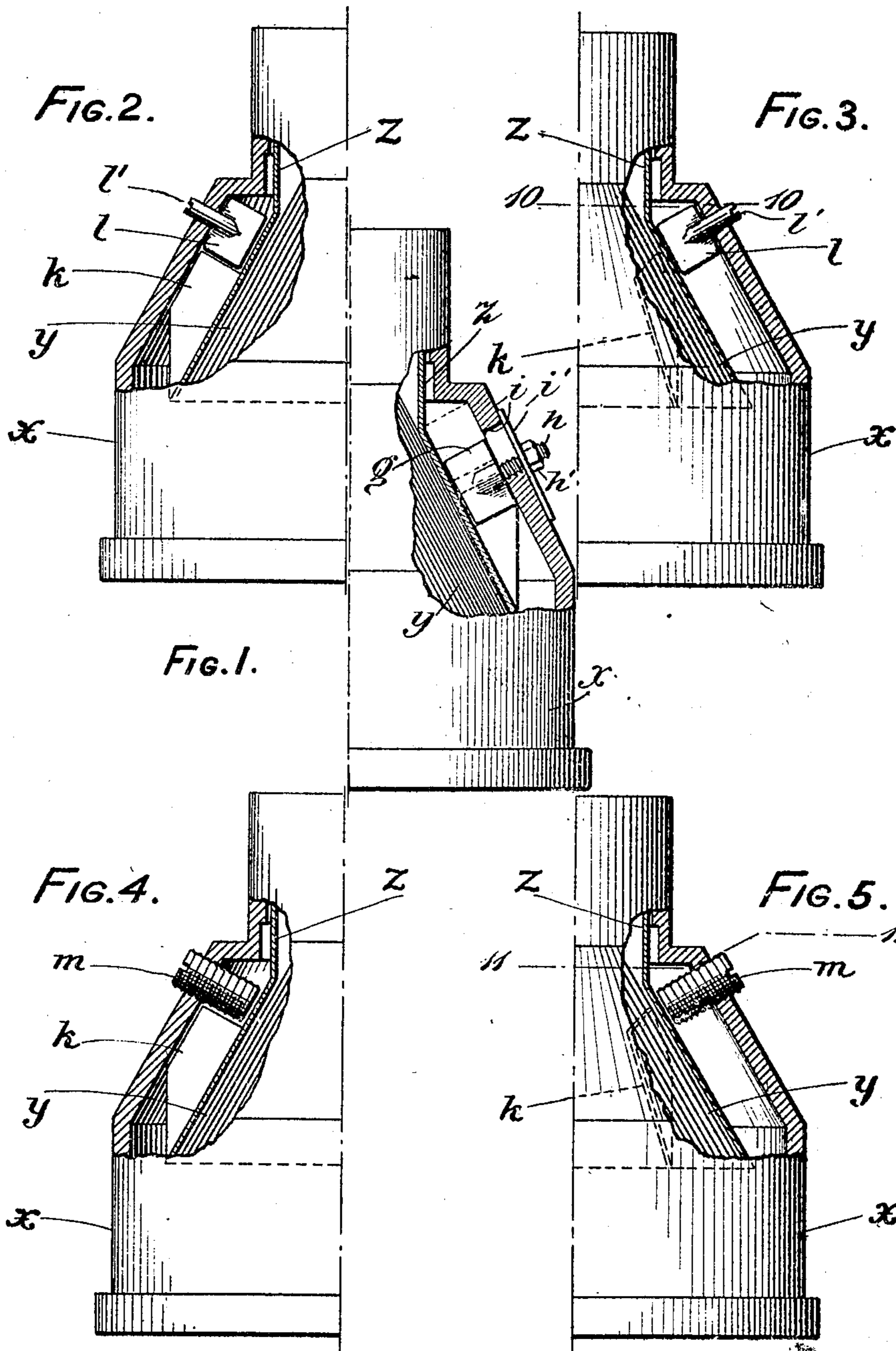
No. 872,173.

PATENTED NOV. 26, 1907.

E. A. FORSBERG.
CENTRIFUGAL LIQUID SEPARATOR.

APPLICATION FILED NOV. 25, 1905.

3 SHEETS—SHEET 1.



WITNESSES:
M. M. Hamilton
Thomley B. Wood

INVENTOR
Erik August Forsberg
BY
Harding & Harding
ATTORNEYS.

