

No. 693,522.

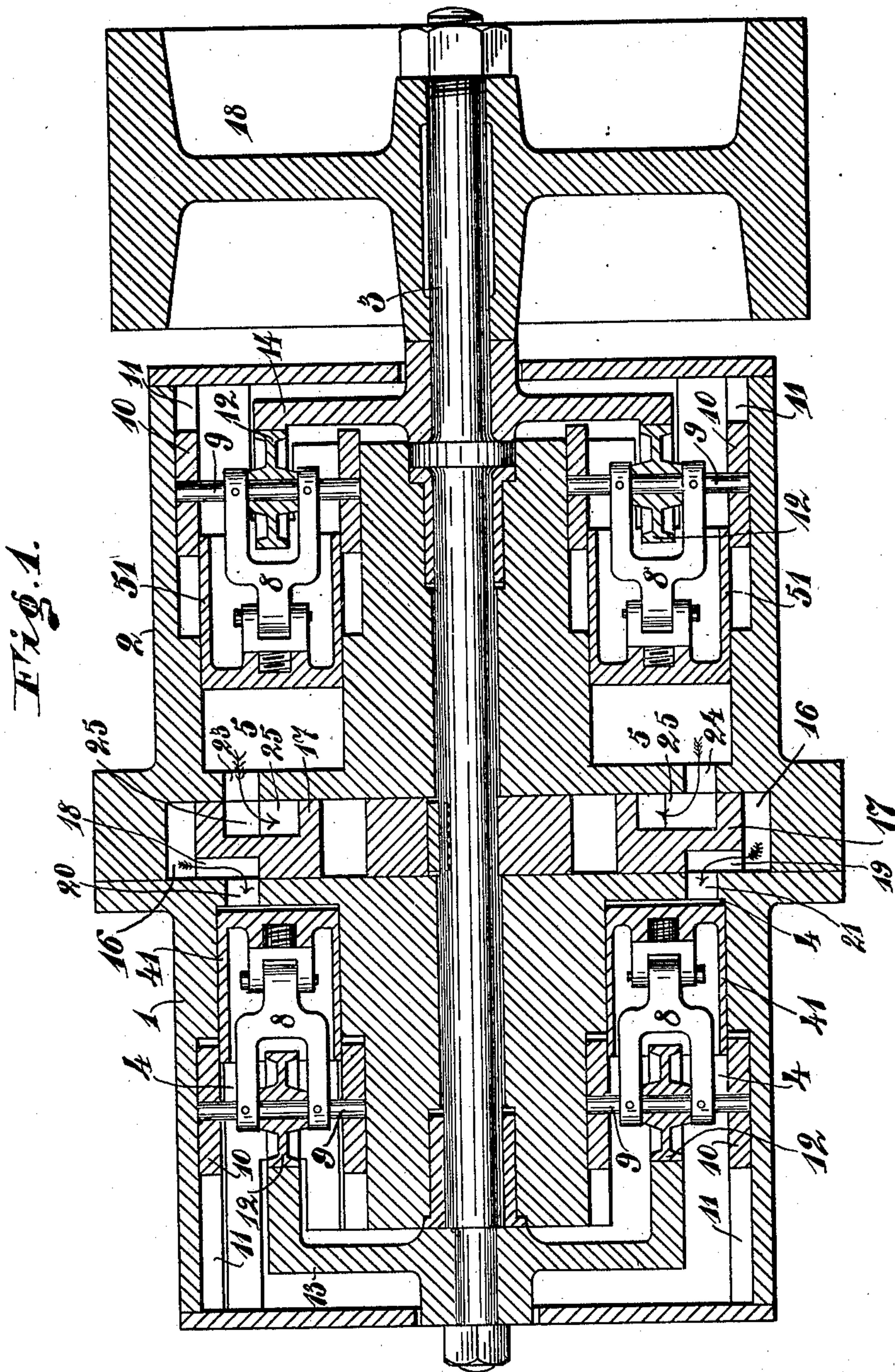
Patented Feb. 18, 1902.

F. J. E. JOHANSSON.
STEAM ENGINE OR THE LIKE.

(Application filed Feb. 28, 1901.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses:
Gustaf Isak.
Gustaf Isak.

