J. H. DEBAUCHE.

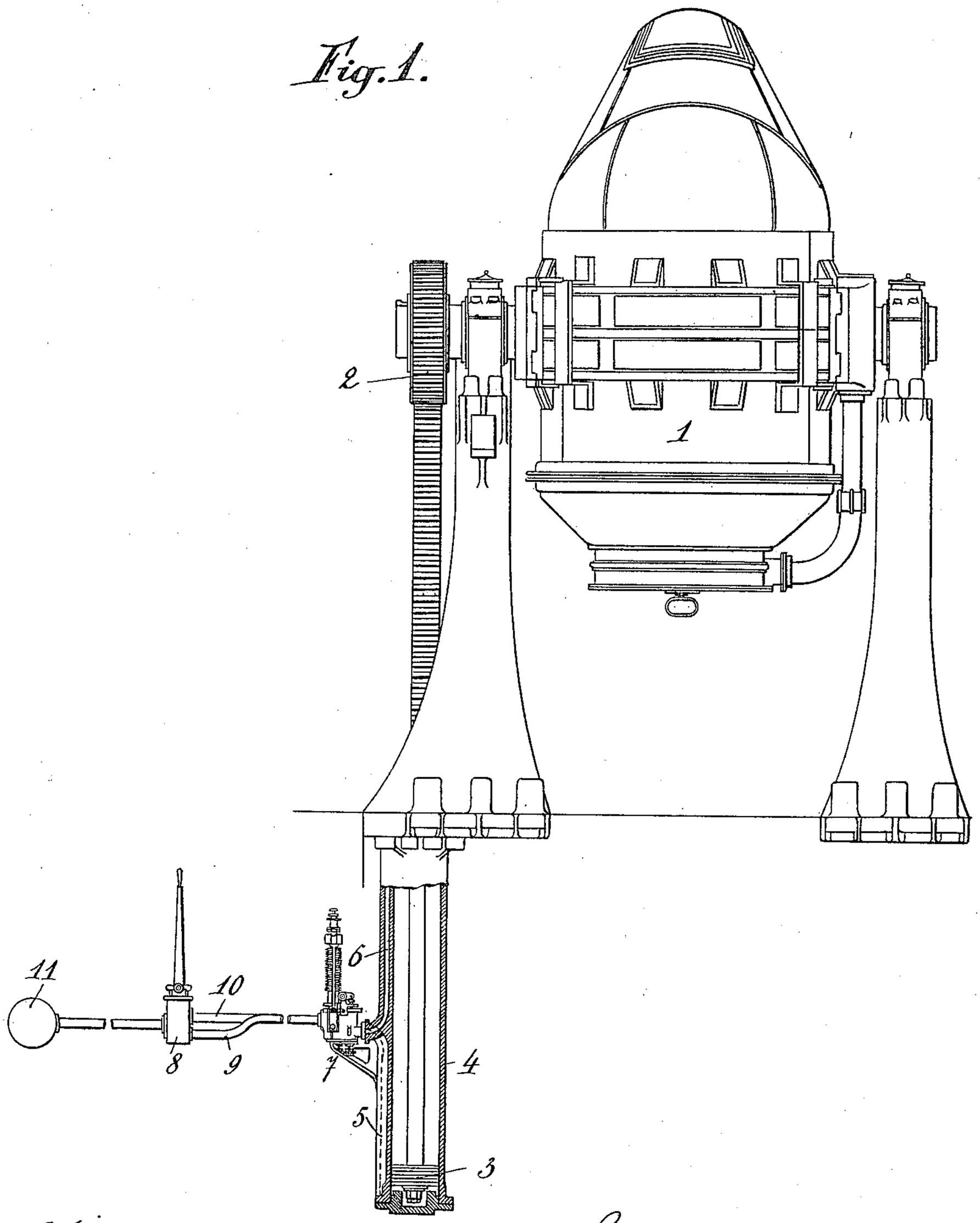
SAFETY OR BRAKING DEVICE FOR APPARATUS DRIVEN BY FLUIDS UNDER PRESSURE.

