

No. 862,017.

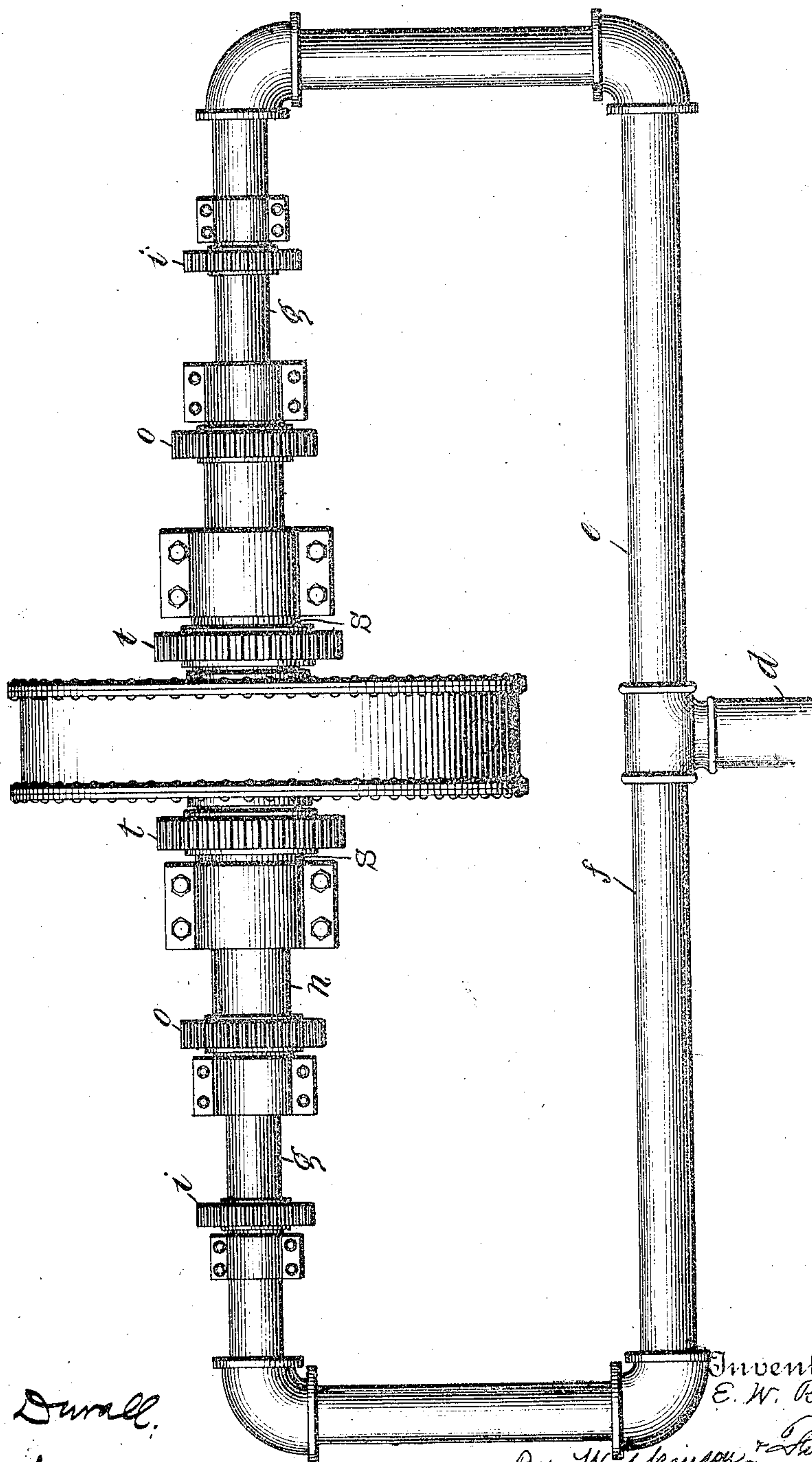
PATENTED JULY 30, 1907.

