No. 750,974. PATENTED FEB. 2, 1904.

H. HOLZWARTH.

IMPACT ENGINE.

APPLICATION FILED NOV. 13, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

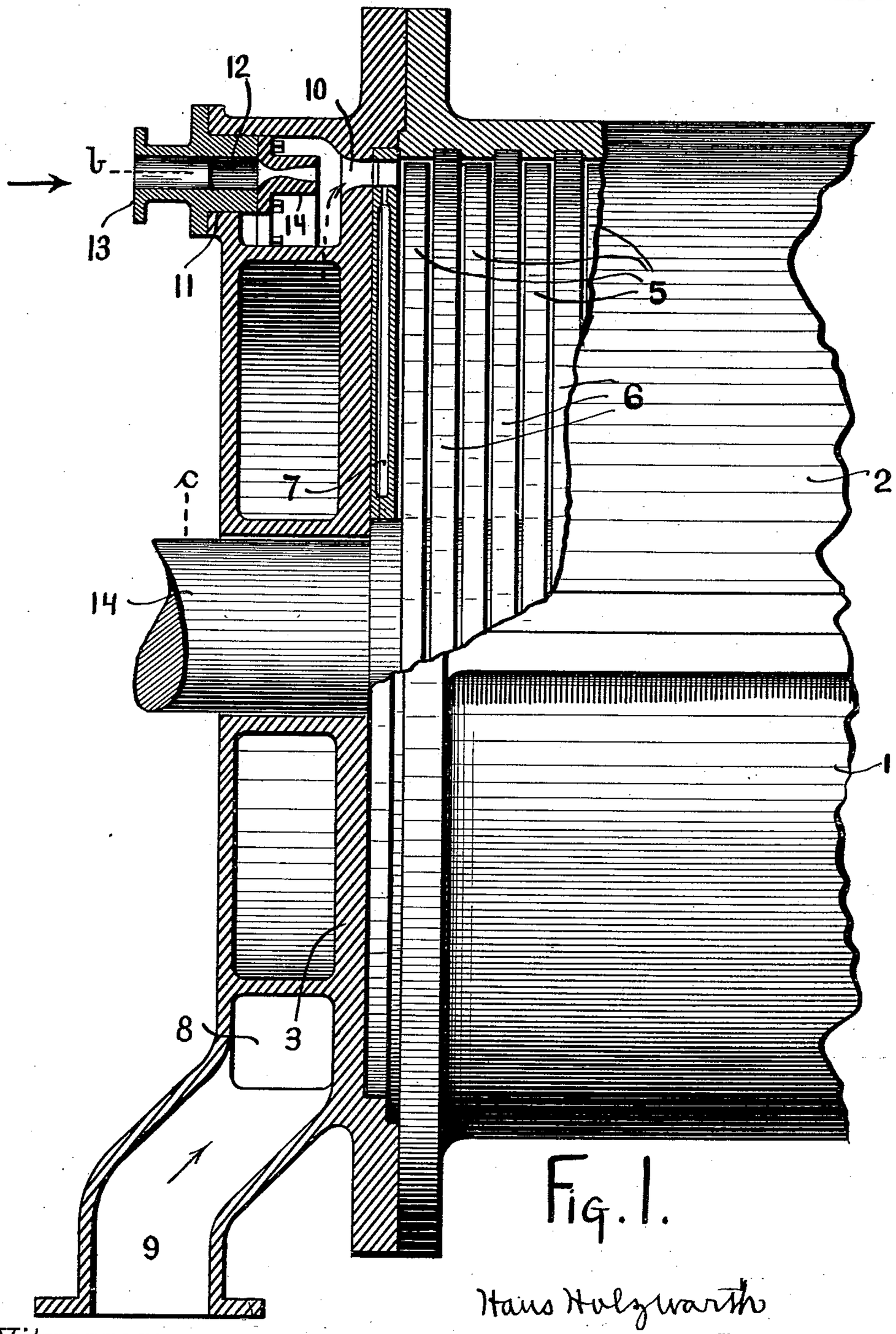

Fig. 1.

Witnesses:
Elmer R. Shipley.
M. S. Belden.

Hans Holzwarth
Inventor
by James W. See
Attorney

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NO MODEL. 3 SHEETS—SHEET 2.