APPLICATION FILED APR. 25, 1910.

993,967. **Patented May 30, 1911.**

3 SHEETS—SHEET 1.

Fig. 1.



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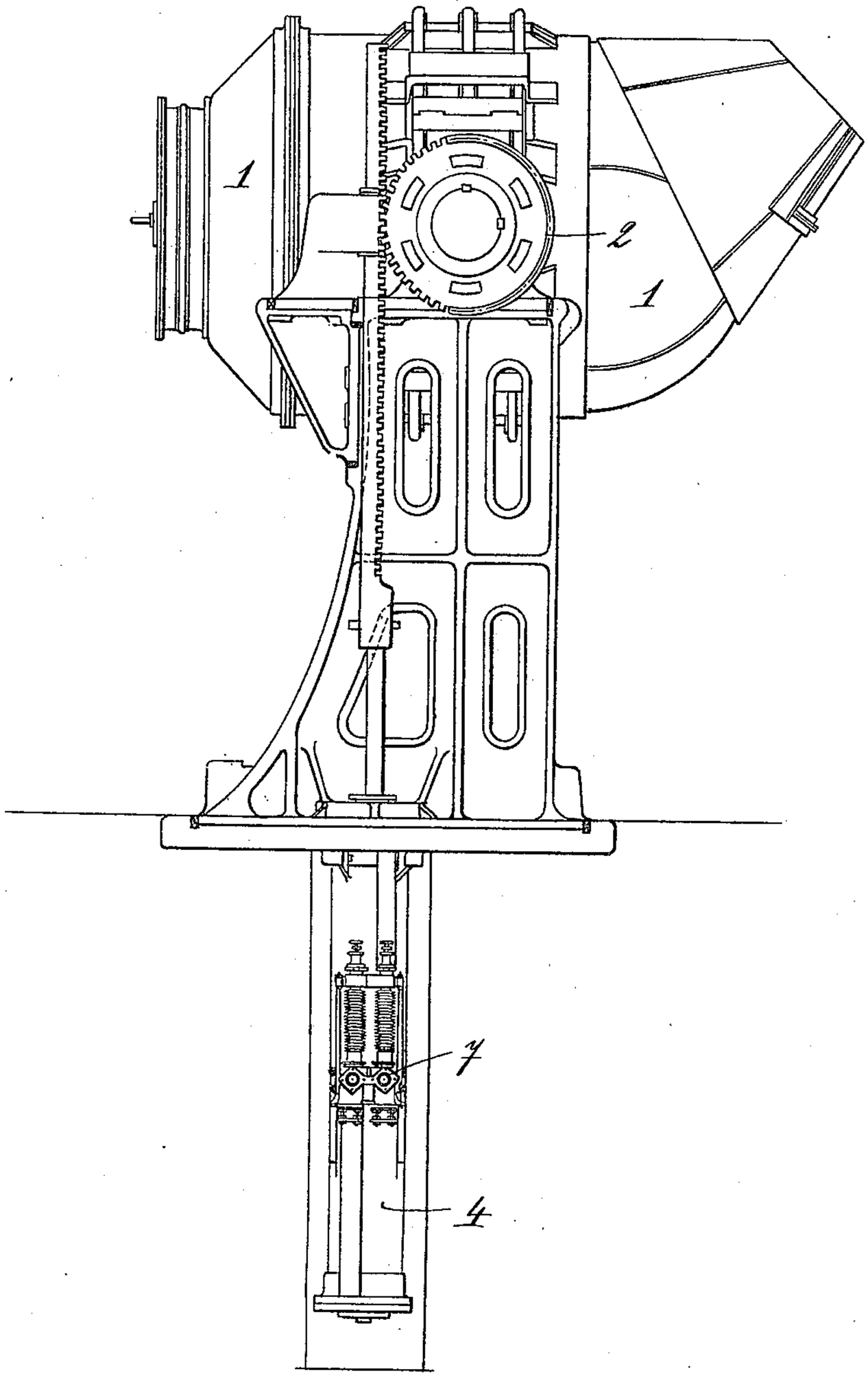
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

