

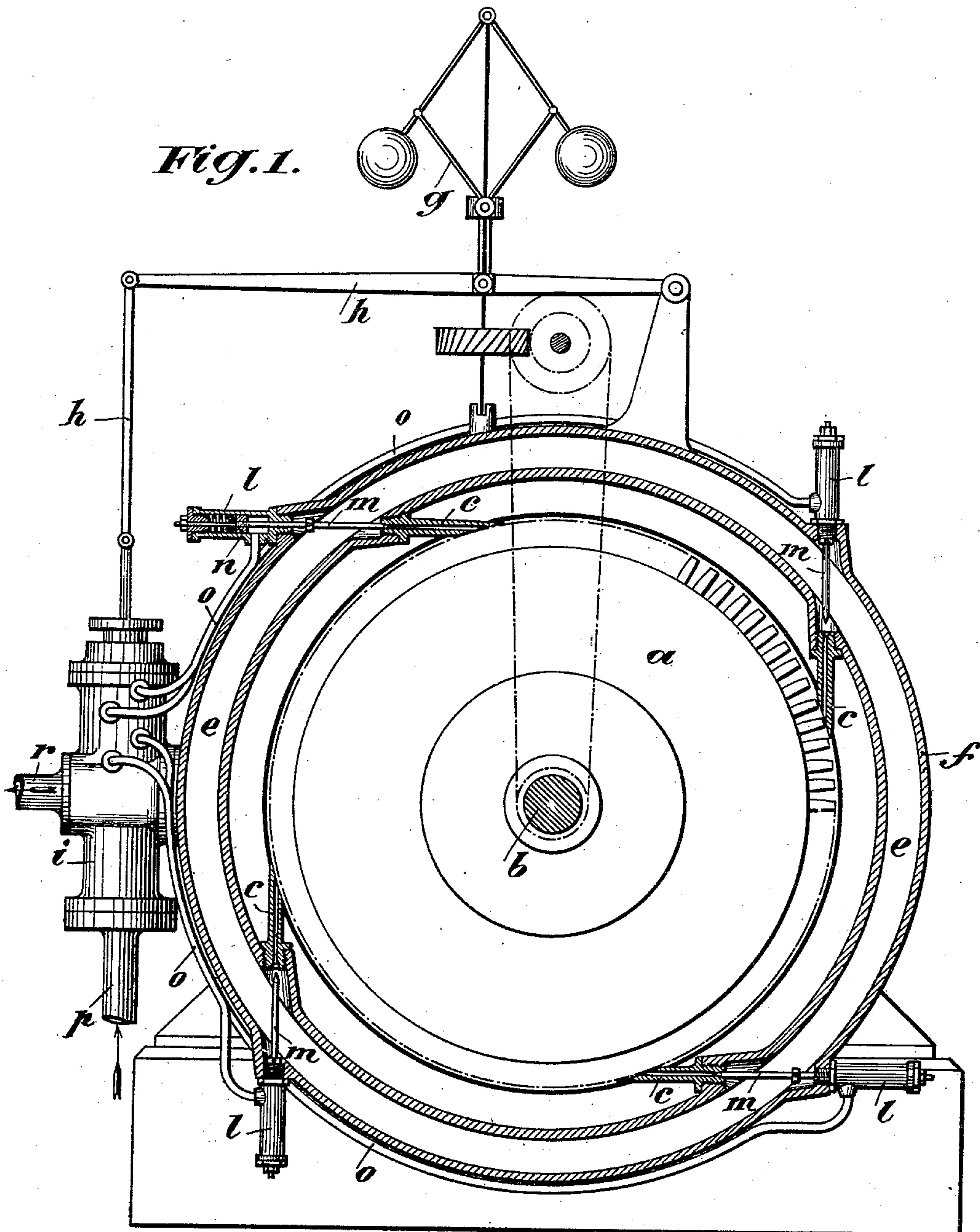
No. 705,890.

Patented July 29, 1902.