E. W. RIGGS.
COMPOUND CENTRIFUGAL PUMP.

APPLICATION FILED JULY 7, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

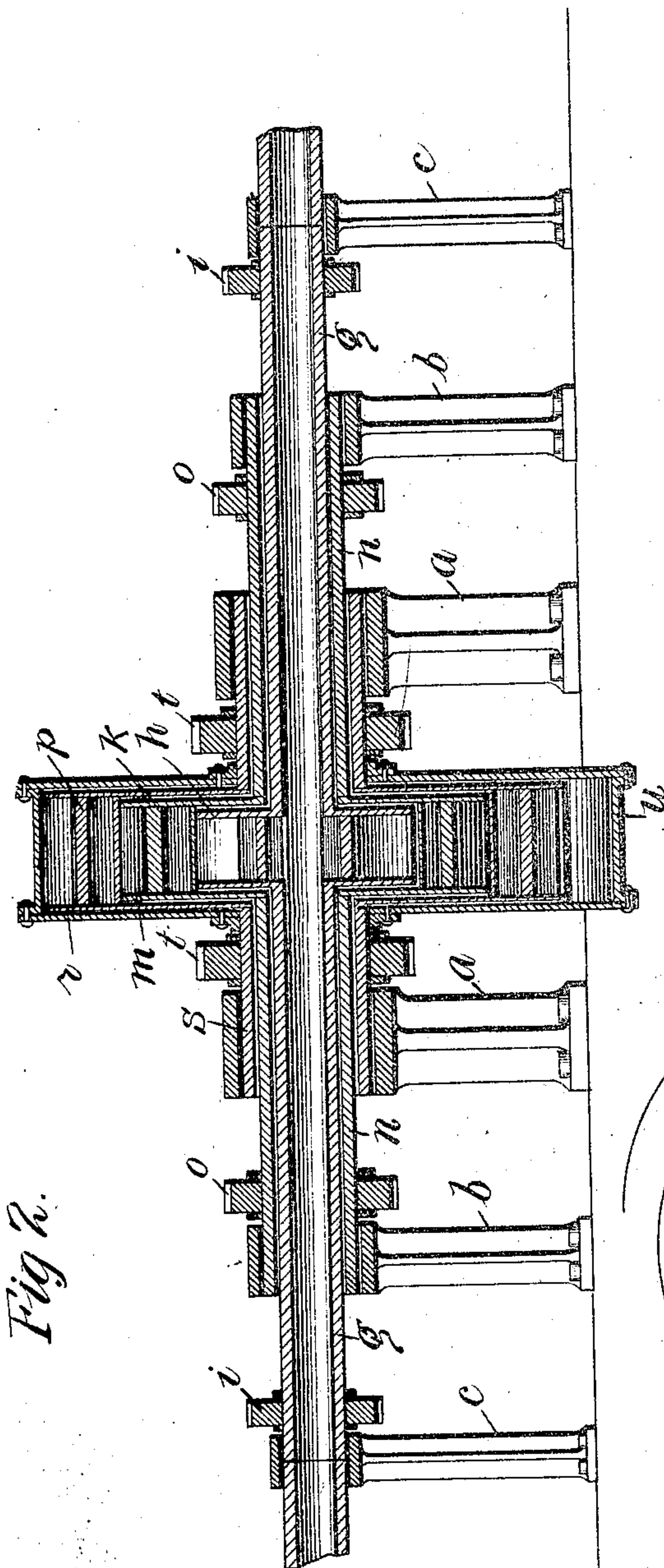


Fig 2.