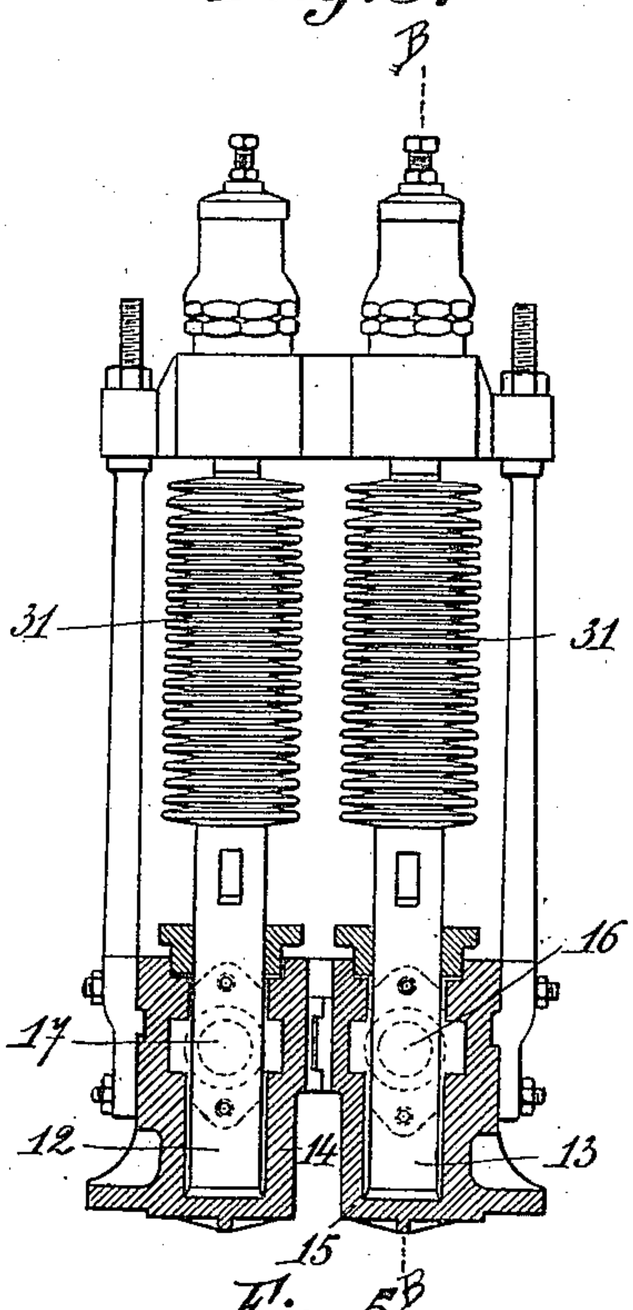


Fig. 4.

