No. 887,728. PATENTED MAY 12, 1908.

W. KIESER.

ELASTIC FLUID TURBINE.

APPLICATION FILED OCT. 25, 1906.

2 SHEETS—SHEET 1.

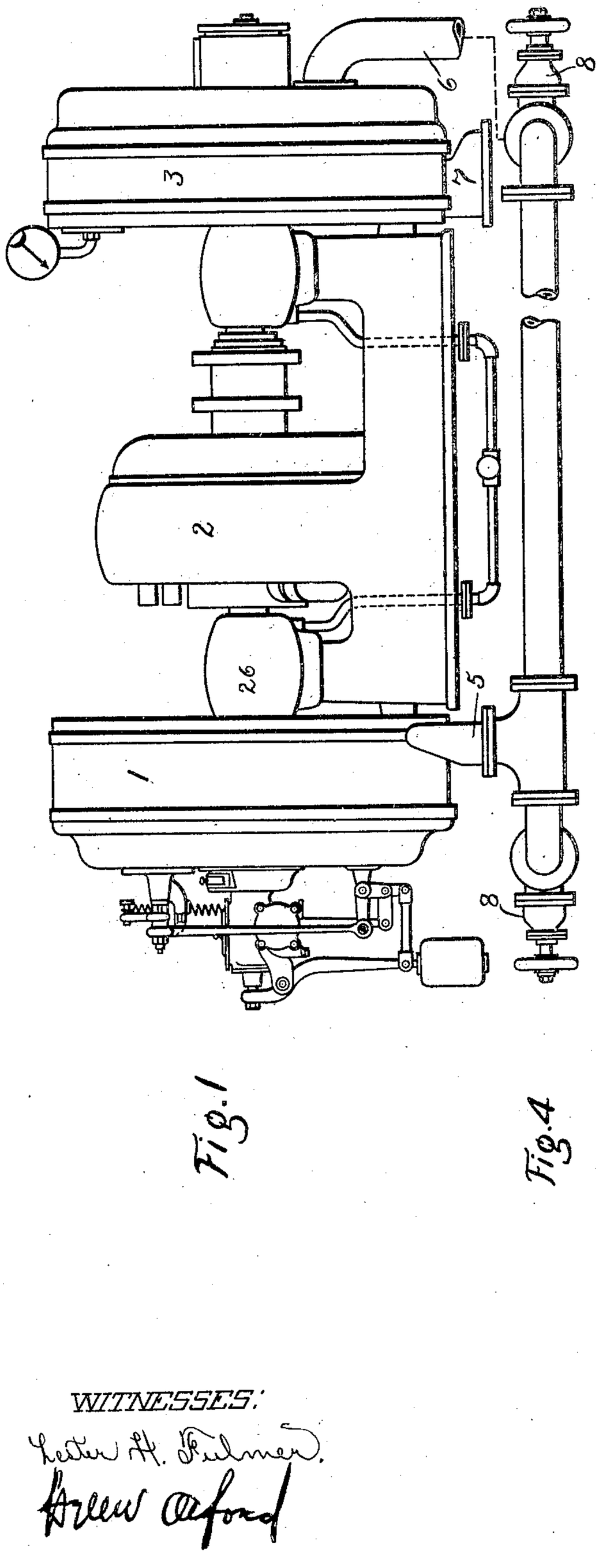

Fig. 1

