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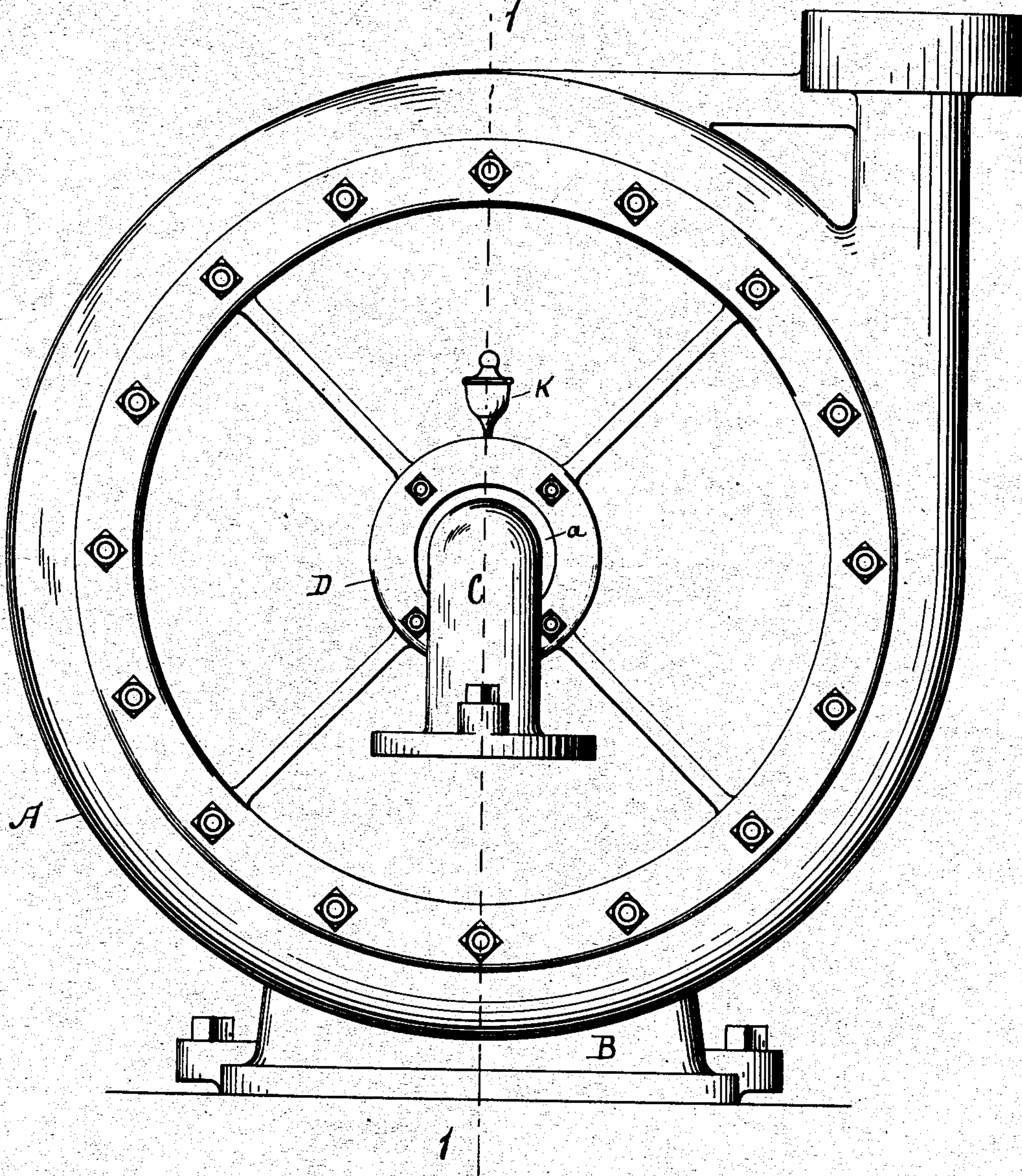
PATENTED MAR. 20, 1906.