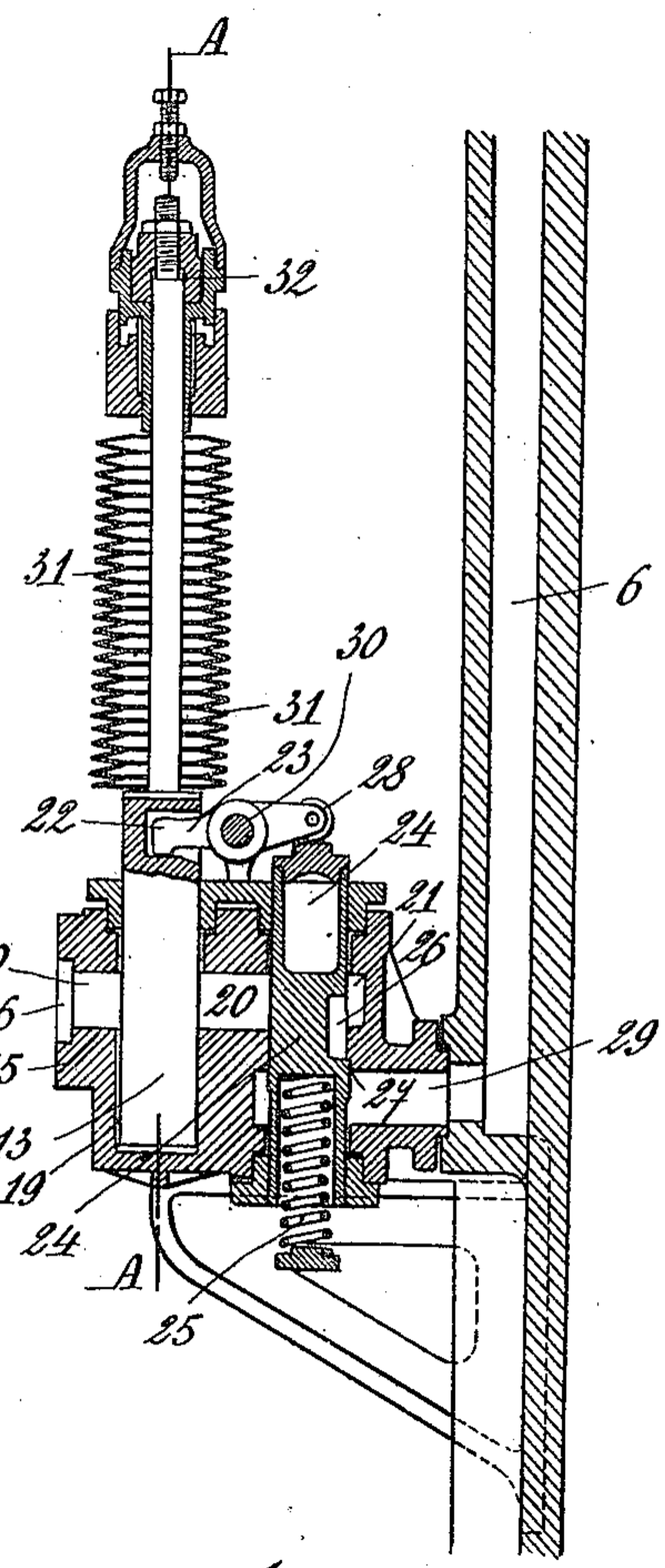


Fig. 5.

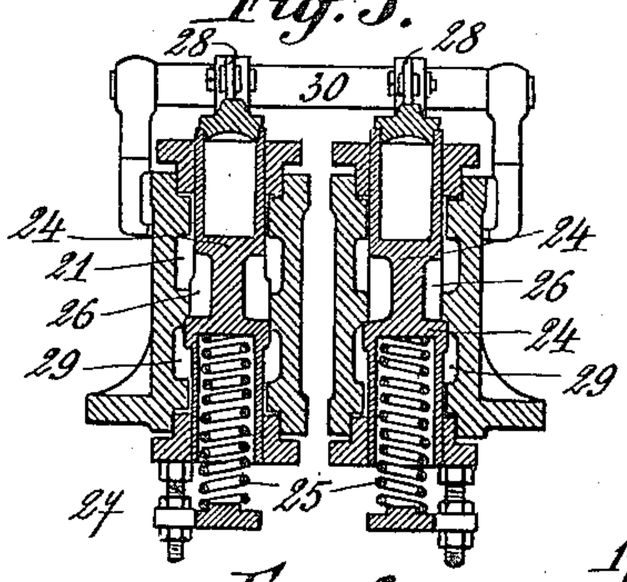


Fig. 7.