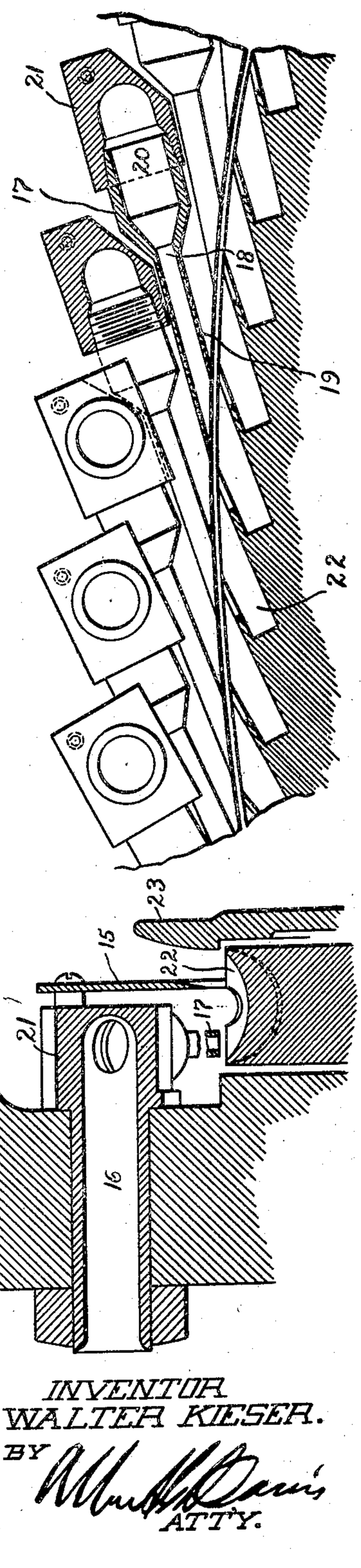

Fig. 3

Fig. 4

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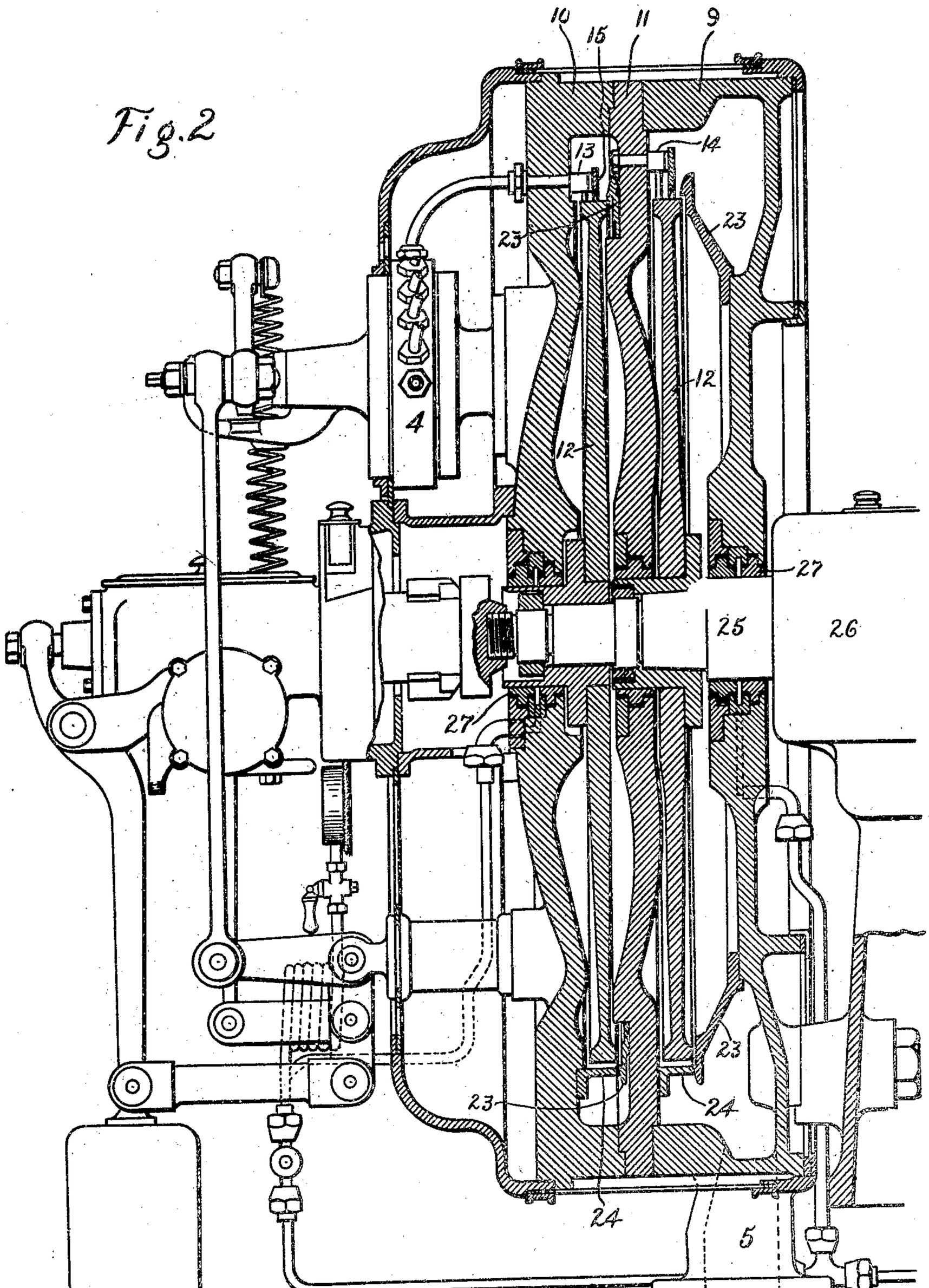
2 SHEETS—SHEET 2.