F. W. & C. A. KROGH.
CENTRIFUGAL PUMP.

APPLICATION FILED SEPT. 1, 1903.

4 SHEETS—SHEET 1.

Fig. 1.



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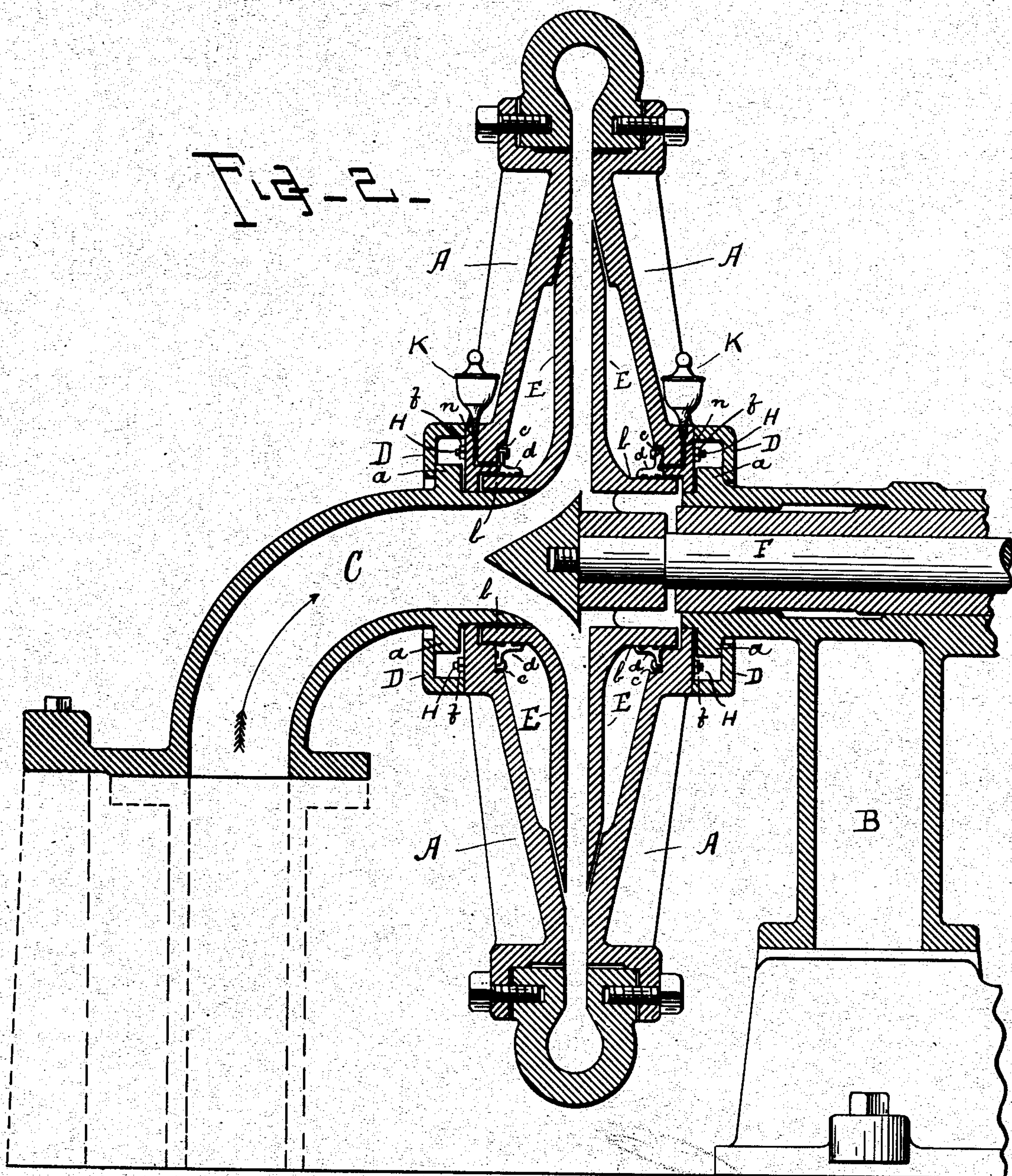
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4 SHEETS—SHEET 2.