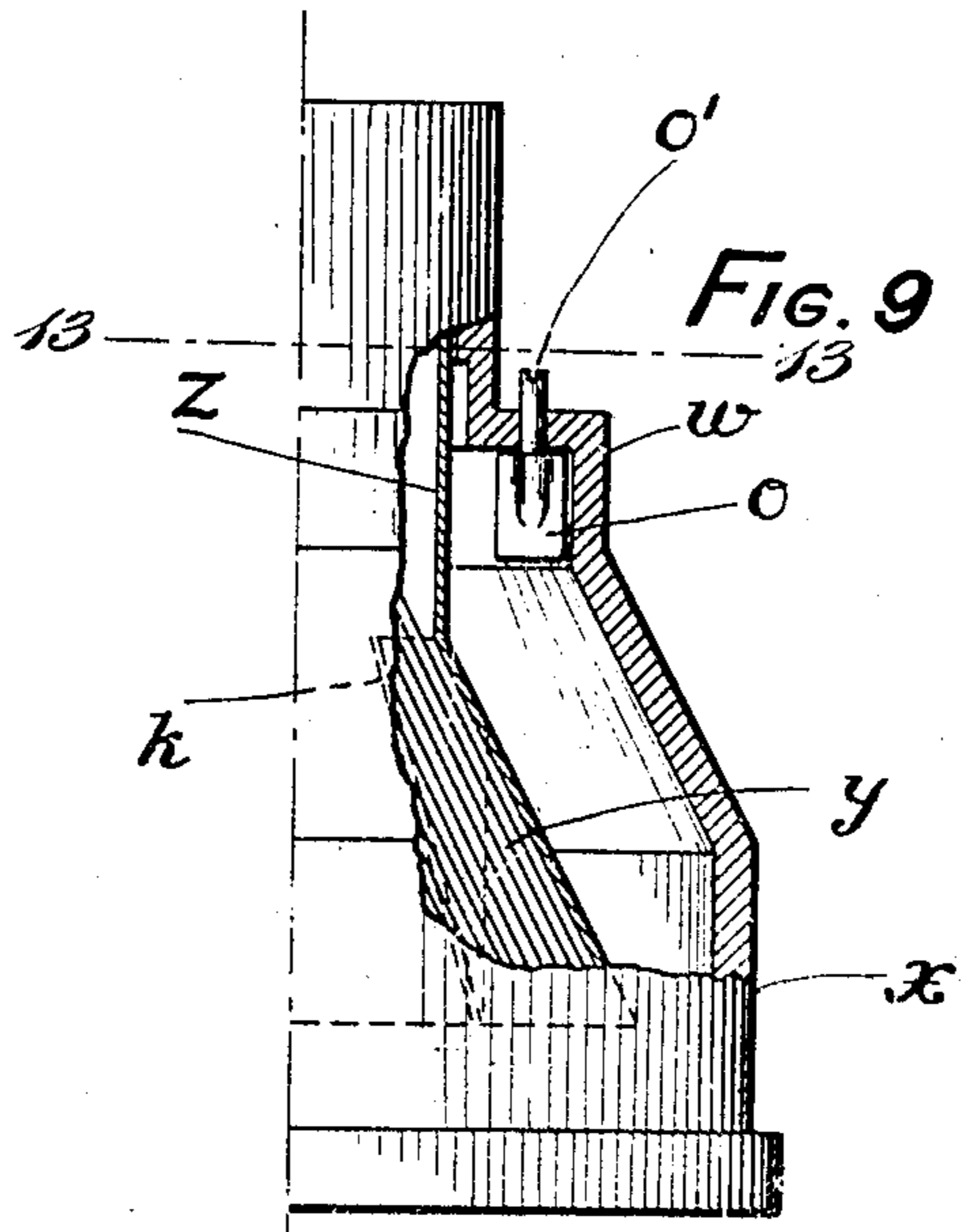
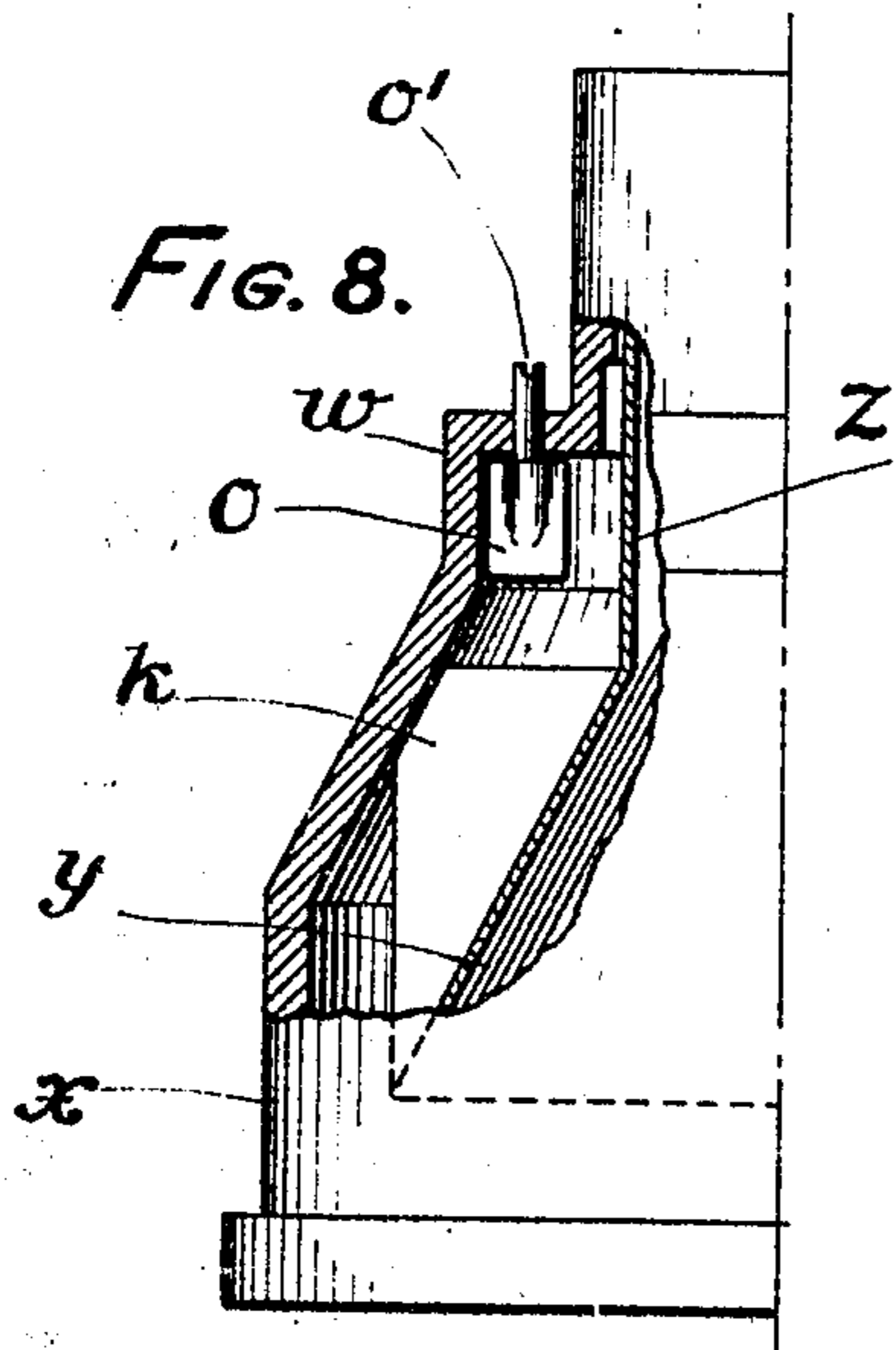