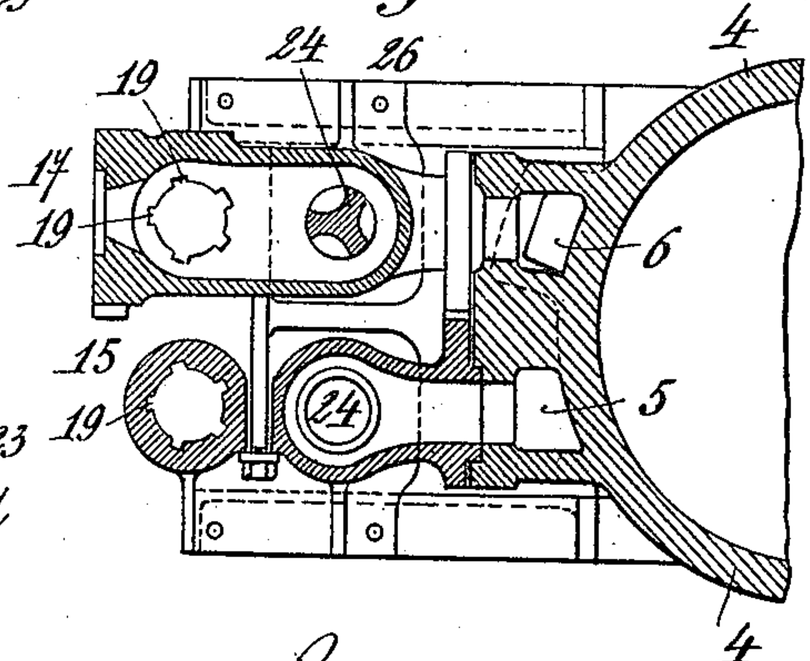
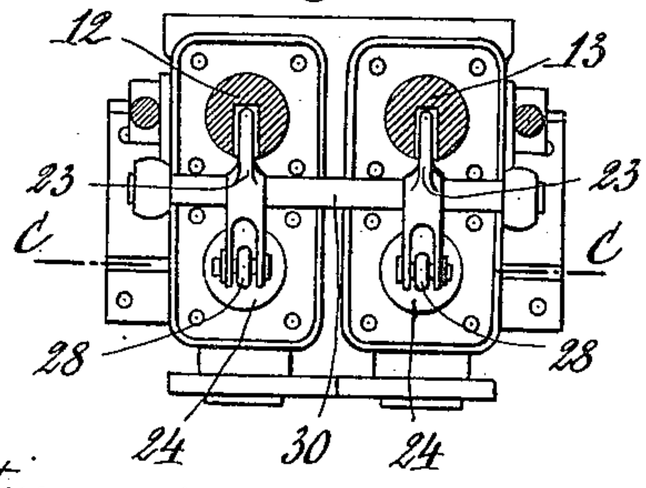


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH HUBERT DEBAUCHE, OF GILLY, BELGIUM.

SAFETY OR BRAKING DEVICE FOR APPARATUS DRIVEN BY FLUIDS UNDER PRESSURE.

993,967. Specification of Letters Patent. Patented May 30, 1911.

Application filed April 25, 1910. Serial No. 557,622.

To all whom it may concern:

Be it known that I, JOSEPH HUBERT DEBAUCHE, a subject of the King of the Belgians, residing at Gilly, Belgium, have invented certain new and useful Improvements in Safety or Braking Devices for Apparatus Driven by Fluids Under Pressure, of which the following is a specification.

This invention relates to an apparatus driven by fluids under pressure.

It is chiefly applicable to apparatus driven by hydraulic force and chiefly intended to be used for cylinders for operating Bessemer converters, hoists, etc.

The object of the invention is to produce a powerful automatically acting brake device constituting a control device for the driver of the distributing apparatus, and intended to avoid any accidents in the event of the bursting of the inlet or discharge pipe or pipes for the fluid under pressure.