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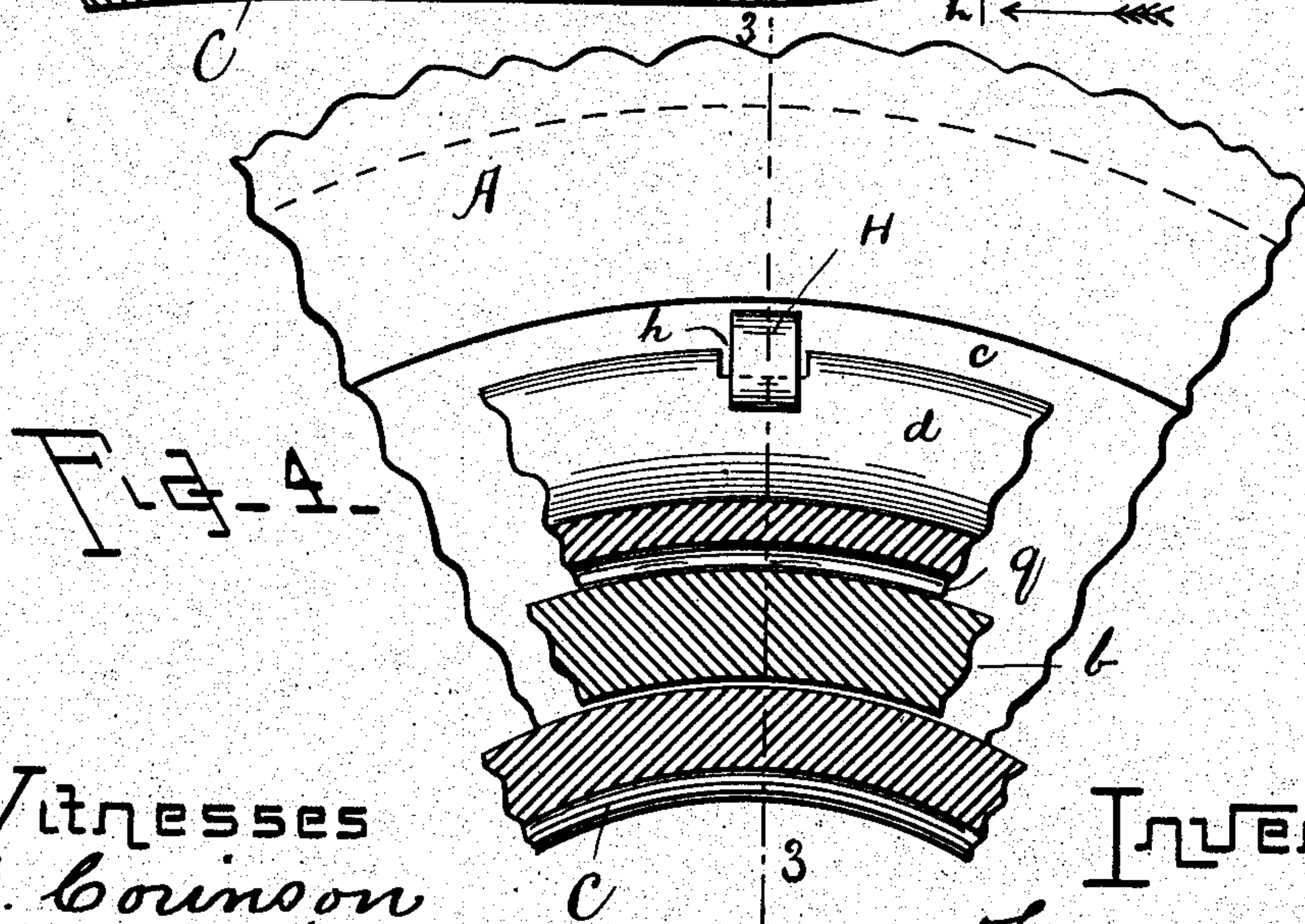