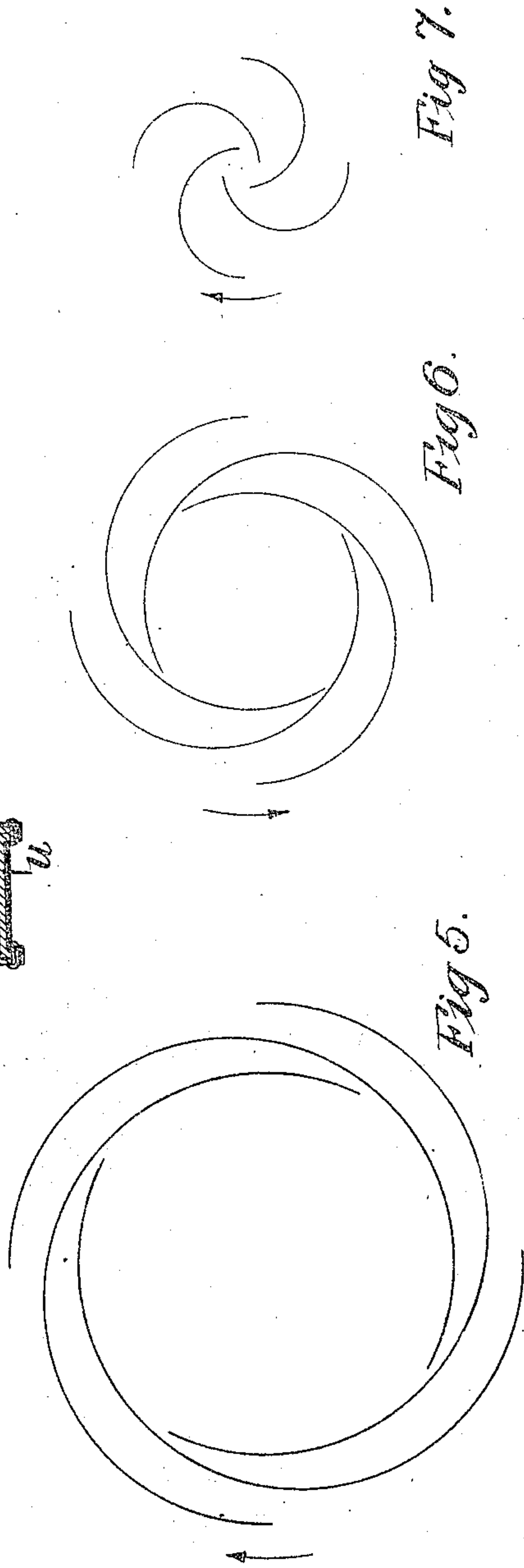


Fig 7.

Fig 6.

Fig 5.

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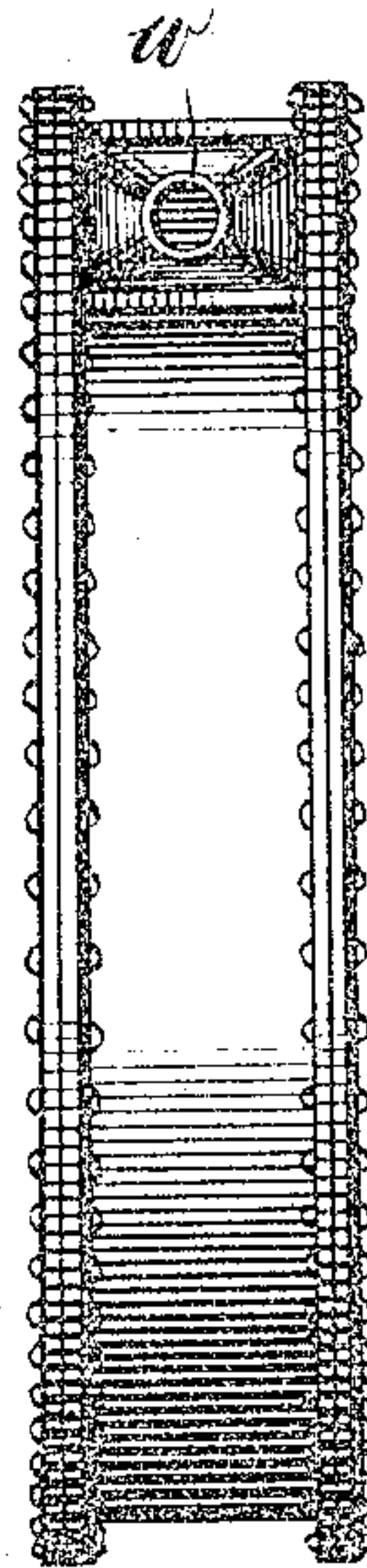
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3 SHEETS—SHEET 3.

Fig. 3.



Fig. 4.



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UNITED STATES PATENT OFFICE.

ERLAND W. RIGGS, OF BUTTE, MONTANA, ASSIGNOR OF ONE-HALF TO MORRIS S. LARGEY,
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COMPOUND CENTRIFUGAL PUMP.

No. 862,017.

Specification of Letters Patent.

Patented July 30, 1907.

