No. 764,586. PATENTED JULY 12, 1904.

P. J. HEDLUND.

STEAM TURBINE.

APPLICATION FILED JUNE 13, 1903.

NO MODEL.

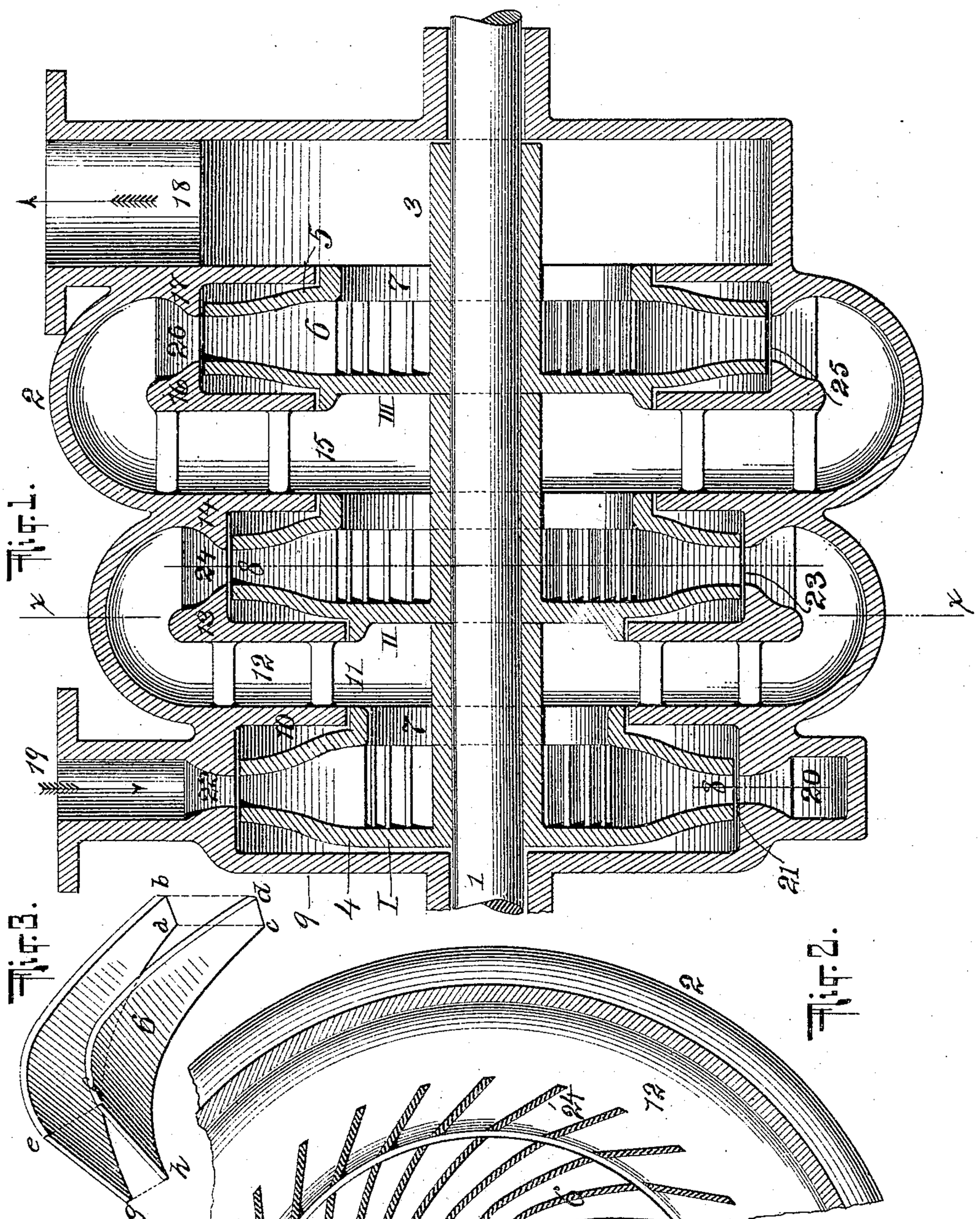

Fig. 1.

Fig. 3.

Fig. 2.