Inventor:
F. J. E. Johansson
by Alois Dahl
his atty

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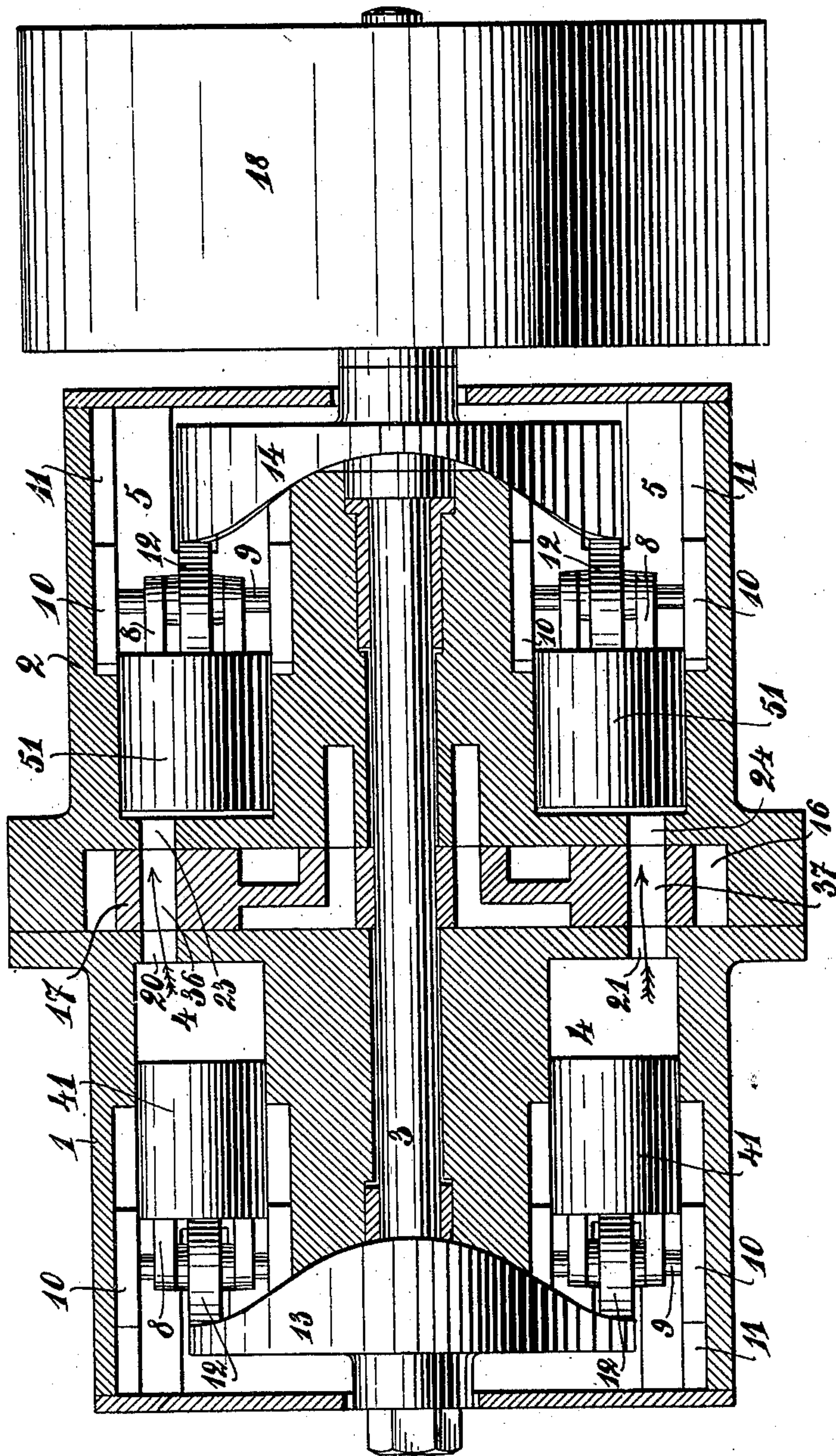
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(No Model.)

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Fig. 2.



Witnesses:
Hustaf Isfält.
Anders Meltzer

Inventor:
F. J. E. Johansson
by Olof Dahl
his atty

No. 693,522.