H. ZOELLY.
STEAM OR GAS TURBINE.
(Application filed Mar. 31, 1902.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

Attn

W. Sommers

Inventor:
By *Heinrich Zoelly*

Henry M. Wood
Atty

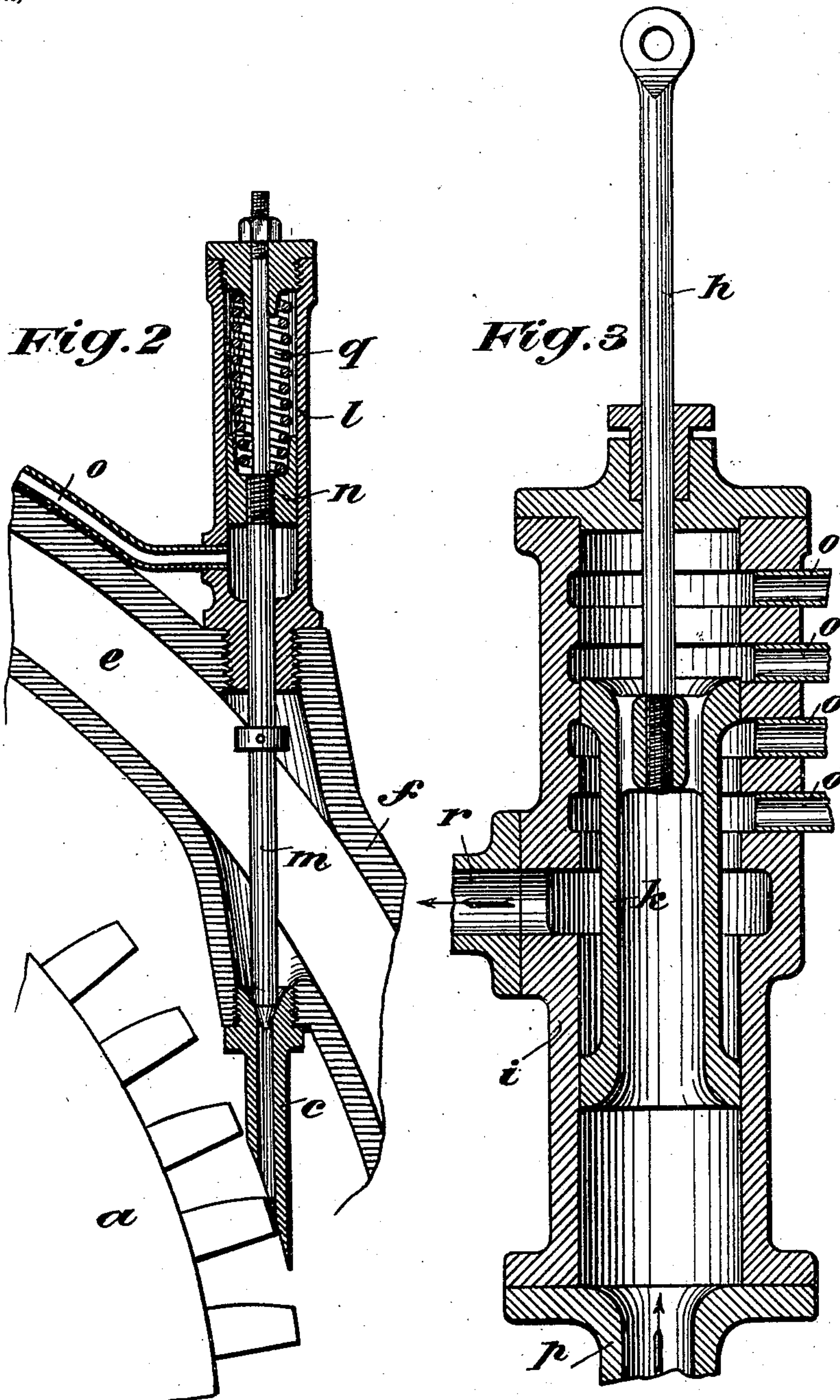
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W. H. Summers

Inventor:

Heinrich Zoelly

By

Wm. Goldsboro
Atty

UNITED STATES PATENT OFFICE.

HEINRICH ZOELLY, OF ZURICH, SWITZERLAND.

STEAM OR GAS TURBINE.

SPECIFICATION forming part of Letters Patent No. 705,890, dated July 29, 1902.

Application filed March 31, 1902. Serial No. 100,733. (No model.)

To all whom it may concern:

Be it known that I, HEINRICH ZOELLY, engineer, a citizen of the Republic of Switzerland, residing at Zurich, Switzerland, have
5 invented new and useful Improvements in Steam or Gas Turbines, of which the following is a specification.

This invention has reference to means for controlling the speed of steam or gas turbines,
10 and comprises apparatus in which the inlet-nozzles are provided with closing devices connected to a common controlling mechanism which acts in combination with a governor for the purpose of opening or closing the various inlet-nozzles singly and consecutively.
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One example of apparatus according to this invention is shown in the accompanying drawings, in which—

Figure 1 is a vertical section of a steam-turbine, and Figs. 2 and 3 are cross-sections of details drawn to a larger scale.

a is a turbine wheel mounted on a shaft *b*, and *c* are inlet-nozzles which communicate with an annular passage *e* in the turbine-casing *f*.
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g is a governor which is driven from the turbine-shaft by means of an endless chain, and the sleeve of which is connected by means of a lever *h* and a link *h'* to the rod *h²*
30 of a piston-valve *k*, Fig. 3, which moves in a controlling-cylinder *i*.