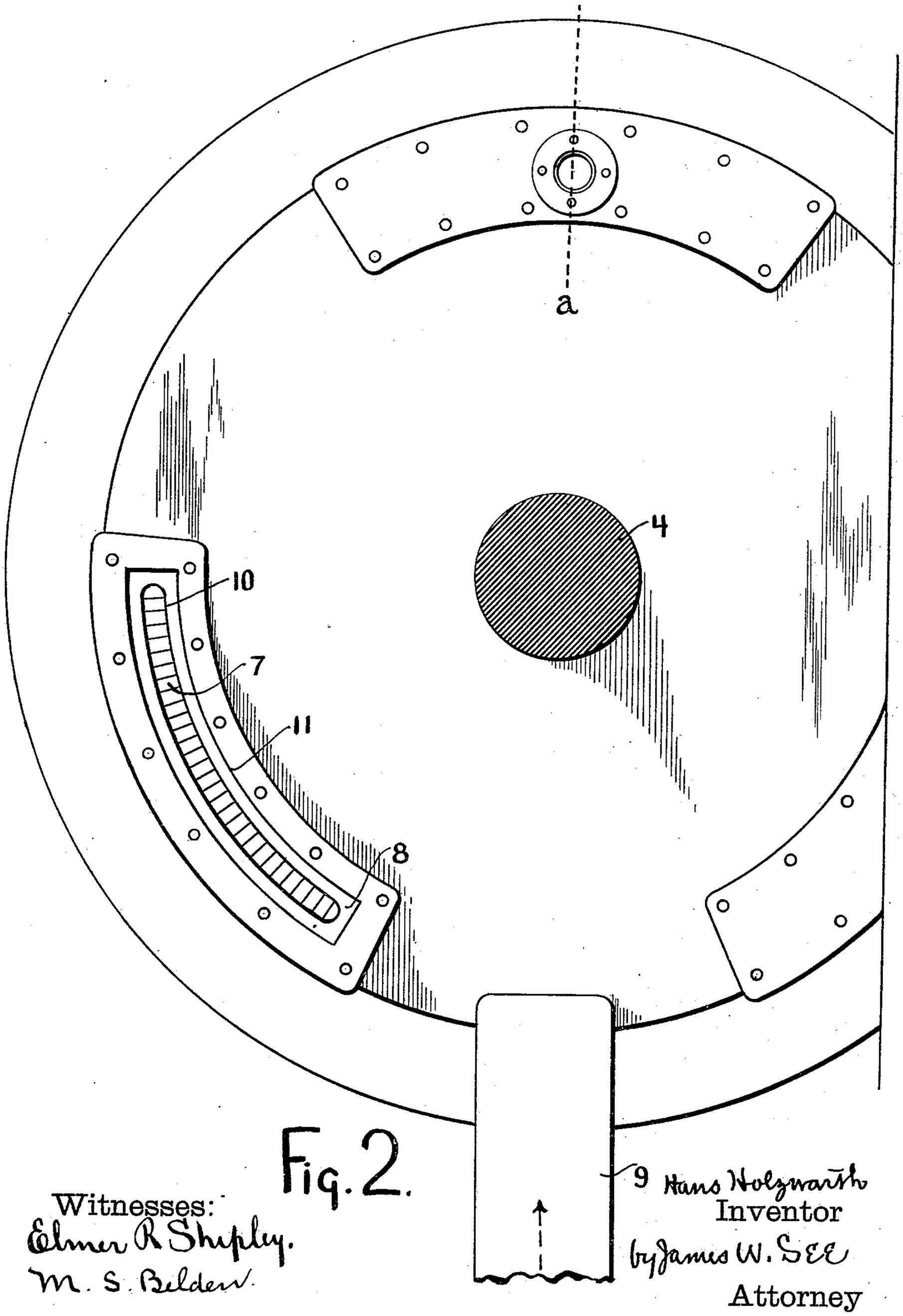

Fig. 2.

Witnesses:
Elmer R Shipley.
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NO MODEL. 3 SHEETS—SHEET 3.