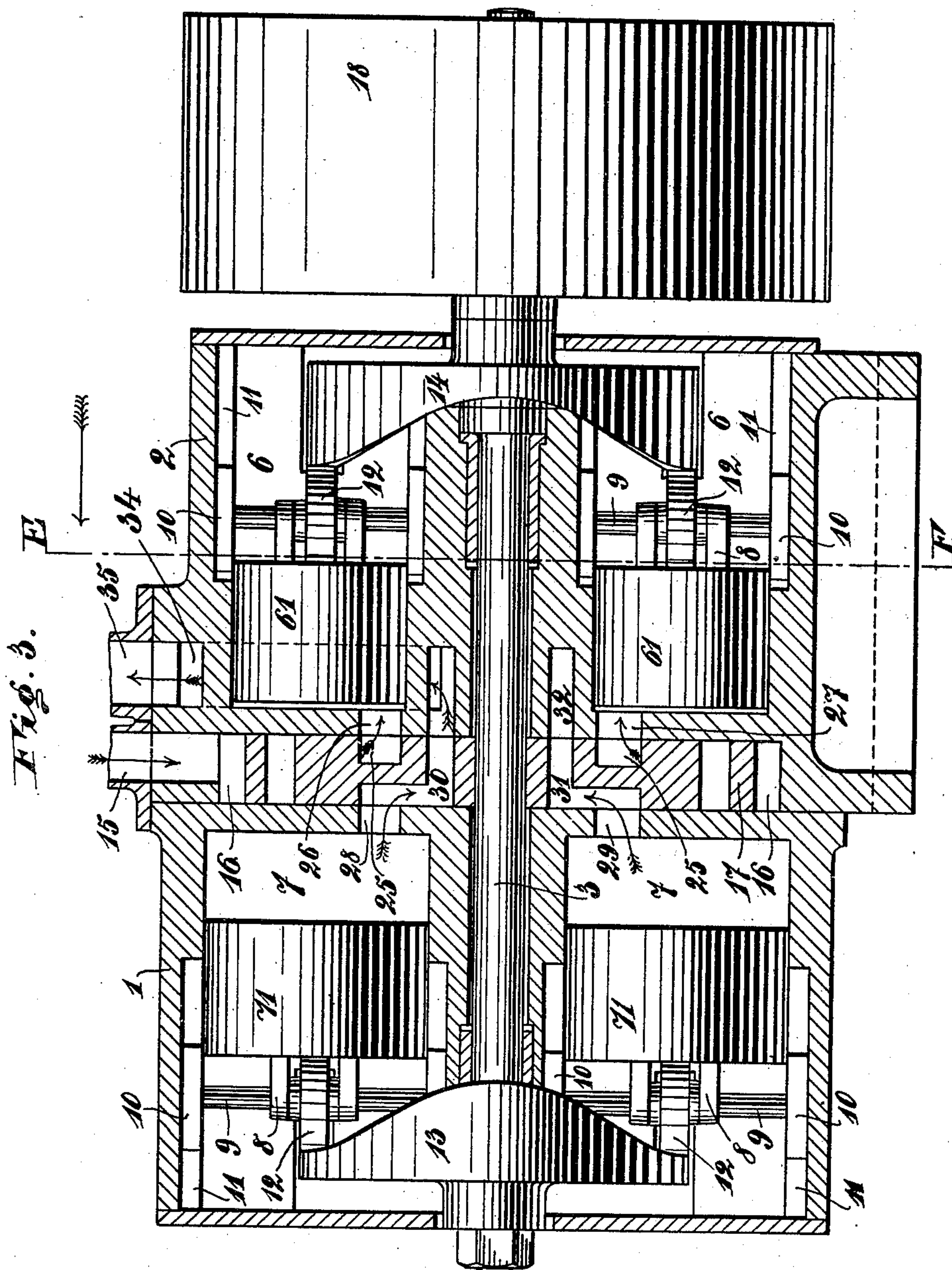
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Witnesses:
 Gustaf Tapan.
 Underindwist.