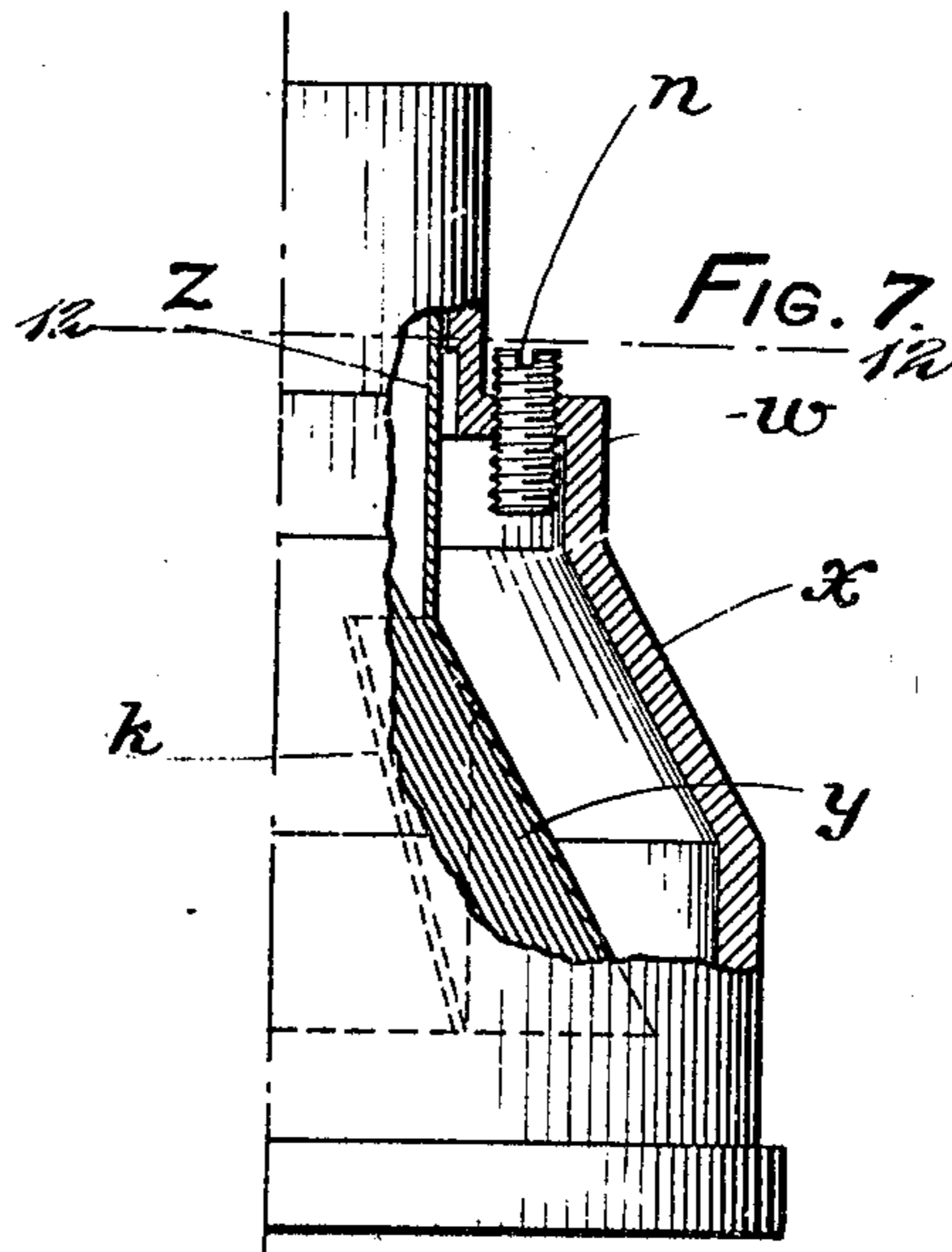
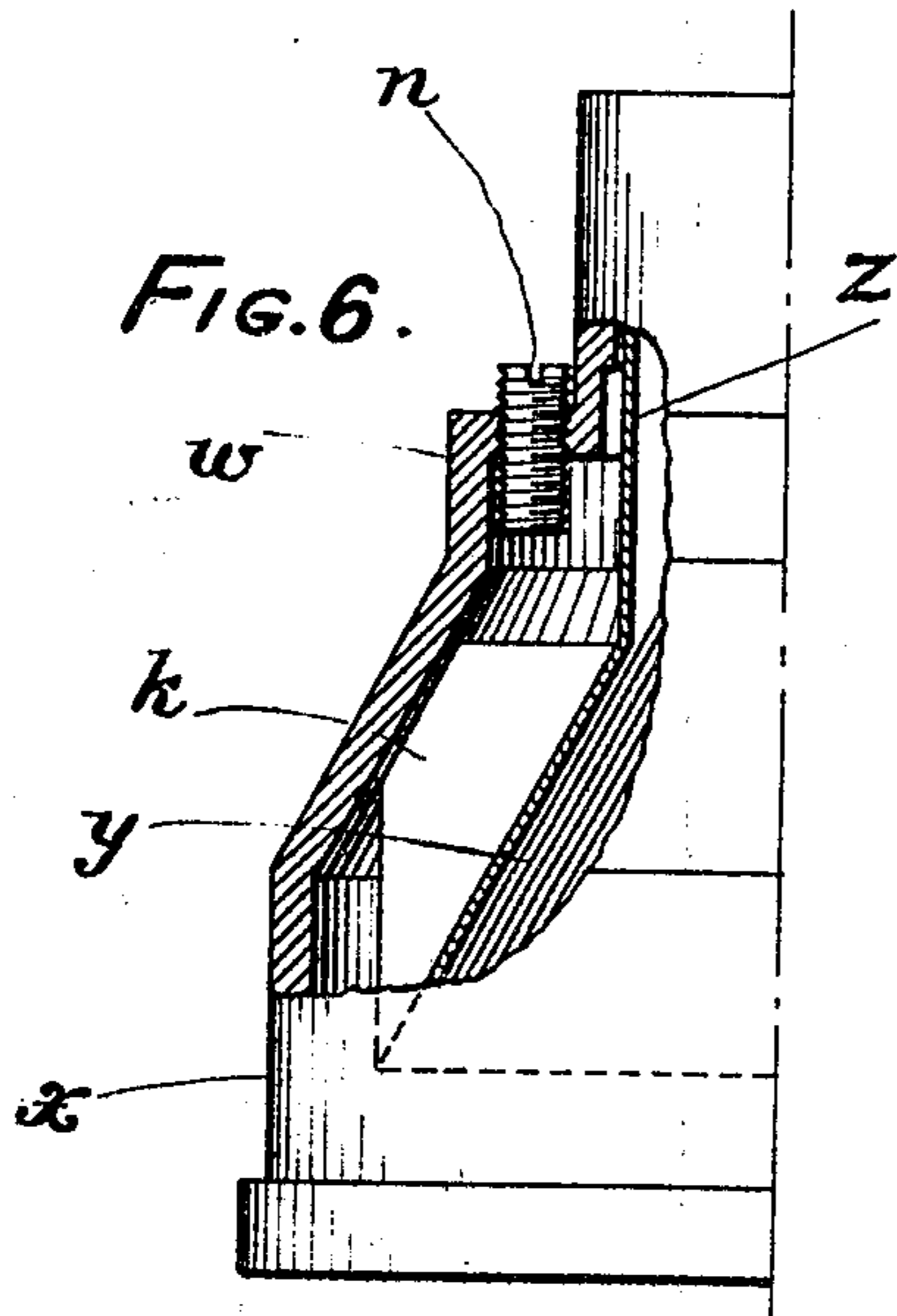
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3 SHEETS—SHEET 2.