The invention chiefly consists in inserting between the principal distributer controlled by the driver, etc., and each face of the piston of the working cylinder, an auxiliary cylinder in which the fluid under pressure, before being admitted into the working cylinder, is obliged to move a control piston on which acts a suitable antagonistic force, slightly smaller than the pressure of the fluid under pressure, so that, on the admission of the latter under the control piston, the said piston opens an auxiliary distributer and establishes communication between the side of the piston of the working cylinder, and the principal distributer. A control piston engaging with a distributer or auxiliary valve, is, therefore, placed on the conduit at each side of the working piston. The connection between the two control pistons and the valves operated by said pistons is effected in such manner that the movement of one of the two control pistons by the fluid under pressure, simultaneously opens the valves. In that way, the fluid under pressure may come into contact with one of the faces of the working piston, while the other face of the latter may drive before it the liquid to be discharged.

If at a given moment the fluid under pressure should fail owing to the bursting of the pipe, the control piston will not move in the direction of the opening of the valves, or if at that moment it is in a position corresponding to a certain opening of the auxiliary valves or distributers, the control piston will be suddenly brought back by the antagonistic force, and will thus produce the closing of the two auxiliary valves. Consequently no fluid under pressure will be able to pass into or to escape from, the working cylinder. The working piston will, therefore, be stopped in the position in which it will be occupying in its cylinder at the moment of the breaking of the pipe. An identical result is obtained at each closing of the principal distributer, so that the control device is closed each time and thus acts as a brake for keeping in their position the bodies or apparatus operated by the working cylinder.

The accompanying drawings show by way of example the application of this invention to the driving by hydraulic force of Bessemer converters, etc. The serious consequences of a breakage of a compressed water pipe in this apparatus are well known, and it is known what great care must be taken to control suitably the converter as soon as it has arrived at a horizontal position or in a given inclined position in which the mass of steel has the tendency to tip the converter. The control device according to this invention will prevent by its action the turning over of the converter in case of a breaking of the conduit, and will maintain it in a position imparted to it by the hydraulic working piston.

In the drawings, Figure 1 is an elevation of a Bessemer converter installation operated by a hydraulic piston, the converter being shown upright in the vertical position. This figure is completed by a diagram of the hydraulic conduit connecting with the principal distributer and passing from the latter to the accumulator other source of fluid under pressure. Fig. 2 is a side elevation, the converter being shown in horizontal position. Fig. 3 is a partial vertical section through line A—A of Fig. 4 and a front elevation of the control pistons. Fig. 4 is a vertical section on line B—B of Fig. 3 of a control piston, with the auxiliary valve controlled direct by the latter. Fig. 5 is a vertical section, along the plane C—C of Fig. 6, of the two distributers. Fig. 6 is a plan of the control cylinders with the boxes or chests of the control distributers, the pistons being shown partly in section. Fig. 7 shows in plan and partly in horizontal cross-section the whole of the control device connected to the working cylinder.

The converter 1 operated by the toothed wheel 2, is controlled in the well known manner by the piston 3 of the working cylinder 4 by means of water under pressure admitted at both sides of the piston 3 through the conduits 5 and 6. Between the ends of the said conduits and the principal distributer 3, is inserted the control device, the whole of which is indicated by 7 in the diagrams shown in Fig. 1, in such manner that the pressure conduit or pipes 9 and 10 starting from the distributer must pass through 7 before communicating with the pipes 5 and 6. The distributer 8 can be connected in well known manner to the hydraulic accumulator or accumulators 11.