WITNESSES:

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No. 764,586. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

PER JOHAN HEDLUND, OF STOCKHOLM, SWEDEN.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 764,586, dated July 12, 1904.

Application filed June 13, 1903. Serial No. 161,328. (No model.)

To all whom it may concern:

Be it known that I, PER JOHAN HEDLUND, of Stockholm, Sweden, have invented a new and useful Improvement in Steam-Turbines, of which the following is a specification.

The invention relates to a compound elastic-fluid turbine, and has for its object to increase the economy and efficiency thereof. The working fluid is first expanded in the inlet-conduit of the wheel-casing and by reason of the contraction thereof at the outlet the velocity of the steam is increased. From said outlet it passes into the wheel through a circumferential opening registering therewith, and so meets the buckets and rotates the wheel by impact thereon. The heads of the wheel inwardly diverge, and between them are placed the wheel-buckets, the walls of which inwardly converge. By reason of the divergence of the wheel-heads and the convergence of the bucket-walls the fluid is discharged at high velocity but low pressure into the chamber formed in wheel and casing by the passage leading to the next wheel. Here the kinetic energy of the exhaust is converted into static pressure, and on passing through the contracted chamber-outlet to the next wheel the velocity of the fluid is again augmented.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of three wheels in compound series with their casing. Fig. 2 is a partial section on the line $x\,x$ of Fig. 1. Fig. 3 shows two wheel-buckets separately in perspective.

Similar characters of reference indicate like parts.

1 is the wheel-shaft, journaled in the casing 2. On said shaft are the wheels I II III of the radial inward-flow type. Each wheel has a hub 3 and one head 4, preferably integral therewith. The other head, 5, is annular and is supported by the buckets 6. Between the inner circumferential periphery of each head 5 and the hub 3 is the exhaust-outlet 7 of each wheel. The heads 4 and 5 are approximated at the wheel circumference, so that a contracted inlet-opening 8 is produced.

The chamber of wheel I is formed by the casing-head 9 and the fixed partition 10, which extends to a flange 11 on the wheel-head 5. On the opposite side of partition 10, leading the working fluid to wheel II, is a passage 12. The chamber of wheel II is formed by a partition 13, supported on partition 10 and a partition 14. In like manner the fluid from wheel II passes to a passage 15, and so to wheel III, the chamber of which is formed by a partition 16, supported on partition 14 and a partition 17. The fluid from wheel III passes to the final exhaust-outlet 18.

The incoming fluid entering at 19 goes to an annular chamber 20, which has a contracted outlet 21, encircling and registering with the contracted inlet 8 of wheel I. In said chamber 20 are guide-blades 22. Two of the wheel-buckets 6 are represented in Fig. 3. The rectangle $a\,b\,c\,d$ included between each two adjacent buckets and the wheel-heads at the inlet is smaller in area than the rectangle $g\,e\,h\,f$ at the outlet. Hence there is formed between the wheel-heads and each pair of buckets an expanding-chamber. By reason of this construction the fluid is discharged at high velocity but low pressure into the chamber formed by the passage 12, leading to the next wheel, and in this chamber the kinetic energy of the exhaust is converted into static pressure. On the escape of the fluid from said chamber through the contracted outlet 23, having guide-blades 24, its velocity is again increased. The outlet 23 registers with the circumferential inlet of wheel II, upon the buckets of which the fluid acts in the manner already described and then proceeds to passage 15, which is contracted at 25 and provided with buckets 26. The outlet 25 registers with the circumferential inlet of wheel III, from which wheel the fluid passes to the final exhaust, as already described.

I claim—

1. In combination with an elastic-fluid turbine of the inward-radial-flow type, a casing having an inlet-passage provided with a contracted annular outlet surrounding and registering with the circumferential inlet of said turbine and guide-blades in said passage.

2. In a compound elastic-fluid turbine a series of wheels of the inward-radial-flow type,

means in each of said wheels for increasing the velocity of the exhaust, chambers between said wheels for changing the kinetic energy of said exhaust into static pressure, and means for increasing the velocity of said fluid upon its escape from said chambers to said wheels.

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

PER JOHAN HEDLUND.

Witnesses:
WM. A. FURMAN,
E. R. TAYLOR.