W. J. A. LONDON.
ELASTIC FLUID TURBINE.
APPLICATION FILED MAY 19, 1911.

998,019. Patented July 18, 1911

2 SHEETS—SHEET 1.

Fig. 1.

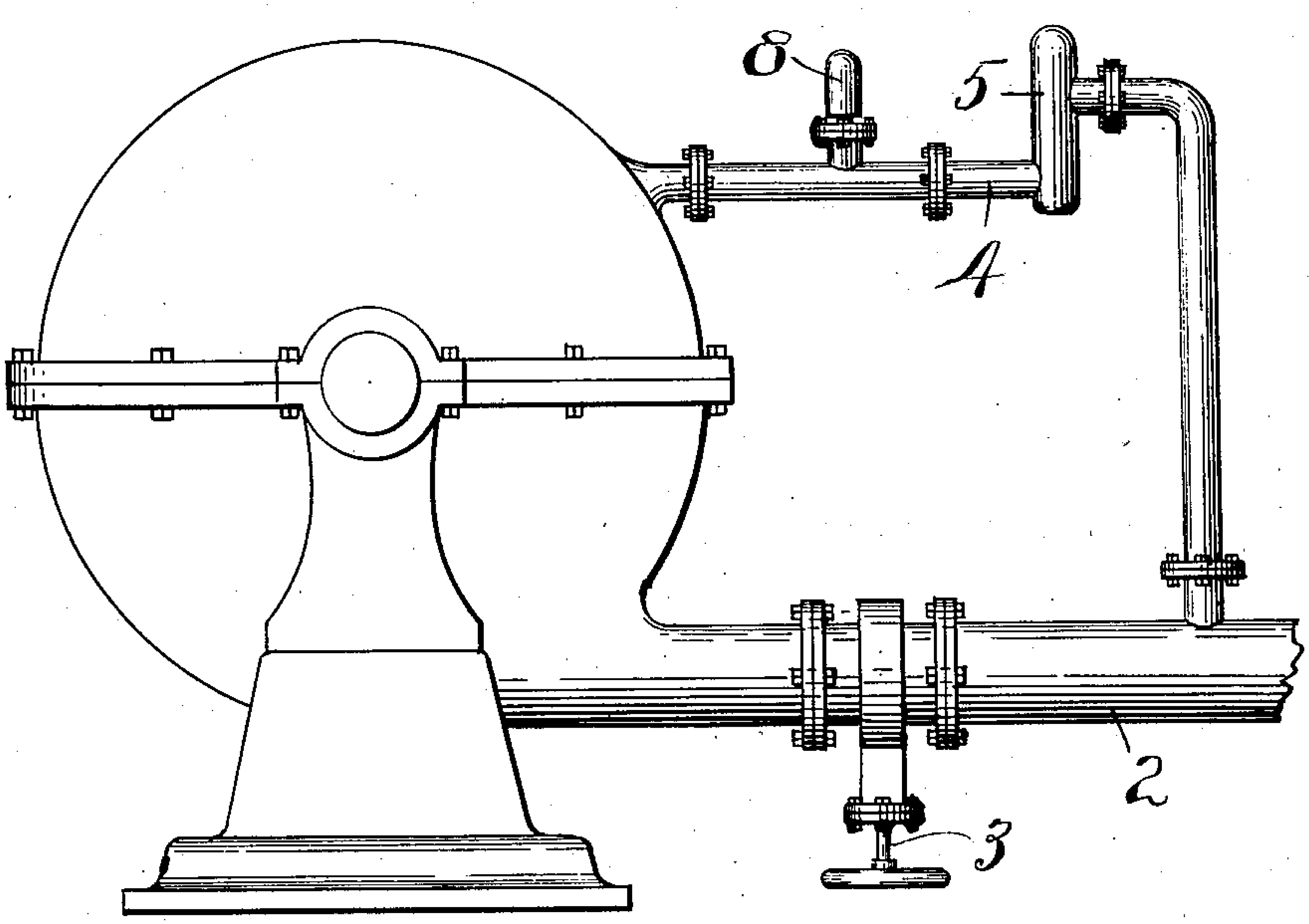
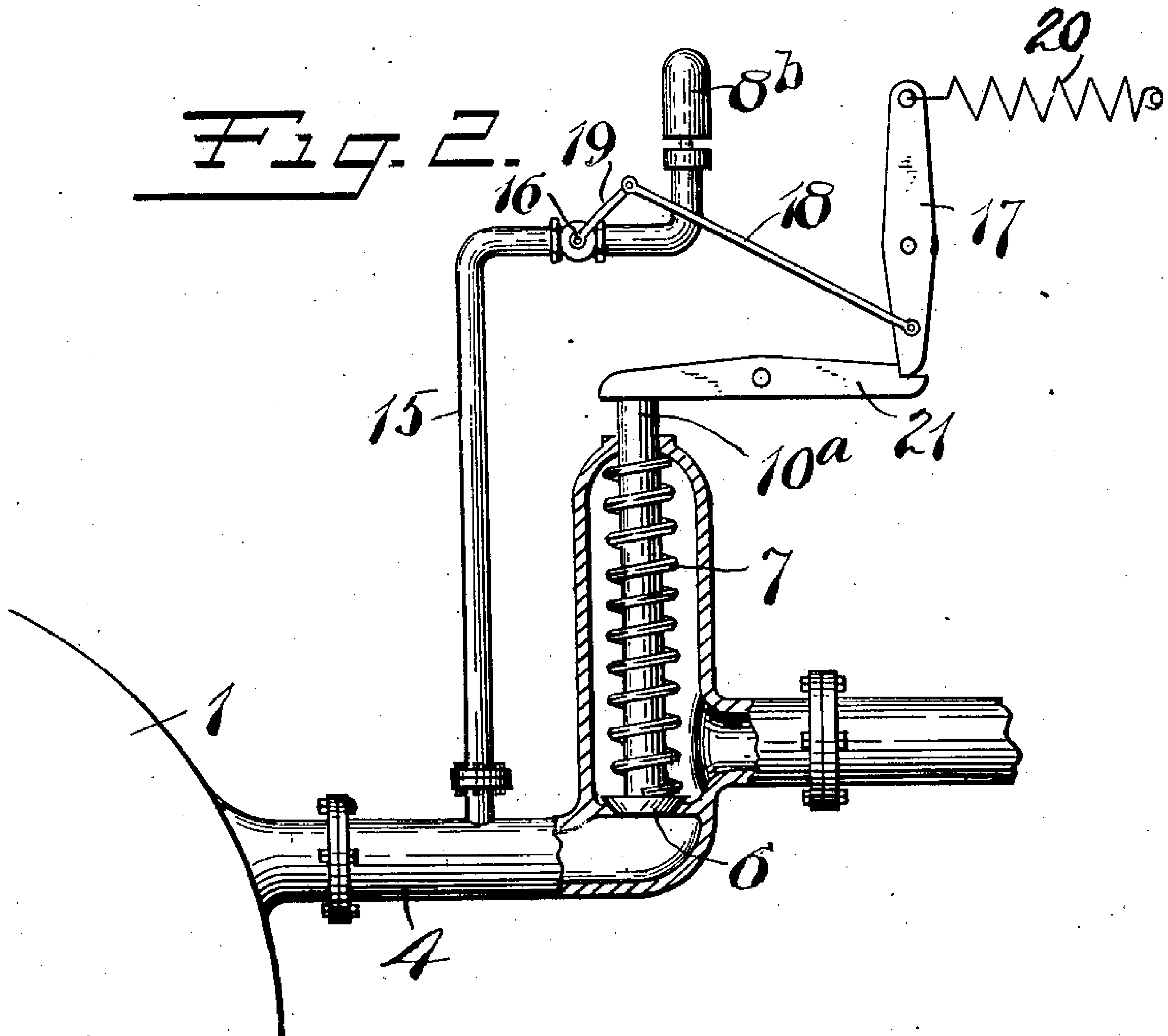