WITNESSES:
M. M. Hamilton
Frederick B. Wood.

INVENTOR
Erik August Forsberg
BY
Harding & Harding
ATTORNEYS.

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3 SHEETS—SHEET 3.

FIG. 10.

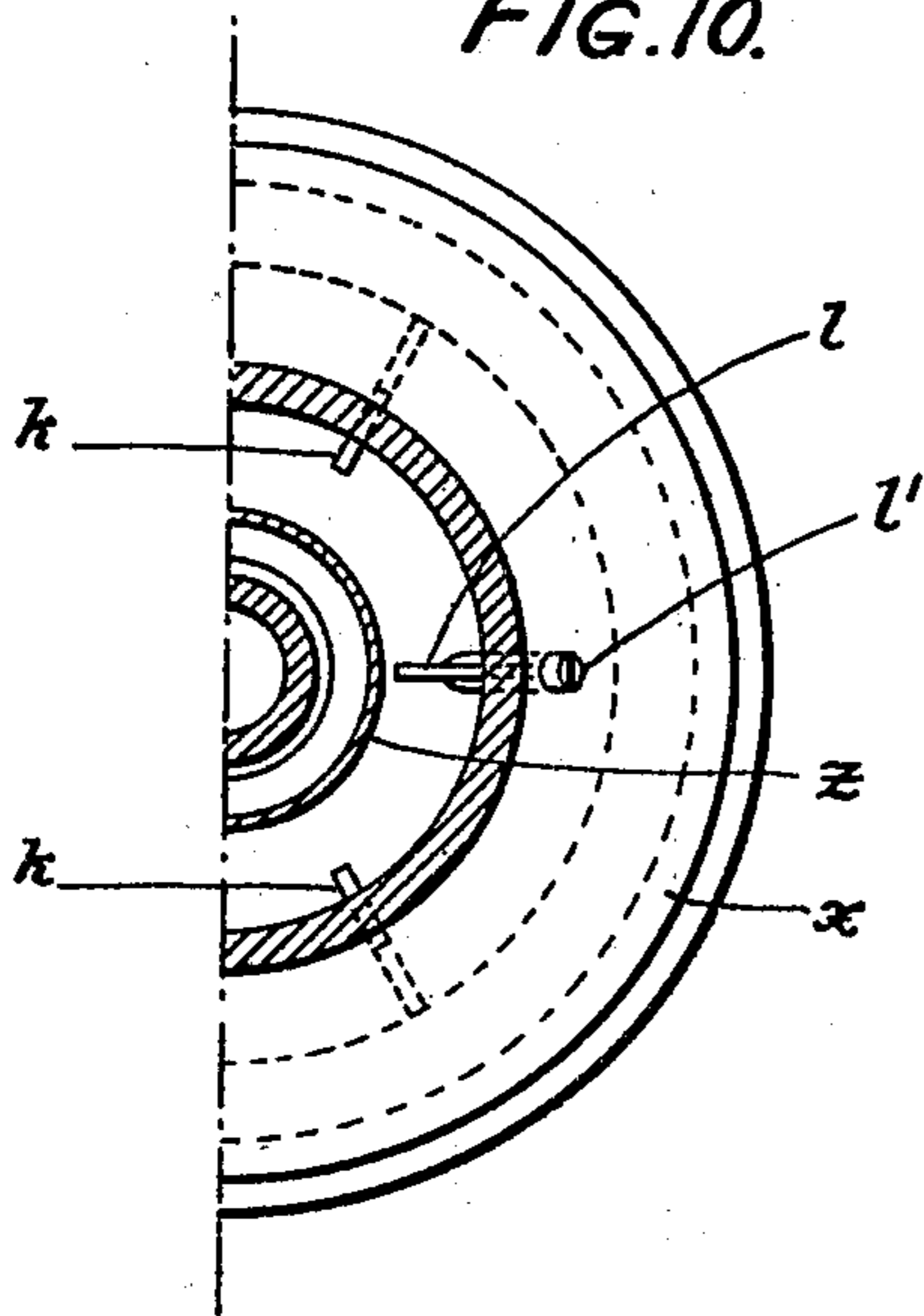


FIG. 11.

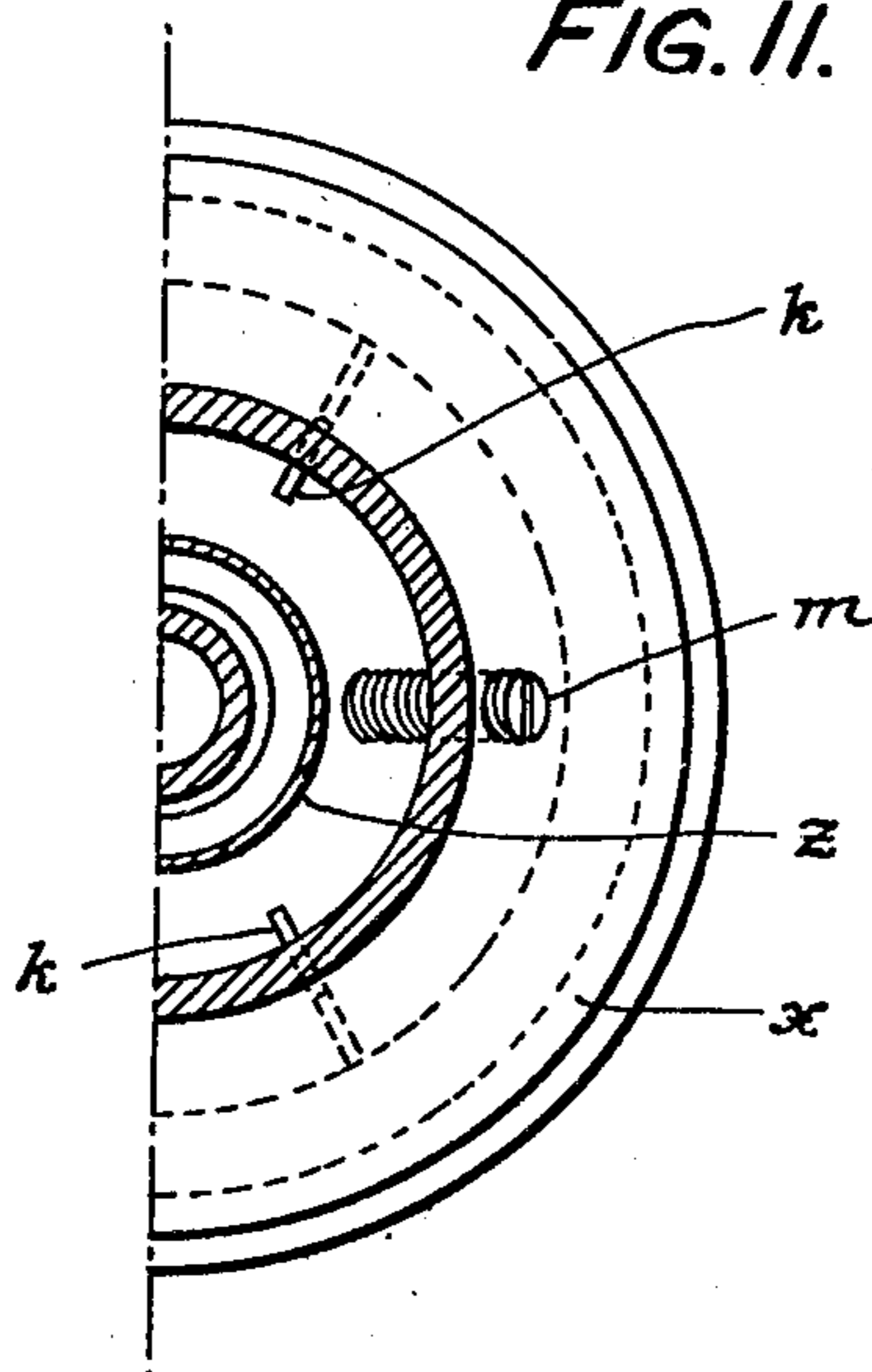


FIG. 12.