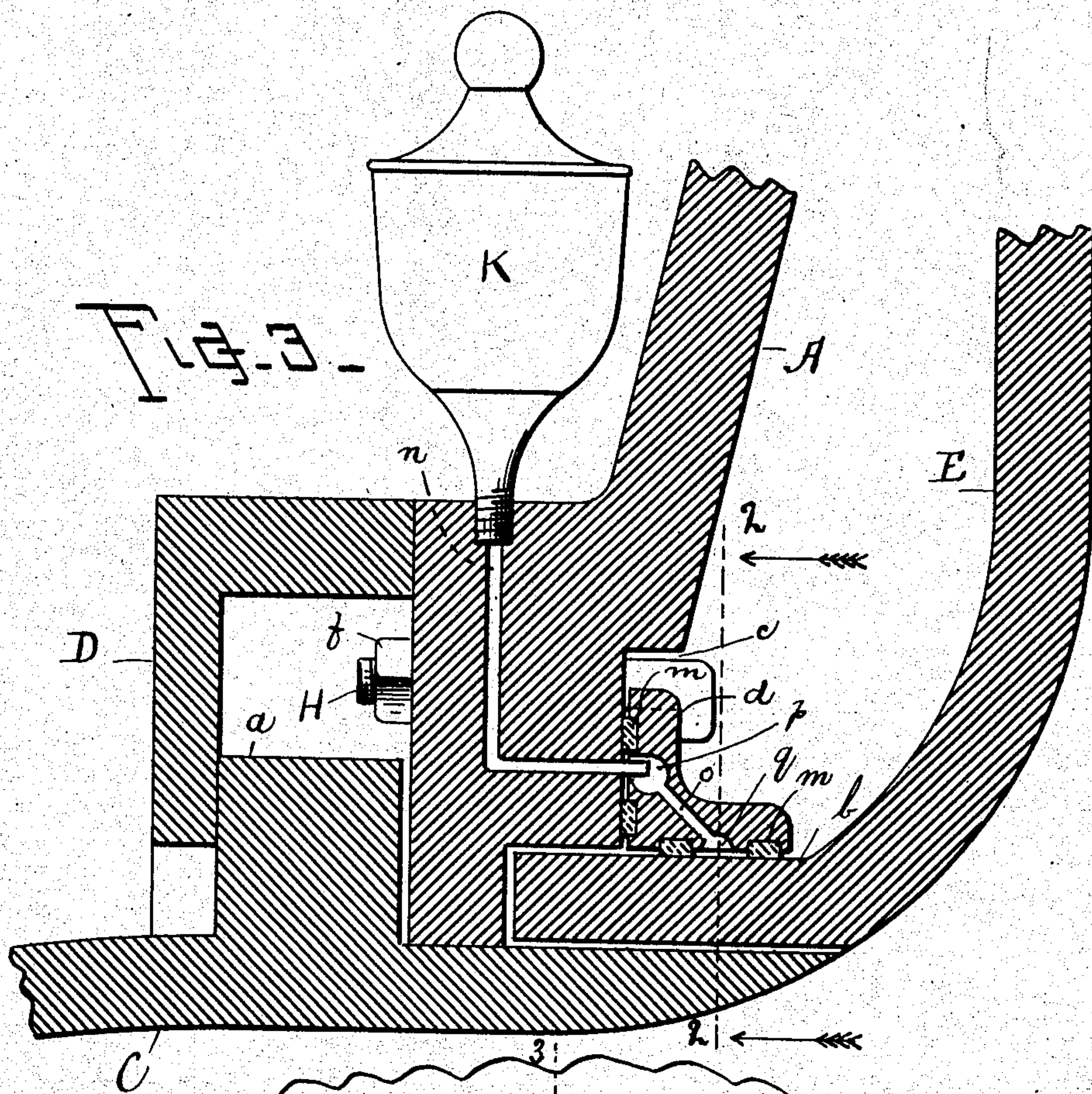
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4 SHEETS—SHEET 3.