Application filed July 7, 1905. Serial No. 268,598.

To all whom it may concern:

Be it known that I, ERLAND W. RIGGS, a citizen of the United States, residing at Butte, in the county of Silverbow and State of Montana, have invented

5 certain new and useful Improvements in Compound Centrifugal Pumps; and I do hereby declare the following to be 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.

10 My invention relates to improvements in compound centrifugal pumps, and the object of my invention is to provide a simple and economical device of this class, which with a small expenditure of power will lift a large amount of water to a considerable

15 height.
With this object in view, my invention consists in the construction and combinations of parts as herein-after described and claimed.

In the accompanying drawings:—Figure 1 is a side view of my complete pump. Fig. 2 is a longitudinal vertical section of a part thereof. Fig. 3 is a cross section of the pump casing. Fig. 4 is an end view of the same, and Figs. 5, 6 and 7 are diagrammatic views representing the arrangement and direction of rotation

25 of the separate pumps, which together form the compound centrifugal pump.

On a suitable foundation, (not shown) are located a series of standards arranged in pairs, *a a*, *b b*, and *c c*, each pair serving as a bearing for one of the centrifugal

30 pumps.

d represents the water inlet pipe which is provided with two branches *e* and *f*, one of which leads into each end of the hollow shaft *g* of the inner centrifugal pump *h*. The shaft *g* is revolved by means of gear wheels *i* located in proximity to the standards *c*. Suitable stuffingboxes may of course be used to prevent the water leaking at the point where the pipes *e* and *f* come in proximity to the hollow shaft *g*. The inner pump *h* is provided with the usual curved blades

40 *j*. Outside of the centrifugal pump *h* is a larger annular centrifugal pump *k*, provided with curved blades *l* arranged, however, in the opposite direction to the blades *j* on the pump *h*. The blades are carried by the side pieces *m* which are secured to the hollow shaft *n* which is mounted in the bearings *b*, gear wheels *o* being provided to drive the shaft *n*. Outside of the pump *k* is arranged another annular centrifugal pump *p*, provided with curved blades *q* oppositely arranged in relation to the blades *l*, but approximately parallel to the blades *j*. The blades *q* are supported in side pieces *r* carried by the hollow shaft *s*, which is supported in the standards *a* and revolved by means of the gear wheels *t*. I have shown two gear wheels for

each hollow shaft, but obviously only one wheel for each shaft is necessary and any driving means can be substituted for the gear wheels shown. Stuffing boxes are of course used where needed to prevent leakage.

The three centrifugal pumps are arranged concentrically as shown within a casing *u*, volute shaped as shown in Fig. 3 and provided with a tapering discharge nozzle *w* which connects with the discharge pipe. As indicated in Figs. 5, 6 and 7, the pumps revolve in different directions, the inner one right handed for example, the intermediate one left handed, and the outer one right handed, and so on, as any desired number of concentric pumps can be used. Furthermore, the gearing is so arranged that the innermost pump travels the slowest, and that the speed of the various pumps increases progressively from the center outwards. This feature, and the feature of having the blades of the respective pumps curved in opposite directions, I consider of special importance. As the water or other liquid is thrown out, its pressure becomes greater, and each vane has a less distance proportionately to throw the water, and furthermore, the vanes are given a longer sweep, thus affording greater leverage.

While I have thus described my invention, I wish it to be distinctly understood that I do not limit myself to the exact details shown and described, as these might be varied in many respects without departing from the spirit of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a compound centrifugal pump, the combination of a central centrifugal pump provided with curved vanes and mounted on a hollow shaft, a series of concentrically arranged annular centrifugal pumps mounted on hollow shafts and surrounding said first named pump, and means for driving said pumps at successively greater speeds from the central pump to the last one of the series, substantially as described.

2. In a compound centrifugal pump, the combination of a central pump mounted on a hollow shaft and provided with curved blades, a series of annular centrifugal pumps, each mounted on a hollow shaft and provided with curved vanes, the vanes on said pumps being curved in opposite directions successively, means for driving said pumps at progressively greater speeds from the central pump outwards, a volute shaped casing surrounding said series of pumps, and inlet and discharge pipes, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

ERLAND W. RIGGS.

Witnesses:

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