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

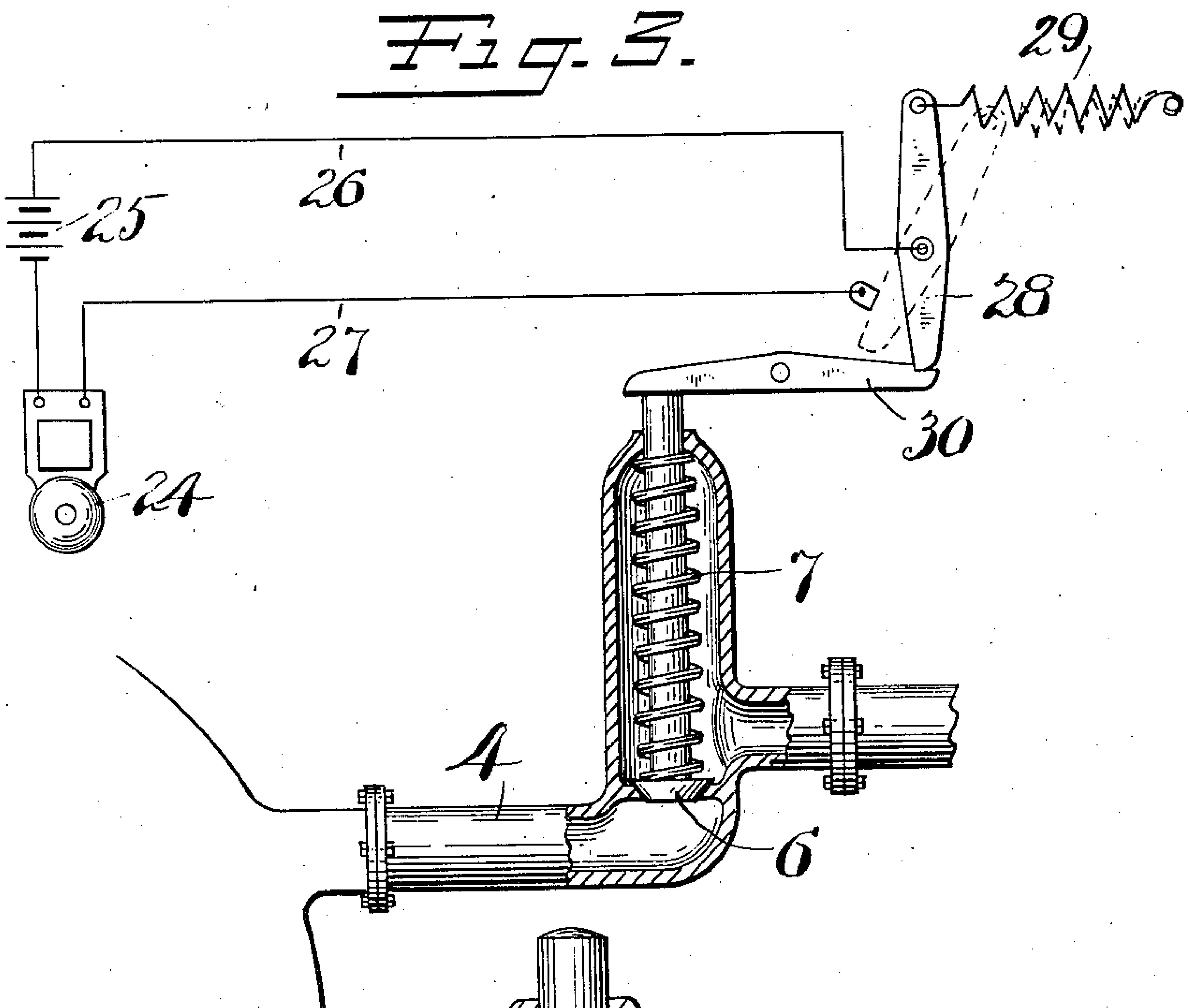
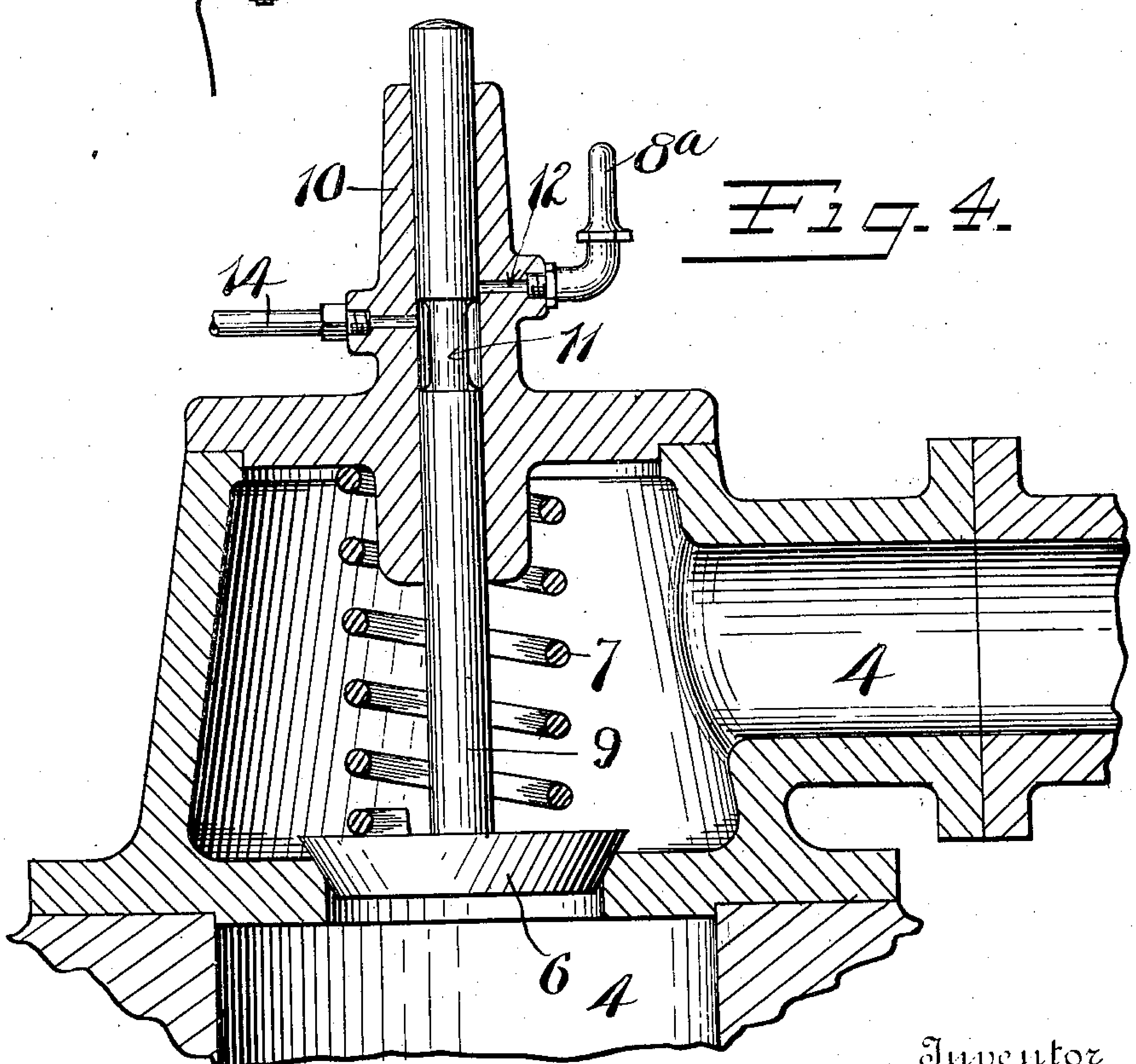