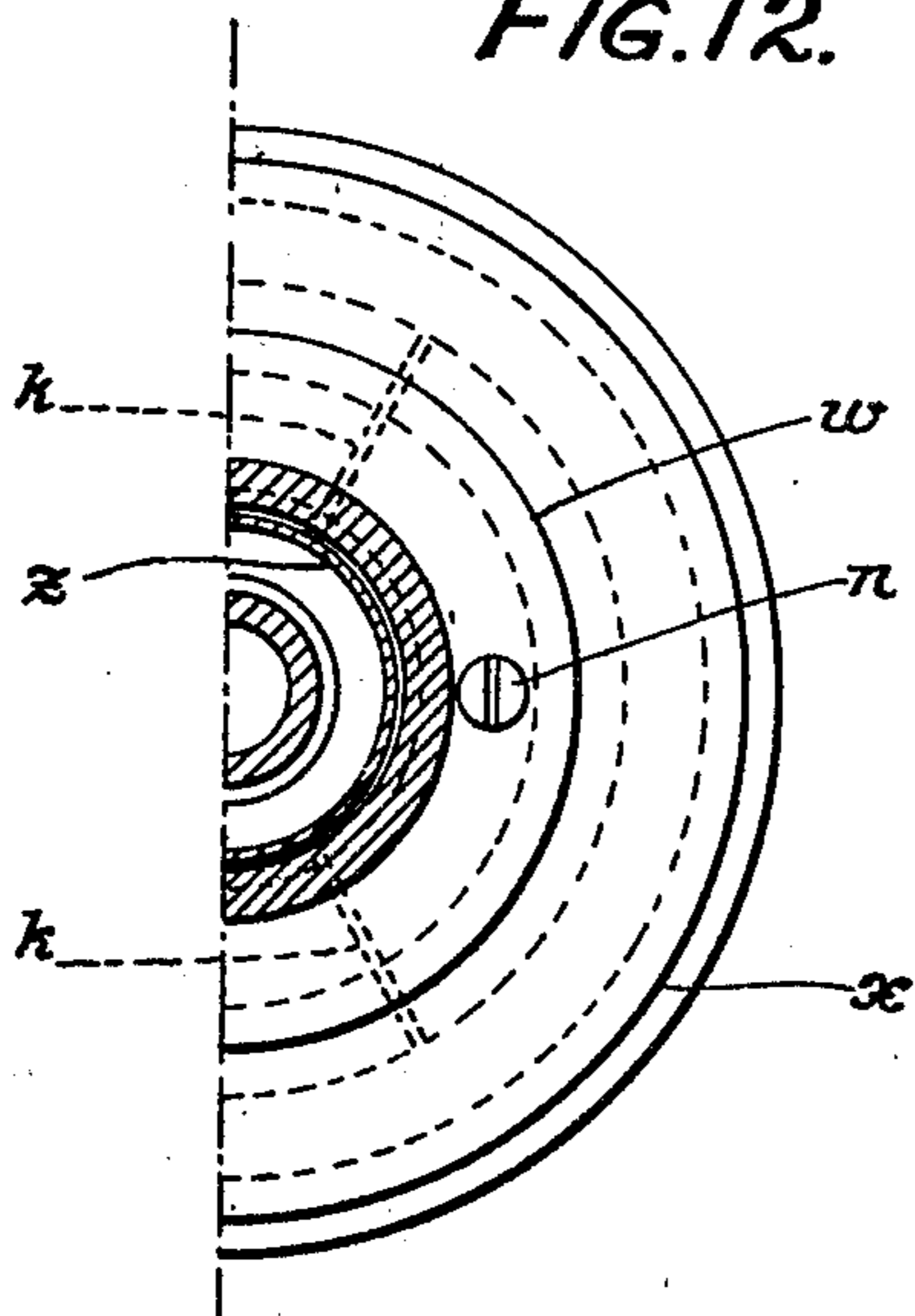
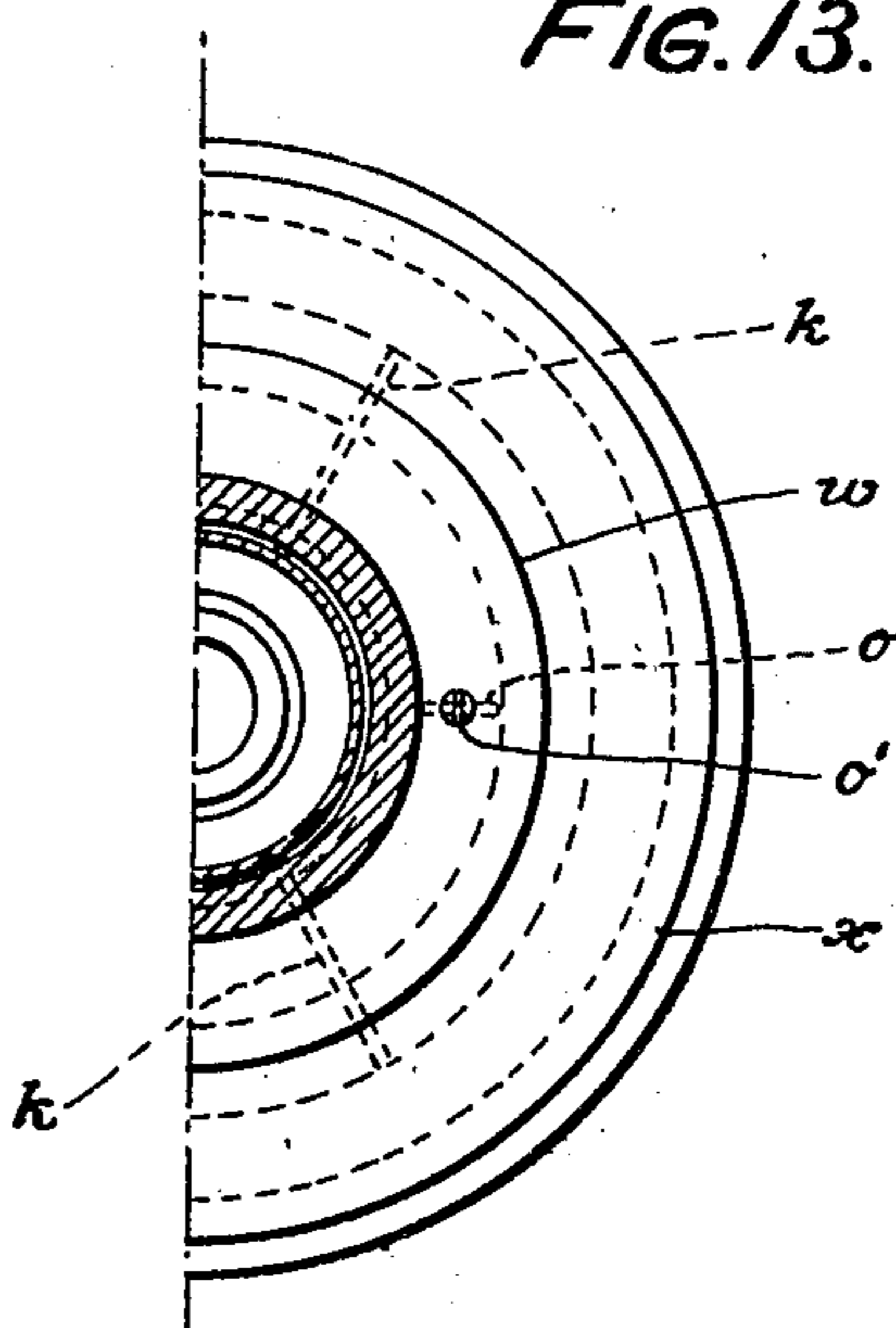