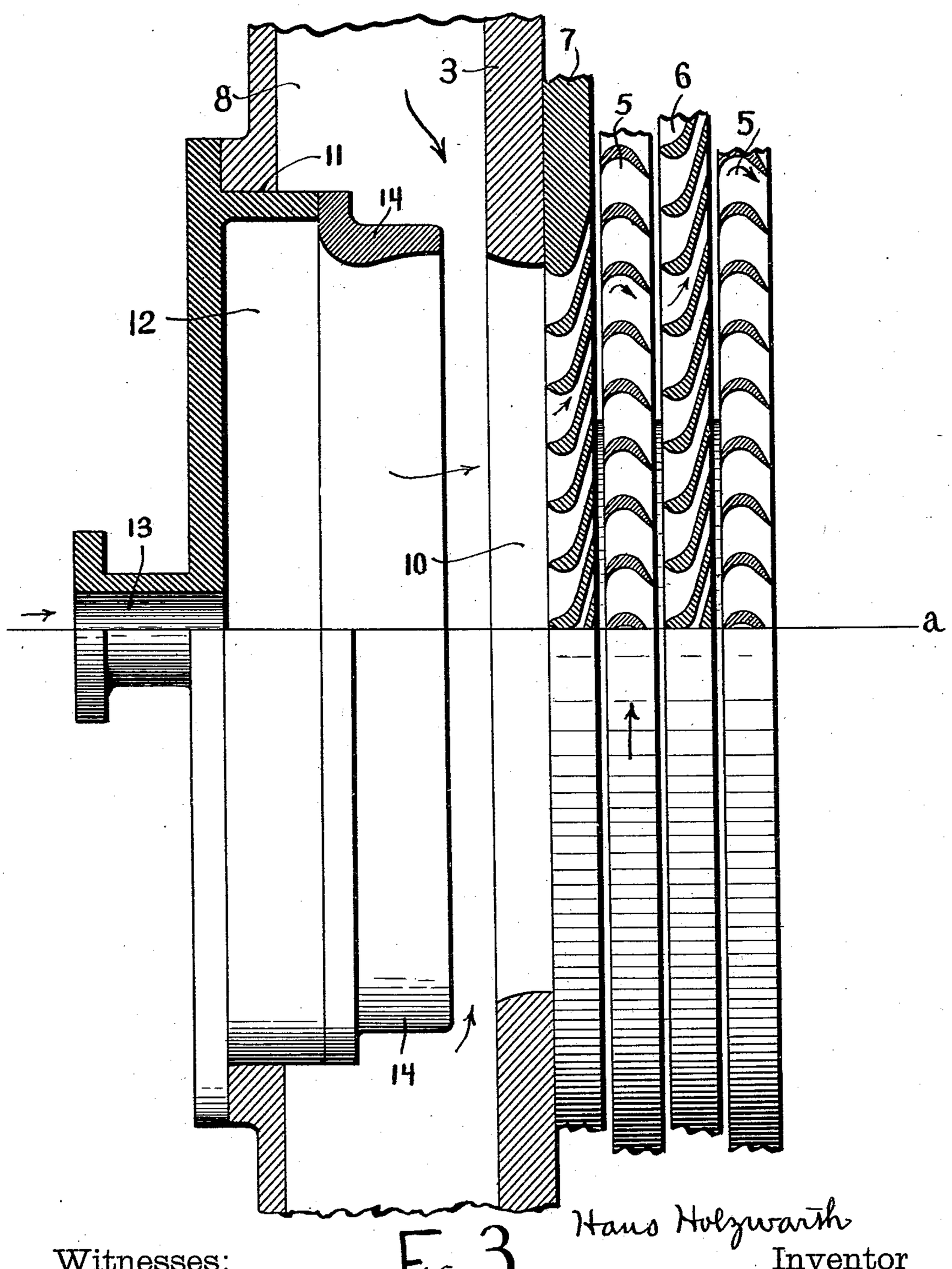

FIG 3

Witnesses:
Elmer R. Shipley
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No. 750,974. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

HANS HOLZWARTH, OF HAMILTON, OHIO, ASSIGNOR TO THE HOOVEN, OWENS, RENTSCHLER COMPANY OF HAMILTON, OHIO.

IMPACT-ENGINE.

SPECIFICATION forming part of Letters Patent No. 750,974, dated February 2, 1904.

Application filed November 13, 1903. Serial No. 180,978. (No model.)

To all whom it may concern:

Be it known that I, HANS HOLZWARTH, a citizen of Germany, residing in Hamilton, Butler county, Ohio, (post-office address Hamilton, Ohio,) have invented certain new and useful Improvements in Impact-Engines, of which the following is a specification.