Fig. 2



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UNITED STATES PATENT OFFICE.

WALTER KIESER, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELASTIC-FLUID TURBINE.

No. 887,728. Specification of Letters Patent. Patented May 12, 1908.

Original application filed April 3, 1906, Serial No. 309,688. Divided and this application filed October 25, 1906. Serial No. 340,512.

To all whom it may concern:

Be it known that I, WALTER KIESER, a citizen of Switzerland, residing at Berlin, Germany, have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a specification.

This application is a division of my pending application, Serial No. 309,688, and is filed in compliance with a requirement for division made by the United States Patent Office under Rules 41 and 42 of said office.

The present invention relates to elastic-fluid turbines and its object is to improve the construction and operation of the turbine as set forth more particularly in the following description and claims.

In the accompanying drawings illustrating one of the embodiments of the invention, Figure 1 is a side elevation of a four-stage turbine with an electric generator between the parts of the turbines; Fig. 2 is a partial longitudinal section of two stages of the turbine at the high pressure end; Fig. 3 is a detail view showing the nozzles and buckets; and Fig. 4 is a sectional view through the nozzle and bucket wheel taken at right angles to Fig. 3.

1 represents the first two stages of a four-stage turbine which are located on one side of and assist in driving the rotating element of the dynamo-electric machine 2. The last two stages are represented at 3 and a shaft common to the turbines and the dynamo is provided. The casings of the turbine are attached to the frame of the dynamo or generator, as shown more particularly in the lower right-hand corner of Fig. 2. Steam is admitted to the first high pressure stage from the valve chest 4 and is exhausted from the second stage by the conduit 5 which is connected with the admission conduit 6 of the low pressure stages. Steam is discharged from the last stage by the conduit 7 which may lead to the atmosphere or to a condenser. Valves 8 are provided so that two of the stages can be cut out and the machine operated non-condensing on the first two stages if desired. The arrangement of the high pressure stages and the lower pressure stages is such that any tendency to thrust on one end is counterbalanced by an equal and opposite thrust on the opposite end.

Referring especially to Fig. 2, the construction of the turbine will be described. The high-pressure and the low-pressure portions of the turbine are the same in general construction so that a description of the high-pressure sections will be sufficient. The casing is made in two principal parts 9 and 10 which are separated by a diaphragm 11 to form two chambers. In each of these chambers is located a bucket wheel 12. These wheels are shown as provided with U-shaped peripheral buckets of the well-known Stumpf construction. It is to be understood however that my invention may be used with other buckets, one other form, for example, being of double U-shape. Steam or other elastic-fluid is delivered to the first wheel by the admission nozzles 13 and by stage nozzles 14 to the second wheel. These nozzles are arranged on an arc at one side of the central plane of the wheel and deliver motive fluid to a portion of the periphery of the wheel. The steam discharged from the individual nozzles or nozzle sections strikes the buckets on the left-hand side of the transversely-extending wall or partition 15 on the opposite side of the central plane of the wheel from the nozzles and is exhausted from the buckets on the right-hand side of said wall, the edge of the wall being beveled to provide a free passage for the stem.

With a double U-shaped bucket, two walls 15, one for each bucket, are used with a double nozzle between them. The arc covered by the partition depends upon that covered by the nozzles. The object of this partition is to prevent steam exhausted from the buckets from in any way interfering with the steam discharged by the nozzles. After the steam passes through the first wheel it collects in a surrounding chamber and passes through the stage nozzles 14 from which it is discharged against the buckets on the second stage wheel. The exhaust from the second stage is carried off by the conduit 5.

Referring to Figs. 3 and 4 which show the nozzle and bucket construction, 16 represents a tube which passes through the wall of the casing or through the diaphragm, as the case may be. One end of the tube is provided with a shoulder and the other end is threaded to receive a retaining nut. The nozzle proper comprises a tube having a throat portion 18, a discharge portion 19

and an enlarged portion 20 containing a bowl. The portion 20 is screw-threaded to the head 21, the latter being formed integral with the tube 16. Steam or other elastic fluid issuing from the nozzles strikes the U-shaped buckets 22 of the Stumpf or other type and produces rotation of the wheel. Steam enters on the left-hand side of the bucket, Fig. 4, and is discharged on the right-hand side, the partition 15 preventing the exhaust steam from interfering with the steam discharged by the nozzles.