FIG. 13.



WITNESSES:

Robt R. Kitchel.

M. M. Hamilton

INVENTOR

Erik August Forsberg

BY

Harding & Harding

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ERIK AUGUST FORSBERG, OF STOCKHOLM, SWEDEN, ASSIGNOR TO AKTIEBOLAGET
SEPARATOR, OF STOCKHOLM, SWEDEN.

CENTRIFUGAL LIQUID-SEPARATOR.

No. 872,173.

Specification of Letters Patent.

Patented Nov. 26, 1907.

Application filed November 25, 1905. Serial No. 289,033.

To all whom it may concern:

Be it known that I, ERIK AUGUST FORSBERG, a subject of the King of Sweden, residing at Stockholm, Sweden, have invented a new and useful Improvement in Centrifugal Liquid-Separators for Regulating the Relative Proportions of the Separated Liquid, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In centrifugal machines for separating liquids of different specific gravity, and especially in milk separators, there is usually some device whereby the relative proportions of the liquids discharged may be regulated. In the constructions hitherto used, this regulation is effected either by varying the radial distance between the discharge orifice for the different liquids or by varying the size of the orifices themselves. These devices have, however, certain drawbacks, which, especially in separators with a top disk, may prove considerable, and among which, apart from the constructional difficulties, the impossibility of varying the percentage of cream at the out-flow of the liquids within wide limits, without a relatively great loss of work, is one of the principal.

The object of the present invention is to obtain an arrangement for regulating the cream, which at the same time enables a great variation of the percentage of cream and a free outlet for the different liquids.

In a liquid separator the unseparated liquid enters, as is well known, at the center and travels toward the periphery, the lighter liquid being separated and gathering towards the center, whence it moves upwardly and makes its egress through an outlet in the bowl-neck, while the heavier separated fluid gathers at the periphery and passes upwardly and inwardly along the wall of the bowl and escapes through openings in the bowl neck. During its passage inwardly towards its outlet, the heavier separated liquid constantly enters zones having decreasing peripheral speed. If no obstacles are present, such liquid will obviously strive to maintain its peripheral speed and thus at every point run more quickly than the drum, whereby the pressure occasioned by the centrifugal power of such liquid will become greater than that corresponding to the an-

gular speed of the drum. Thus there arises a certain resistance against the motion of the heavier separated liquid inwardly caused by the gliding of the liquid, and the rapidity of the discharge of such liquid is reduced below what it would be if the said resistance were absent. This circumstance is, according to the present invention, made use of for regulating the relative proportions of the effluent liquids by suitably inserting within the bowl, adjustable from outside, a resistance device in the way of the liquids, whereby the above mentioned gliding effect is more or less counteracted. That is, any portion of the inwardly moving separated heavier liquid that, in its effort to run at a speed exceeding the angular speed of the drum, meets this adjustable resistance device, will have its speed arrested and cut down to that of the angular speed of the drum, thus reducing the resistance against the motion of such liquid inwardly caused by the gliding and consequently facilitating its discharge. By adjusting the resistance device so that it may be in the path of a greater or less volume of such inwardly moving liquid, the resistance against the motion of the liquid inwardly caused by the gliding will be more or less reduced and the rapidity of discharge of the heavier liquid more or less increased. It is obvious that to the extent that the rapidity of discharge of the heavier fluid is thus increased, the percentage of cream will be decreased.