Fig. 4.



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ELASTIC-FLUID TURBINE.

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To all whom it may concern:

Be it known that I, WILLIAM J. A. LONDON, a citizen of Great Britain, residing at Hartford, county of Hartford, State of Connecticut, U. S. A., have invented certain new and useful Improvements in Elastic-Fluid Turbines, of which the following is a full, clear, and exact description.

My invention relates to elastic fluid turbines and has for its main object the provision of mechanism for safeguarding the turbine against injury by the automatic sounding of a warning signal in the event of an abnormal pressure within the turbine casing.

In the accompanying drawings, Figure 1 is a side elevation, diagrammatic in character, on a reduced scale of part of a turbine equipped with my improved safety apparatus: Fig. 2 is a relatively enlarged view, partly in section, of a modification. Fig. 3 is a similar view of another modification. Fig. 4 is a view on a still larger scale of another modification.

1 represents the external casing of a turbine; 2 represents the main exhaust pipe; 3 represents a controlling valve in the exhaust tube; 4 represents a relief pipe made up as desired and leading from the interior of the casing 1 to the free side of the exhaust.

5 represents the casing of, what I will term, a pressure-controlled-check-valve, relatively enlarged views of the valve proper being shown in Figs. 2, 3 and 4. The valve in these figures is in all instances substantially the same and is indicated by the numeral 6. 7 is a spring provided to hold said valve closed or seated against the outflow of fluid excepting as at such times as the pressure back of the valve 3 in the region of the relief pipe 4 may rise to a point beyond that adapted to be resisted by the means for holding the valve 6 closed, when, at such period, said valve opens, thereby relieving the pressure within the casing 1. 8 (Fig. 1) conventionally represents a signaling device, in this instance a whistle, the same being in communication with the relief pipe 4 and preferably at a point between the valve 5 and the casing 1. This whistle may likewise operate only when the pressure rises to a point corresponding substantially to the pressure at which the valve 6 opens, so that simultaneously with the opening of said valve, or, if desired, slightly in advance thereof, said whistle will be blown for the purpose of causing an alarm to warn the attendant that the predetermined pressure has been reached.

In Fig. 4, 8^a represents a whistle which is controlled directly by the movement of the valve 6. In this instance the valve 6 has a stem 9 which is mounted in a relatively long guide 10, and said stem is cut away as at 11. 12 is a duct which penetrates the valve stem guide 10 at a point preferably slightly above the reduced part 11 of the valve stem when the valve is seated. 14 is a duct which penetrates said valve stem guide 10 preferably at a point adjacent to the reduced portion 11 of the valve stem when said valve is seated. The valve stem accordingly operates as a valve in the whistle circuit. The duct 14 may lead, as does the relief pipe 4, to the casing 1, or indeed, to a source of compressed air. From the foregoing it follows that when pressure within the casing 1 rises to a point sufficient to open the valve 6, said operation will take place and simultaneously the valve stem will be moved to a position to open the whistle circuit whereby, and at which time, the whistle warning will be sounded.

In Fig. 2 I have shown a modification in which 8^b represents the whistle, the same being directly connected by a pipe 15 with the exhaust 2^a, preferably back of the valve therein. 16 represents a valve in the whistle pipe 15. 17 represents a spring-controlled-lever connected by a link 18 and arm 19 with the valve 16. When the lever 17 is in the position shown in Fig. 2, the whistle pipe 15 is closed. The lever 17 is held in this position against the tension of the spring 20 by the trigger 21. In this instance, the valve stem 10^a co-acts with the trigger 21 in such a manner as to trip the trigger and release the lever 17 whenever the valve 6 opens. Upon releasing the lever 17, the spring 20 moves the stem in a direction to open the valve 16, whereby the whistle warning will be sounded.

In Fig. 3 I have shown an equivalent arrangement of that shown in Fig. 2, in which, instead of providing a whistle warning, I have provided an alarm bell 23, the same being operated in any suitable manner, for example, by an electric battery 25. 26—27 are circuit wires. 28 is a lever moved in any suitable manner, as by a spring 29, which lever 28 operates as a circuit closer when released, that is, when it stands in the position indicated in dotted lines, Fig. 3. 30 is a trigger operated in the same manner as the trigger 21, illustrated in Fig. 2. When the trigger 30 is moved to release the lever 28, the spring moves the latter in a direction to close the bell circuit, whereupon the bell 24 will sound the warning and the attendant is called to attend to the apparatus.