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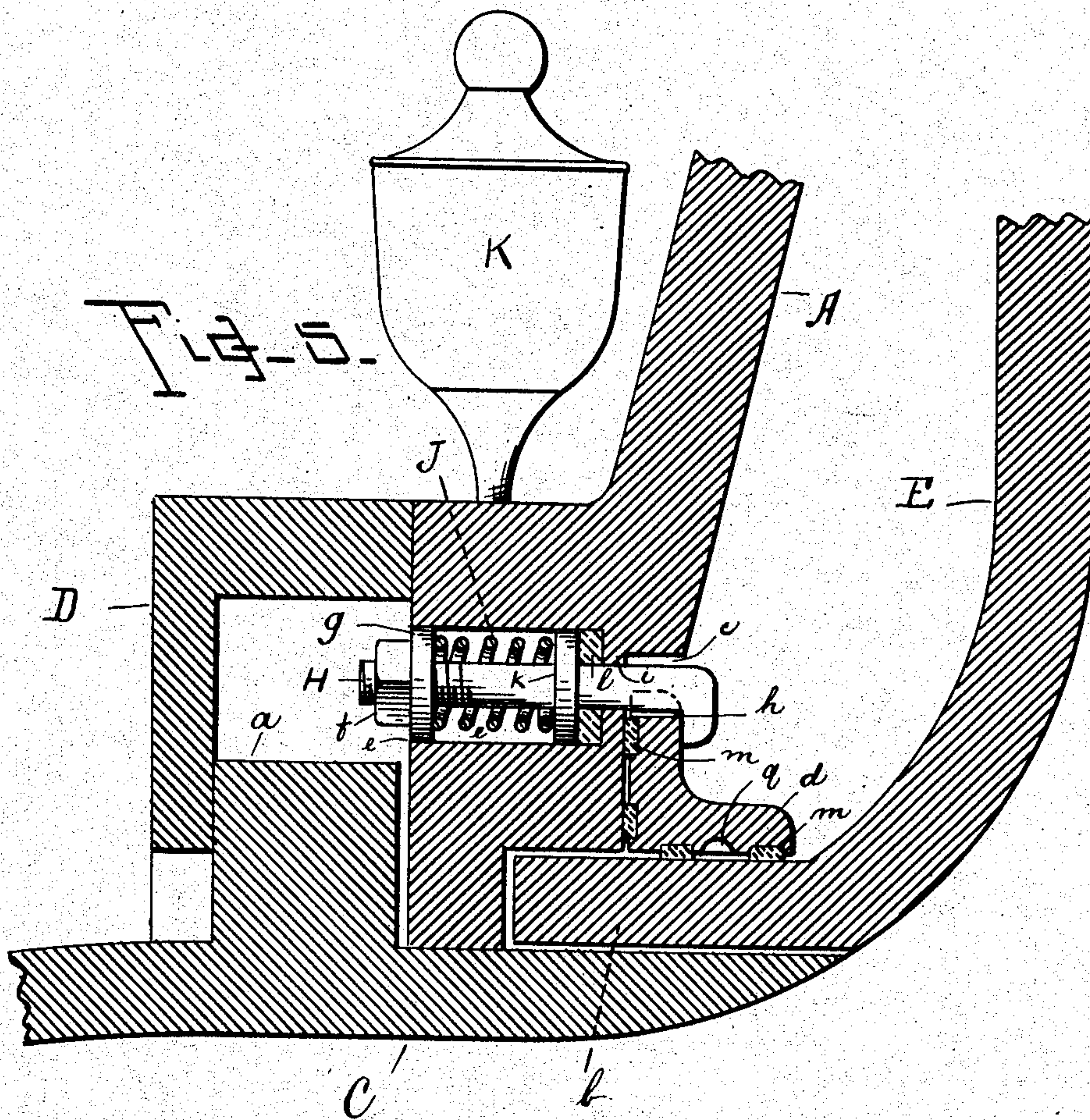
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