This invention, pertaining to improvements in rotary impact-engines, will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation, part vertical diametrical section, of an end portion of a steam-turbine embodying my improvement, the section being in the plane of line *a* of Figs. 2 and 3; Fig. 2, an end elevation of the same with one of the nozzles removed, the shaft appearing in transverse vertical section in the plane of line *c* of Fig. 1; and Fig. 3, a horizontal section, upon an enlarged scale, in the plane of line *b* of Figs. 1 and 2.

In the drawings, 1 indicates the lower half of the cylindrical casing of the low-pressure member of a compound steam-turbine; 2, the upper half of this casing; 3, the casing-head at the admission end of the casing; 4, the shaft; 5, the rotary bucket-disks, consisting of spaced disks secured to the shaft and having buckets at their peripheries just within the bore of the casing; 6, the stationary blade-disks, being disks secured fixedly within the casing and alternating with the rotary bucket-disks and having blades at their peripheries, the steam passing first a stationary blade-disk and then a rotary bucket-disk, and so on, as usual; 7, the initial one of the stationary blade-disks, being the one lying against casing-head 3 and being the first one which the entering steam passes; 8, an annular steam-passage formed in the casing-head 3; 9, low-pressure steam-inlet to the passage 8, this inlet communicating, as usual, with the exhaust of the high-pressure member of the compound turbine; 10, a circumferential series of segmental ports leading from chamber 8 to the blades of stationary blade-disk 7, these ports being in any number desired, three being provided for in the exemplification; 11, a segmental opening in the outer end wall of passage 8, one opposite each of ports 10; 12, a segmental box secured one in each of openings 11, these boxes opening interiorly and having a circumferential extent corresponding with the circumferential length of the ports 10; 13, a high-pressure steam-inlet to each of the boxes 12, and 14 a nozzle secured to the inner face of each of boxes 12 and discharging into ports 10, but having their discharge extremities some distance from the entrance to ports 10, these nozzles being of the flared type and having a circumferential length corresponding with that of the ports 10.

Under ordinary conditions of running of the compound turbine the low-pressure member receives its steam through low-pressure inlet 9, this steam entering the annular passage 8 and going thence through ports 10 to the stationary blade-disks and the rotary bucket-disk, as usual, the high-pressure provisions of the low-pressure structure being in such case without immediate office; but in case of excessive duty high-pressure steam is to be admitted to the inlets 13, this high-pressure steam jetting through ports 10 and to the blade and bucket disks, which thus become acted upon by high-pressure steam. While the high-pressure steam is thus jetting into the low-pressure turbine its jet or jets act injector-like to enhance the flow of the low-pressure steam through the ports 10 and to the low-pressure turbine. The high-pressure steam thus acts upon the low-pressure turbine directly in virtue of its own energy and at the same time it accelerates the flow of the low-pressure steam acting upon the same turbine.

I claim as my invention—

1. In a compound rotary impact-engine, the combination, substantially as set forth, of a casing for the low-pressure turbine, stationary blade-disks and rotary bucket-disks therein, a low-pressure steam-passage at the initial end of the casing and communicating by port with the interior of the casing and having a low-pressure steam-inlet, an injection-nozzle ar-

ranged to jet through said passage and into the casing, and a high-pressure steam-inlet connected with said nozzle.

2. In a compound rotary impact-engine, the combination, substantially as set forth, of a casing for the low-pressure turbine, stationary blade-disks and rotary bucket-disks therein, a casing-head at the initial end of the casing having an annular steam-passage communicating with the interior of the casing by a segmental port, a low-pressure inlet communicating with said passage, a segmental box secured in the outer wall of said passage opposite said port, a high-pressure steam-inlet to said box, and a segmental nozzle disposed within said passage at the inner extremity of said box and arranged to jet into the casing through said segmental port.

3. In a compound rotary impact-engine, the combination, substantially as set forth, of a casing for the low-pressure turbine, stationary blade-disks and rotary bucket-disks therein, a casing-head at the initial end of the casing having an annular steam-passage communicating with the interior of the casing by segmental ports arranged in circumferential series, a low-pressure inlet communicating with said passage, a segmental opening in the outer wall of said passage opposite each of said ports, a segmental box secured in each of said openings, a high-pressure steam-inlet communicating with each of said boxes, and a segmentally-extending nozzle at the inner extremity of each box and arranged to jet into the interior of the casing through said ports.

HANS HOLZWARTH.

Witnesses:
J. W. See,
Sam. D. Fitton, Jr.