It will be seen by the foregoing that the above means will provide for the safeguarding of the operation of an engine of the type referred to by insuring against danger of accident or explosion due to pressure being built up higher than the predetermined pressure. Obviously, the exhaust past the alarm valve 6 may lead into the main exhaust or to a condenser, or indeed, into the open, it being immaterial so long as a proper outlet is afforded. Obviously, the warning may be sounded by a whistle or bell, as shown, or by any other suitable alarm device capable of operating with certainty and efficiency in connection with the apparatus described.

It is obvious that there are many details of a turbine engine construction which are well understood that I have deemed it unnecessary to illustrate or describe herein, since I appreciate that any of the well-known apparatus of the prior art may be associated with the apparatus diagrammatically shown herein without the exercise of invention, and indeed, without requiring disclosure herein.

What I claim is:

1. In a safety apparatus for turbine engines, a turbine casing, an exhaust, means for controlling the flow of motive fluid through the exhaust, a relief pipe leading from the interior of said casing, a pressure-controlled-check-valve in said relief pipe operable by the pressure within the casing above a predetermined limit, and an alarm device also controlled by a rise in pressure within said turbine casing above a predetermined limit.

2. In a safety apparatus for turbine engines, a turbine casing, an exhaust, a valve therein, a relief pipe leading from the interior of the space at one side of said valve to the interior of the exhaust at the other side of the valve, a check-valve in said relief pipe, and an alarm controllable by said check-valve.

3. In a safety apparatus for turbine engines, a turbine casing, a valved exhaust, a relief pipe communicating with the interior of the turbine back of the valve in said exhaust, a pressure-controlled-check-valve in said relief pipe, means to open said valve when the pressure back of the valve in the exhaust rises above a predetermined limit, and an alarm device also controlled by a rise in pressure back of said valved exhaust when the same exceeds a predetermined limit.

4. In a safety apparatus for turbine engines, a turbine casing, a valved exhaust, a relief pipe communicating with the interior of the turbine back of the valve in said exhaust, a pressure-controlled-check-valve in said relief pipe, means to open said valve when the pressure back of the valve in the exhaust rises above a predetermined limit, an alarm device also controlled by a rise in pressure back of said valved exhaust when the same exceeds a predetermined limit, and means between the valve in said relief pipe and said alarm whereby the operation of the latter is controlled by the operation of the former.

5. In a safety apparatus for turbine engines, a turbine casing, a valved exhaust, a relief pipe communicating with the interior of the turbine back of the valve in said exhaust, a pressure-controlled-check-valve in said relief pipe, means to open said valve when the pressure back of the valve in the exhaust rises above a predetermined limit, an alarm device also controlled by a rise in pressure back of said valved exhaust when the same exceeds a predetermined limit, and means between the valve in said relief pipe and said alarm whereby the operation of the latter is controlled by the operation of the former, said alarm comprising a whistle, said means comprising a valved duct leading to said whistle from a source of fluid pressure.

6. In a safety apparatus for turbine engines, a turbine casing, a valved exhaust, a relief pipe communicating with the interior of the turbine back of the valve in said exhaust, a pressure-controlled-check-valve in said relief pipe, means to open said valve when the pressure back of the valve in the exhaust rises above a predetermined limit, an alarm device also controlled by a rise in pressure back of said valved exhaust when the same exceeds a predetermined limit, and means between the valve in said relief pipe and said alarm whereby the operation of the latter is controlled by the operation of the former, said alarm comprising a whistle, said means comprising a valved duct leading to said whistle from a source of fluid pressure, the stem of the pressure-controlled valve constituting the valve for said whistle duct.

7. In a safety apparatus for turbine en-

gines, a turbine casing, a valved exhaust therefor, a pressure-controlled-relief-valve operable by the fluid pressure within said casing when the same exceeds a predetermined limit, an alarm device associated therewith, and means for automatically operating the same when the pressure within said turbine casing exceeds a predetermined limit.

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