FERDINAND W. KROGH AND CARL A. KROGH, OF SAN FRANCISCO,
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CENTRIFUGAL PUMP.

No. 815,439.

Specification of Letters Patent.

Patented March 20, 1906.

Application filed September 1, 1903. Serial No. 171,552.

To all whom it may concern:

Be it known that we, FERDINAND W. KROGH and CARL A. KROGH, citizens of the United States, and residents of San Francisco, in the county of San Francisco, State of California, have invented a new and useful Improvement in Centrifugal Pumps; and we do hereby declare that the following is a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

Our invention relates to pumps in general, but more particularly to that class called "centrifugal;" and it consists especially in the peculiar construction and arrangement of annular collars adjustably secured around the connecting portion of the impeller to the inner side of the pump-casing and to provide same with suitable packings, the object of which is to form a water-tight joint between the casing and the impeller and at the same time provide suitable means for lubricating the same, as will be more fully described hereinafter.

Reference is made to the herewith-annexed drawings, consisting of five figures, which form a part of this specification, in which—

Figure 1 represents a vertical elevation of an ordinary centrifugal pump. Fig. 2 is a central vertical section taken from dotted line 1 to 1 of Fig. 1 with a portion broken away, showing our invention. Fig. 3 is an enlarged fragmentary sectional view showing particularly our improved annular collars provided with packing and lubricating means. Fig. 4 is a segmental view taken from dotted line 2 to 2 of Fig. 3 looking in the direction of the arrows; and Fig. 5 is a view taken from dotted line 3 to 3 of Fig. 4, showing particularly the means by which the annular collars are adjusted in position.

Like letters of reference made use of in the several figures indicate like parts wherever employed.

A represents the casing of an ordinary centrifugal pump, projecting outwardly at its axis; B, a vertical base provided with an upper horizontal cylindrical bearing portion, and C is a elbow suction or inlet pipe mounted upon a suitable base, as shown in dotted line, Fig. 2. The casing A is mounted between the ends of the elbow-pipe C and the upper horizontal cylindrical bearing portion

of the base B and rigidly secured thereon by means of angular brackets D, bolted to the axis of the casing and adjusted against the annular projections *a*, formed around the ends of the elbow-pipe C and the horizontal cylindrical bearing portion of the vertical base B. Within the casing A is the impeller E, supported therein by means of shaft F, placed within the upper horizontal cylindrical bearing portion of the vertical base B. Its central portion is provided with cylindrical flanges *b*, projecting outwardly from its sides into annular depressions cut inwardly around the axis of the casing within which it revolves. Surrounding the cylindrical projecting flanges *b* of the impeller E just mentioned and within the recesses *c*, made upon the inner sides of the casing at its axis, are packing-rings or annular collars *d*, formed angularly to provide suitable bearing-faces and adjustably secured in position by means of bolts H, adjustably secured within the holes *e*, bored through the side walls of the casing or at its axis for that purpose, as is particularly shown in Fig. 5. The bolts H are provided at their outer end with nuts *f* and washers *g*, adjusted within the holes *e*, which serve as guides to keep the bolts always centrally within the holes *e*. The inner ends of the bolts are bent to overlap the edges of the packing-rings or annular collars *d*, which rings or collars have notches *h* formed upon their circumferences to receive said inner ends and hold the bolts rigid while the nuts are being screwed on their outer ends. The walls of the holes *e* are provided at the inner ends of said holes with annular inwardly-projecting shoulders *i*, through which the bolts pass centrally, and near said shoulders and upon said bolts are located washers *k*, between which and said shoulders are interposed packings *l*, whereby water-tight joints are formed at these places. Between the washers *g* and *k* and coiled around the bolts are springs J, which are intended to pull said bolts outwardly. The tension of said springs is regulated by the nut *f*, secured at the outer end of the bolts. By this arrangement the annular collars *d* are constantly forced against the inner sides of the casing and the bearing-faces of which are provided with circular packings *m*, which may be of any suitable material, thus providing a water-tight joint between the annular collars *d* and the inner

faces of the casing and the outer circumference of the cylindrical flanges *b* of the impeller E, as particularly illustrated in Figs. 3 and 5.