In the drawings: Figures 1 to 9 inclusive are vertical sections through half the bowl illustrating various modified forms of my invention. Figs. 10, 11, 12 and 13 are horizontal sections respectively on the line 10—10 of Fig. 3, line 11—11 of Fig. 5, line 12—12 of Fig. 7 and line 13—13 of Fig. 9.

In all the figures x represents the bowl, y the liner therein, and z the upper plate of the liner.

In Fig. 1, the arrangement consists of an adjustable strip g , placed between the inner wall of the bowl and the upper plate. The strip is connected to a screw h passing through the wall of the drum and movable in a slot i in the wall of the drum and which may be fixed in different positions by means of a nut h' . A plate i' is confined between the outside wall of the bowl and the nut and closes the slot at all positions of the strip.

The higher up or the nearer the center the strip is placed, the greater will be the resistance offered to the gliding of the liquid, and thus it is possible to regulate this effect and thereby also the proportion between the quantities of the outpouring liquids.

In Figs. 2 and 3, strips *k* are shown in the space between the upper plate and the bowl wall and fastened to the upper plate or to the bowl wall. In Fig. 2 is shown a shutter *l*, located in line with and above, and forming a prolongation of the strip *k* (which is cut off at the top) and secured to a stud *l'* projecting through the wall of the bowl and turnable from the outside so that the shutter may take different positions, thus counteracting the gliding more or less. In Fig. 3, another shutter, similarly constructed and operated, is shown but in this modification, the shutter does not form a prolongation of the stationary strip, but is placed between two stationary strips. The resistance, caused by the stationary strips themselves, against the gliding, may thus be further regulated by turning the shutters *l* more or less.

In Figs. 4 and 5, the constructions of Figs. 2 and 3 are modified by the substitution, for the shutters *l*, of screws *m*, projecting through the wall of the bowl and turnable from the outside. In Fig. 4, the screw is arranged to constitute a prolongation of the stationary strip, while in Fig. 5, the screw is placed between two stationary strips.

In Figs. 6 and 7, still another modification is shown. In the construction of both figures, the regulating screw or screws do not constitute any prolongation of the stationary strips, as in Fig. 4, nor are they placed between these strips, as in Fig. 5, but they are placed in a free space, above the upper limit of the strips, obtained by providing the upper part of the conical bowl with a cylindrical collar *w*. In this there are one or more regulating screws *n*, one of which is shown as extending through the top wall of the collar into the said free space and turnable from the outside so as to shut off said space more or less and thus regulate the gliding effect arising within said space. The regulating screws may be placed either in the same vertical plane as the stationary strips *k*, as shown in Fig. 6, or in a vertical plane extending between two stationary strips, as shown in Fig. 7.

In Figs. 8 and 9, the constructions of Figs. 6 and 7 are modified by the substitution, for the regulating screws *n*, of doors *o* secured to studs *o'* projecting through the top wall of the collar *w* and turnable from the outside. In Fig. 8, the door is placed in the same vertical plane as the stationary strip *k*, while in

Fig. 9 the door is in a vertical plane between two stationary strips.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a centrifugal liquid separator, the combination, with the separator, of a resistance device within the separator adapted to counteract the gliding effect caused by the difference of speed of the bowl and the separated liquid, and means enabling said resistance device to be adjusted from outside the bowl to vary its resistance, thereby enabling the relative proportions of the separated liquids to be regulated.

2. In a centrifugal liquid separator, the combination with the bowl and its contained liner, of a resistance device, adapted to counteract the gliding effect caused by the difference of speed of the bowl and the separated liquid, interposed in the space between the wall of the bowl and the liner, and means enabling said resistance device to be adjusted from outside the bowl to vary its resistance, thereby enabling the relative proportions of the separated liquids to be regulated.

3. In a centrifugal liquid separator, the combination between the bowl and its contained liner and top disk, of a resistance device, adapted to counteract the gliding effect caused by the difference in speed of the bowl and the separated liquid, interposed in the space between the top disk of the liner and wall of the bowl, and means enabling said resistance device to be adjusted from outside the bowl to vary its resistance, thereby enabling the relative proportions of the separated liquids to be regulated.

4. In a centrifugal liquid separator, the combination between the bowl and its contained liner and top disk, of a resistance device comprising one or more stationary strips arranged in the space between the bowl and the top disk, and an adjustable member arranged in the space above the upper limit of said strip or strips, said resistance device being adapted to counteract the gliding effect caused by the difference of speed of the bowl and the separated liquid and the adjustable member thereof by its adjustment enabling the relative proportions of the separated liquids to be regulated.

In testimony of which invention, I have hereunto set my hand, at Stockholm, on this 10th day of November, 1905.

ERIK AUGUST FORSBERG.

Witnesses:

CARL FRIBERG,
HARRY ALBIHN.