Inventor:
F. J. T. Johansson
by Asaph A. Dahl
his att'y

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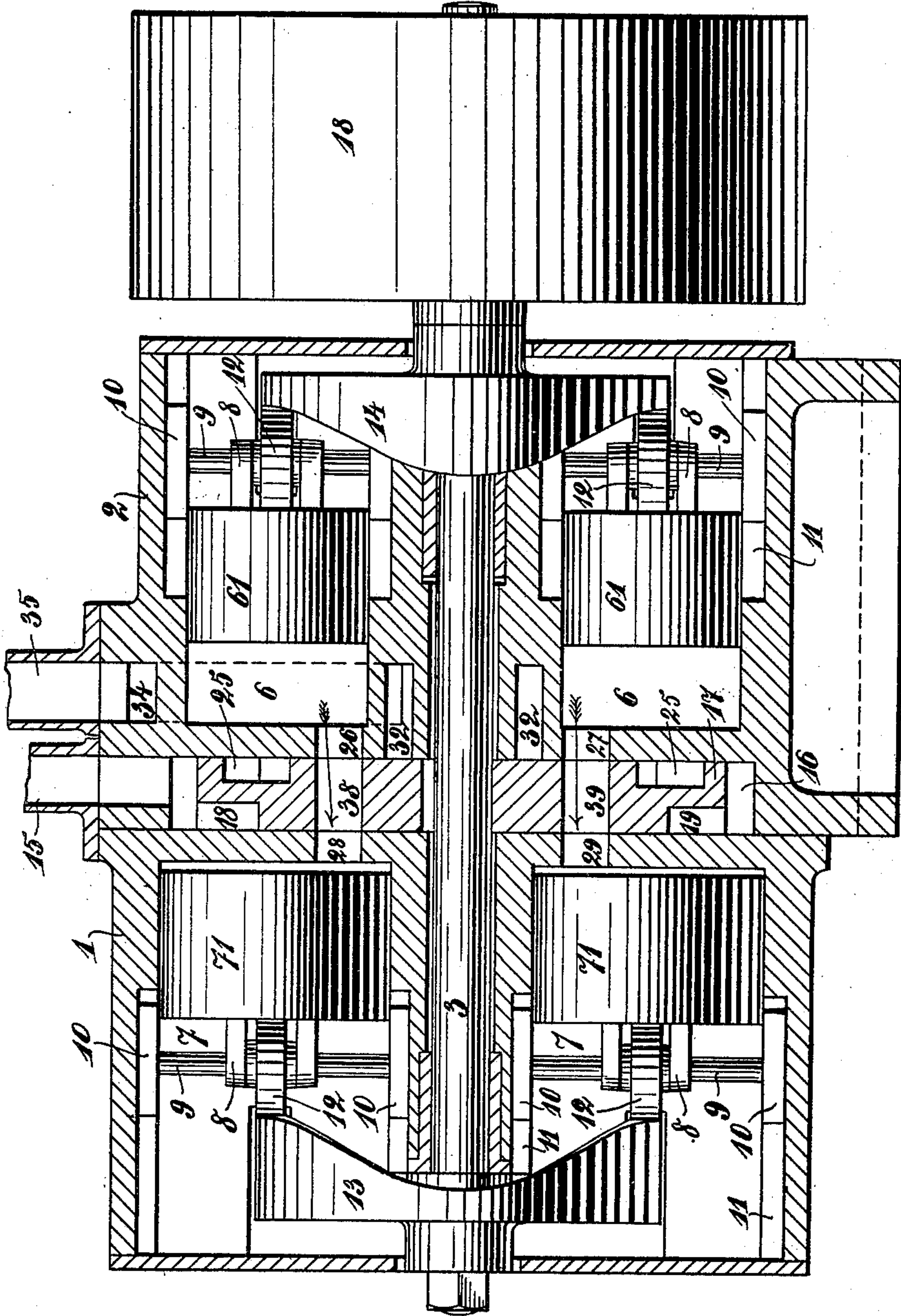
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(No Model.)

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Fig. 4.



Witnesses:
Gustaf Lofv
Ludvig Mikkvist

Inventor:
F. J. E. Johansson
by Axel Dahl
his att'y

No. 693,522.