In order to reduce the rotation losses as much as possible, an annular plate 23, Figs. 2 and 4, is provided which is located at one side of the wheel, and has a portion that overhangs the periphery of the wheel, the overhanging portion flaring outwardly and forming between it and the wall 15 an outward passage for the discharged fluid. This plate serves to restrict the passage of steam from the portion of the chamber surrounding the rim of the wheel to the portion of the chamber adjacent to the shaft. The portion of the wheel circumference not directly acted upon by steam from the nozzles is covered by a cylindrical cover 24, Fig. 2, attached to the head of the machine and engaging the ring or plate 23. This cover is located in close proximity to the wheel-buckets so as to reduce their fan-like action and thus reduce the rotation losses. The construction of the means for preventing rotation losses in the second stage is similar to that in the first except that the shape of the plate 23 has been changed slightly to conform to the interior construction of the casing.

The bucket wheels are mounted upon a shaft 25, and the latter is carried by bearings 26 mounted on the frame of the dynamo. Between the outer walls of the casing and the shaft and also between the diaphragm and shaft are packings 27 of suitable construction to which steam or other fluid is admitted by conduits.

The governing mechanism shown but not particularly described in this application, is not claimed herein because it forms the subject-matter of the above mentioned application from which this one was divided.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, togethe rwith the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In an elastic fluid turbine, the combination of a wheel, buckets on the periphery of the wheel, nozzles which discharge motive fluid to the buckets at one side of the wheel, and a wall separate from the nozzle structure located between the nozzles and the other side of the wheel to prevent the fluid exhausting from the buckets from interfering with that discharged by the nozzles.

2. In an elastic fluid turbine, the combination of a wheel, buckets on the periphery of the wheel, which have a tendency to discharge fluid toward the nozzle or nozzles, one or more nozzles located at one side of the central plane of the wheel for delivering motive fluid to the buckets, and a wall located on the opposite side of the central plane of the wheel which prevents interference between the fluid discharged from the buckets and that delivered by the nozzles.

3. In an elastic fluid turbine, the combination of a wheel, U-shaped buckets mounted on the periphery thereof, nozzles for discharging motive fluid against one side of the buckets, and a separate wall concentric with the bucket wheel which prevents the fluid exhausting from the other side of the buckets from interfering with that discharged by the nozzles, the face of the wall toward the nozzles being in line with the inner edges of the discharge passages of the buckets and the inner edge of the wall being beveled outwardly to permit a free passage of steam from the buckets.

4. In an elastic fluid turbine, the combination of a casing, a wheel within the casing, buckets carried by the wheel, and a wall supported by the casing and situated at one side of and extending beyond the buckets, the projecting portion of said wall flaring outwardly with its inner edge overhanging the edge of the bucket wheel in close proximity thereto, to reduce rotation losses and to restrict the passage of motive fluid toward the axis of the wheel.

5. In an elastic fluid turbine, the combination of a bucket wheel, a casing having a chamber in which the wheel rotates, an annular ring secured to one wall of the chamber and having one face conforming to and in close proximity to the face of the wheel, with a portion overhanging the edge of the wheel, and a segmental ring secured to the other wall of the chamber and extending across the idle portion of the wheel buckets into engagement with the first mentioned ring.

6. In an elastic fluid turbine, the combination of a bucket wheel, nozzles delivering motive fluid to one side of the wheel, a wall adjacent the nozzles which separates the fluid delivered by the nozzles from that discharged by the wheel buckets, and a wall closely adjacent the other side of the wheel having an outwardly flaring edge which forms between it and the first mentioned wall a passage to direct the discharged fluid outwardly.

7. The combination of a shaft, turbines on the shaft for driving it, a driven member connected to the shaft, means for supplying

motive fluid in a given direction through one turbine, means for supplying motive fluid to the other turbine so that it flows through it in the opposite direction and causes the thrusts of the turbines to oppose each other, and devices for cutting one of the turbines out of action when desired.

In witness whereof, I have hereunto set my hand this sixteenth day of October, 1906.

WALTER KIESER.

Witnesses:
ALEX. F. MACDONALD,
JOHN A. McMANUS, Jr.