Small regulating-cylinders *l*, the number of which is equal to that of the inlet-nozzles *c*, Figs. 1 and 2, are mounted on the turbine-casing *f*, and each cylinder contains a piston
35 *n*, which carries a regulating-pin *m* and is loaded by a spring *q*. The space on the side of the piston of each regulating-cylinder opposite to that on which the spring is located
40 is in communication through a pipe *o* with the controlling-cylinder *i*, to the under side of which there is connected a pipe *p* for the purpose of supplying pressure fluid, such as steam or the like. The controlling-cylinder
45 *i* communicates through a pipe *r* with the atmosphere.

When the turbine is in operation, the movement of the sleeve of the governor *g* is transmitted, by means of the lever *h*, the link *h'*,
50 and the rod *h²*, to the piston-valve *k*. According to the position of the piston-valve *k* the pressure fluid is admitted to one or more of

the regulating-cylinders *l* on the side of the piston opposite to that on which the spring *q* is located, so as to move the piston or pistons
55 *n* in the cylinder or cylinders *l* against the action of the spring or springs *q*, and thereby to open the inlet nozzle or nozzles *c*, while the piston or pistons *n* of the regulating cylinder or cylinders *l*, which communicates or
60 communicate with the pipe *r* by reason of the position of the piston-valve, is or are moved by the spring or springs *q* in the regulating cylinder or cylinders *l*, so as to close the corresponding inlet nozzle or nozzles by means
65 of the regulating pin or pins *m*.

The hereinbefore-described controlling apparatus is applicable to simple or compound turbines, and in the case of compound turbines the regulating-cylinders *l* of all the turbine wheels can be controlled by a single controlling-cylinder *i*, so as to close or open the inlet nozzle or nozzles without throttling the steam, and thus retain the efficiency of all the turbine wheels uniform at all powers.
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Having now particularly described and ascertained the nature of my said invention, I declare that what I claim is—

1. In a steam or gas turbine, a plurality of inlet-nozzles, an independent valve controlling each nozzle and a piston-valve controlled by the speed of the turbine to separately actuate said valves, substantially as described.
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2. In a steam or gas turbine, a plurality of inlet-nozzles, an independent valve controlling each nozzle normally closed and actuated by motive fluid, and a piston-valve controlled by the speed of the turbine to admit and cut off motive fluid to and from said valves in succession, substantially as described.
85

3. In a steam or gas turbine, the combination with the turbine wheel, of an annular motive-fluid passage surrounding the wheel, a plurality of nozzles leading from the passage, a motive-fluid-actuated valve to control
90 each nozzle and governor-actuated means to control motive fluid to said valves, substantially as described.

4. In a steam or gas turbine, the combination with the turbine wheel, of an annular
100 motive-fluid passage concentric with the wheel, a plurality of nozzles leading from the passage, a cylinder, a loaded piston and a valve connected to the piston for each nozzle

zle, and a governor-controlled piston-valve to admit and cut off motive fluid to and from said valves successively, substantially as described.

5 5. In a steam or gas turbine, the combination with the turbine wheel, of a plurality of inlet-nozzles, a regulating-pin for each nozzle to control motive fluid thereto, cylinders, a piston in each, and springs to load the pistons, each pin connected to a piston, a separate pipe connection to each cylinder, a controlling-cylinder to which each pipe is connected and a piston-valve, controlled by the speed of the turbine, in said controlling-cylinder to admit motive fluid to and cut it off from the first-mentioned cylinder in succession, substantially as described.

15 6. In a steam or gas turbine, a plurality of inlet-nozzles, an independent valve controlling each nozzle and actuated by motive fluid, and means controlled by the speed of the turbine to separately control the supply of motive fluid to said valves, substantially as described.

20 and means controlled by the speed of the turbine to separately control the supply of motive fluid to said valves, substantially as described.

7. In a steam or gas turbine, a plurality of inlet-nozzles, an independent valve controlling each nozzle actuated by motive fluid, and a valve controlled by the speed of the turbine to admit motive fluid to and cut it off from said turbines, substantially as described.

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

HEINRICH ZOELLY.

Witnesses:

MORITZ VEITH,
A. LIEBERKNECHT.