5 Conveniently formed through the axis of the casing are oil-conduits *n*, which are connected to the oil-conduit *o*, bored through the annular collars *d*. The oil-conduits *o* are provided at their upper end with a small
10 pocket *p*, in which the oil drops in from the oil-conduits *n*, and their lower ends are connected to an annular groove *q*, invertedly formed within the inner bearing-face of the collars *d*, which are adjusted to the cylindrical flanges *b* of the impeller, thus fully lubricating that portion. The oil-conduits *n*
15 are provided with oil-cup K to supply the oil to the grooves *q* and lubricating the bearing-faces between the collars *d* and the cylindrical flanges *b* of the impeller E.
20

Believing we have produced a simple and effective means of packing and lubricating the connecting portion of the impeller to the casing of a centrifugal pump and having
25 fully described same, what we claim as new, and desire to secure by United States Letters Patent, is—

1. In the class of machinery described, a movable packing-ring secured to the stationary part and having faces engaging seats on
30 said stationary and moving parts and provided with means for preventing leakage of water between said faces and seats.

2. In the class of machinery described, the combination with a stationary part and a
35 moving part, of a movable packing-ring having faces engaging seats on said stationary and moving parts, spring-pressed means for securing said ring to said stationary part, and
40 means for preventing leakage of water between said faces and seats.

3. In the class of machinery described, the combination with a stationary part having an opening, and a moving part in said stationary part, of a packing-ring having faces
45 engaging said stationary and moving parts, a bolt extending through said opening and engaged with said ring, means tending to force said bolt in one direction, and packing means
50 contiguous to said bolt.

4. In the class of machinery described, the combination with a stationary part having an opening, and a moving part in said stationary part, of a packing-ring having faces

engaging said stationary and moving parts, a
55 bolt extending through said opening and engaged with said ring, means for holding said bolt against axial movement, a spring on said bolt, tending to press the same and the packing-ring in one direction, a tension-
60 adjusting means for said spring, and a packing on said bolt, for the purposes specified.

5. In the class of machinery described, a stationary and a moving part a movable
65 packing-ring secured to the stationary part, and having a face engaging a seat on the moving part and provided with means for preventing leakage of water between said face and seat, in combination with means for lubricating said face of the ring.
70

6. In the class of machinery described, the combination with a stationary and a movable part, of a packing-ring secured to the stationary part and having a water-tight face engaging a seat on the moving part, said packing-
75 ring also having an oil-conduit open upon said face, and means through which said conduit is supplied with oil.

7. In a centrifugal pump, the combination with a casing having shoulders, and an im-
80 peller rotating in said casing, of packing-rings engaging said impeller and provided with adjustable means for connecting them to said casing, comprising bolts extending through said shoulders and engaging said
85 rings, a spring on each bolt, and washers at the ends of said spring.

8. In a centrifugal pump, the combination with a casing having shoulders, and an im-
90 peller in said casing, of packing-rings engaging said impeller and provided with adjustable means for connecting them to said casing, said adjustable means comprising bolts extending through said shoulders and connected to said rings, springs on said bolts,
95 washers at the ends of said springs, nuts at the outer ends of said bolts, and a packing on each bolt, interposed between the inner washer and the contiguous shoulder.

In testimony whereof we have affixed our
100 signatures, in the presence of two witnesses, this 15th day of August, A. D. 1903.

FERDINAND W. KROGH.
CARL A. KROGH.

In presence of—
J. CORINSON,
N. RASCHEN.