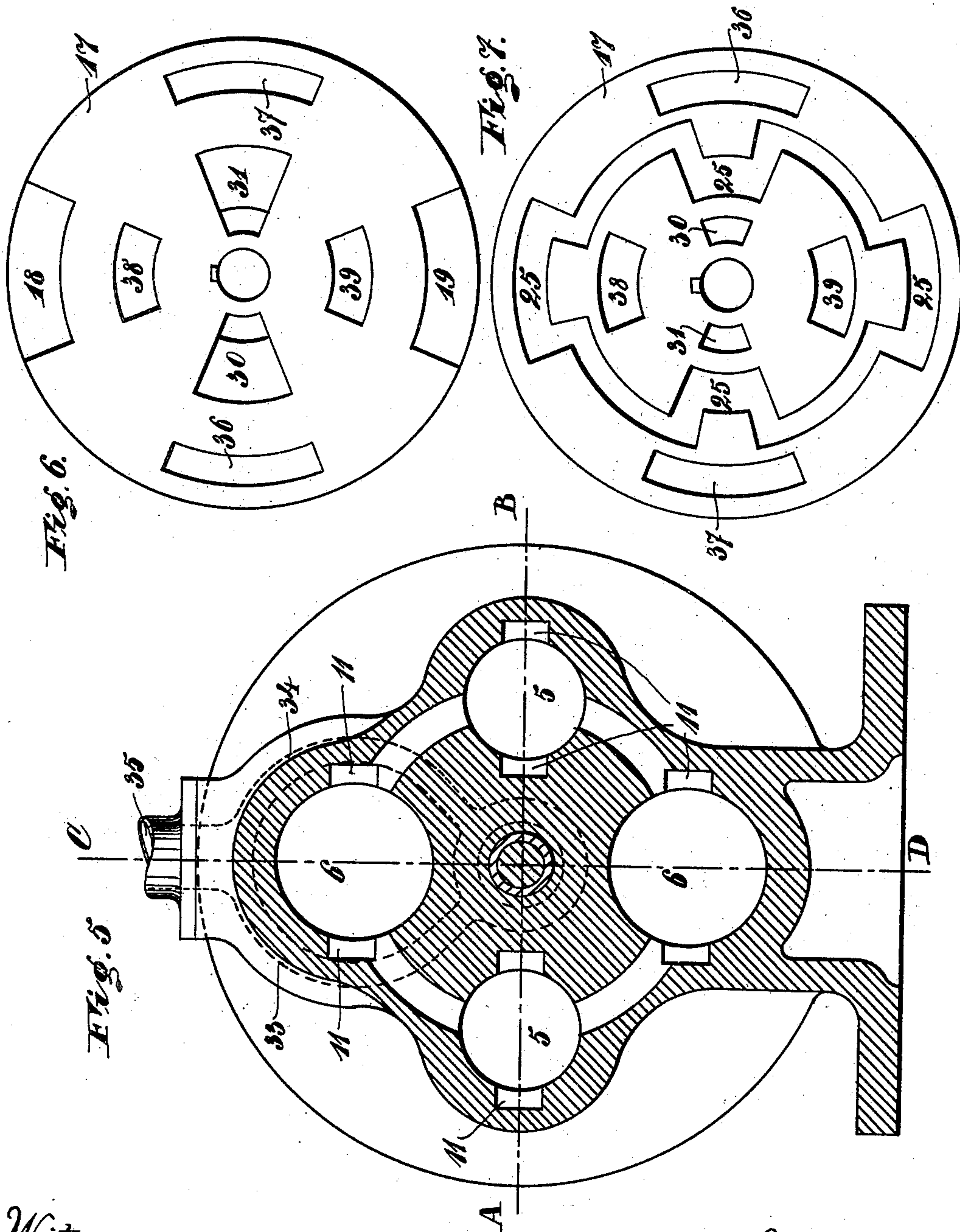
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(Application filed Feb. 28, 1901.)

(No Model.)

5 Sheets—Sheet 5.



Witnesses:
Maud Pinkerton
Lucretia Spurr.

Inventor:
F. J. Johansson
by Gustaf Dahl
his att'y

UNITED STATES PATENT OFFICE.

FRANS JOHAN EMIL JOHANSSON, OF STOCKHOLM, SWEDEN.

STEAM-ENGINE OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 693,522, dated February 18, 1902.

Application filed February 28, 1901. Serial No. 49,364. (No model.)

To all whom it may concern:

Be it known that I, FRANS JOHAN EMIL JOHANSSON, a subject of the King of Sweden and Norway, and a resident of Stockholm, Sweden, have invented new and useful Improvements in Steam-Engines or the Like Engines, of which the following is a specification, reference being had to the drawings accompanying and forming a part hereof.

This invention relates to steam-engines or the like.

The object of the invention is to provide an engine which will at the same time occupy a small room, be cheap to build and maintain, and in which the expansion system may be easily employed in a high degree, whereby the engine will be economical as regards the consumption of steam.

The invention consists principally in placing around the driving-shaft of two groups of cylinders, preferably of different sizes, one behind the other, and locating between these two groups of cylinders a distributing-valve secured to the shaft, said distributing-valve, by means of suitable passages, controlling the admission and discharge of steam to and from all the cylinders, and by placing at each end of the engine a drum provided with cam-surfaces and secured to the shaft, on which drums the pistons of both groups of cylinders act axially in opposite directions. In this manner even quadruple-expansion engines can be produced at about the same cost as the ordinary high-pressure engines, and, moreover, an engine according to the present invention occupies a much smaller space than a crank-engine with the same rate of expansion and developing the same power.

The invention further consists in the combination and arrangements of parts hereinafter described and claimed.

In the accompanying drawings is illustrated a quadruple-expansion engine according to the present invention with two pistons of each size.

Figures 1 and 2 show, respectively, longitudinal sections of the engine on line A B in Fig. 5 with the pistons in different extreme positions. Figs. 3 and 4 likewise show, respectively, longitudinal sections on line C D in Fig. 5 with the pistons in different extreme positions. Fig. 5 shows a cross-section

on line E F in Fig. 3 looking in the direction of the arrow, and Figs. 6 and 7 show the valve from different sides.

In a case composed of two parts 1 and 2 are eight cylinders of four different sizes, four in each part. All the cylinders are parallel to a shaft 3, passing through the case 1 2 and suitably journaled in same. In the cylinders 4 4, 5 5, 6 6, 7 7 are located pistons 41 41, 51 51, 61 61, 71 71, which are made hollow to gain a saving in weight and space. At the bottoms of the cylinders are jointed forks 8, each carrying a shaft 9, the ends of which engage with slides 10. The latter run in corresponding grooves 11 in the walls of the cylinders. On each shaft 9 is journaled a roller or wheel 12 between the prongs of the fork. During the running of the engine these rollers or wheels run on the cam-surfaces of the drums 13 14. The object of the slides 10 and the joint connection between the pistons and the forks is to absorb the lateral pressure which would otherwise be brought to bear on the pistons during the running of the rollers on the cam-surfaces. Between the two parts 1 2 of the case and in a recess of one of said parts 2 is placed the circular distributing-valve 17, which is surrounded by an annular space 16, communicating with the admission-pipe 15 for the high-pressure steam. The said valve 17 is secured to the shaft and provided with apertures and passages effecting the admission and discharge of the steam to and from all the cylinders, as will be more fully described below. On the shaft 3 is secured a belt-pulley 18, which suitably serves as a fly-wheel.

The engine operates as follows: In Figs. 1 and 3 the pistons 41 41 and 61 61 occupy their inner extreme positions, while the pistons 51 51 and 71 71 occupy their outer extreme positions. The valve 17 at the same time is in such a position that the high-pressure steam admitted through the admission-pipe 15 into the annular space 16 flows into the high-pressure cylinders 4 4 through the valve-apertures 18 19 and apertures 20 21 in the part 1 of the case 1 2. Further, the cylinders 5 5 communicate with the cylinders 6 6 through apertures 23 24 in the part 2 of the case 1 2 and a valve passage or port 25 (compare Fig. 7) and apertures 26 27, Fig. 3, in the part 2 of the case 1 2, so that the steam in the cylinders

5 5 expands into the cylinders 6 6. Finally the cylinders 7 7 communicate with exhaust-passages 33 34 (compare Fig. 5) and the exhaust-pipe 35 through apertures 28 29 in the part 1 of the case 1 2 and valve-passages 30 31 and an annular space 32 in the part 2 of the case 1 2. In consequence of the connections described the cylinder-pistons move into the positions shown in Figs. 2 and 4, the pistons 10 41 41 61 61 meantime by means of the drums 13 14 rotating the shaft 3 through one-quarter of a revolution, while the pistons 51 51 71 71 are forced into their cylinders by the cam-surfaces of the drums. When the pistons have 15 arrived at the positions shown in Figs. 2 and 4, the condition will be as follows: The cylinders 4 4, Fig. 2, communicate each with one cylinder 5 through the apertures 20 21, valve-apertures 36 37, and the apertures 23 24, the 20 steam expanding through the valve to the cylinders 5 5. At the same time the cylinders 6 6, Fig. 4, are in communication with the cylinders 7 7 through the apertures 26 27, valve-apertures 38 39, and the apertures 28 29, the 25 steam here also expanding through the valve 17 to the cylinders 7 7. The shaft meantime is rotated through another quarter of a revolution, this time by the pistons 51 51 71 71. When this one-quarter revolution has been 30 completed, all pistons are in their initial positions, (shown in Figs. 1 and 3,) fresh steam now flowing into the high-pressure cylinders 4 4 and the cycle described above being repeated.

35 From the above it is evident that fresh steam is admitted twice in each revolution of the shaft and that consequently all cylinders are filled and emptied twice in this time. It is readily understood, however, that only one 40 single admission of fresh steam in each revolution may be obtained—viz., by providing each drum 13 14 with one cam only and employing only four cylinders of different sizes, two on each side of the valve—or that three 45 or more admissions of fresh steam in each revolution can be provided for by increasing the number of cams on the drums 13 14 and correspondingly increasing the number of cylinders. Such modifications depend on the 50 ratio desired between the number of revolutions of the shaft and the number of piston-strokes in each cylinder.

The valve-port 25, by which communication is brought about between the four cylinders 5 5 6 6, arranged side by side in pairs, is arranged symmetrically in order to admit of running the engine in both directions, as desired. In starting the engine it is only necessary to turn the axle 3 so as to place the 60 rollers 12 on one side or the other of the cam-points, and the engine will immediately commence running in the desired direction.

A modification of the above-described en-

gine can be made by locating between the two parts of the case 1 2 one or more drums the 65 ends of which are shaped as cam-surfaces and arranging at each end of the engine a suitable distributing-valve secured to the shaft. In this case, however, each group of cylinders must form by itself a complete ex- 70 pansion system.

It is obvious that my invention is not limited to quadruple engines, as shown, but may be built with any number of cylinders and for single, compound, triple, quadruple, or 75 any number of expansions by properly arranging the cylinders, nor to the precise carrying out of the details, since those and other such modifications may be made without deviating from my invention, as will be well 80 understood by those skilled in the art.

Engines of this kind are simple and cheap to build, having fewer parts than corresponding engines of the types hitherto known. They are cheap to maintain, since most of the wear- 85 ing parts may be provided with roller-bearings and may, moreover, entirely run in oil. By arranging that two pistons are working on different drums at the same time the axial pressure will be well balanced, thereby re- 90 ducing the end thrust to a very small minimum or next to nothing. By having two cylinders at each end working in the same direction at the same time the bending on the drums and shaft will be reduced to a mini- 95 mum. The engine being very compact, the loss by condensation is reduced to a minimum even without steam-jacketing, which latter, however, may be very easily applied. By using several successive expansions the con- 100 sumption of steam may be comparatively low for a certain effect.

For the sake of simplicity the dimensions, &c., shown in the drawings are chosen arbitrarily, since the most advantageous dimen- 105 sions will be well understood by those skilled in the art.

Having now described my invention, what I claim as new, and desire to secure by United States Letters Patent, is— 110

In a steam-engine, the combination, of a driving-shaft, cam-drums secured to said shaft, two sets of high and low pressure steam cylinders arranged axially around said shaft, pistons for said cylinders, the pistons of each set 115 of cylinders engaging with one of said cam-drums, and distributing-valves common to both sets of cylinders, substantially as and for the purpose set forth.

I testify whereof I have signed my name 120 to this specification in the presence of two subscribing witnesses.

FRANS JOHAN EMIL JOHANSSON.

Witnesses:

JOHN JOHANSSON,
GUSTAF TSPAU.