The control device 7 is shown in detail in Figs. 3–7 and comprises two control pistons 12, 13 traveling respectively in the cylinders 14, 15. Each control cylinder is provided with its inlet opening 16, 17 communicating respectively with the pipes 9, 10 and is in open communication, by means of grooves 19 of the cylinders 15 and 14, with the bottom face of the pistons 13 and 12. The inlet opening communicates moreover, in each cylinder 14 and 15, with a circular conduit 20, 21 made in the body of the cylinder and the body of the distributer. The upper end of the pistons is provided with a recess 22 with which engages with a certain play a two-armed lever 23 resting at the other end by means of a roller, etc., on a piston valve, distributer or valve 24 held in engagement with its seat 27 by a spring 25. When the control piston, for instance 13, is raised, it lowers by means of the rollers 28 of the lever 23, the valve 24, the recess 26 of which then establishes communication with an opening 29 connected to the pipe 5 (leading to one or to the other face of the working piston according as it is question of one or of the other control distributer). The two levers 23 are keyed to one and the same spindle 30, so that they move together, and so that the lowering of one of the two control pistons 12 or 13 brings about the closing of the two control valves of the two pipes, 5 and 6. But each piston is controlled by an antagonistic force which is slightly smaller than the pressure of the accumulators 11. In the example illustrated, the force in question is constituted by a series of Belleville springs of adjustable tension 31 having the tendency to pull the pistons 11 and 13 downward. The rods of the pistons 12 and 13 engage moreover, at the end of their strokes with adjustable dash pistons 32 resting on air cushions, so as to prevent the control pistons, from going to the bottom of their cylinders and thus to avoid any shocks in case of a too sudden closing of the control pistons. The movement of the cylinders of the dash pistons can be utilized for regulating the tension of the Belleville springs, and the position of the dash pistons in their cylinders can be regulated. The face of the control piston not reaching the bottom, communicates, therefore, to a full extent and in a constant manner with the inlet grooves 19 of the fluid under pressure. In order to work the installation in a normal manner, the driver admits, for instance, water under pressure under the control piston 12, which results in the opening of the two valves 24 and in the connection of the two pipes 5 and 6 to the corresponding two pipes 10 and 9, one of which admits water under pressure, and the other discharges water having done its work. The same result will be obtained in the opposite direction if water under pressure is sent under the control piston 13.

Let it be assumed that the exhaust pipe, for instance, the pipe 9, breaks at the moment when the loaded converter 1 is in the horizontal position shown in Fig. 2, in which the liquid mass of steel has the tendency to raise the working piston 3. In ordinary conditions, the position would be disastrous. The mass would swing the converter and spread on the ground. The consequence, as is well known, may be terrible. On the contrary, with the control device 7, the piston 13 connected to the pipe 9 would be no longer supported by the fluid under pressure, and following the force of the springs 31, would suddenly descend, closing the two valves 24, so that the two pipes 5 and 6 would be closed, and no liquid could escape, and the converter would be maintained in the position which it occupied at the moment of the accident. In order to work the converter, in spite of the rupture of the exhaust pipe, that is to say, in order to incline it still more, water under pressure could be introduced in small quantities below the control piston 12 communicating with the uninjured pipe 10, and in that way the valves 24 would be slightly raised, and the converter will at once incline and raise the piston 3, but the valves 24 being closed again, the movement of the converter will be stopped. By proceeding in a cautious manner, the converter could be inclined as slowly as desired for pouring the steel into a ladle.

With this device, in the event of—

1. A rupture of the pipe connecting the principal distributer to the accumulator, the control pistons will at once become operative and stop the converter.

2. The same result is obtained in case of a rupture of one of the conduits 9 and 10 connecting the distributer to the working piston.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A controlling device for Bessemer con-

verters, hoists, etc., operating by fluid pressure, comprising a source of pressure, a working cylinder, a main distributer situated between said source of pressure and said working cylinder, control pistons subject to the fluid pressure situated between the main distributer and the working cylinder, inlet and exhaust pipes adapted to conduct the pressure to and from said working cylinder, auxiliary distributers or valves controlling said inlet and exhaust pipes, and means, acting on said control pistons in a direction antagonistic to the fluid pressure and slightly weaker in strength than the latter, and adapted automatically to close said auxiliary distributer or valves and thus to sustain in position the converter or other machine in question, on a break occurring in the pressure connection of either end of the working cylinder.

2. A controlling device for Bessemer converters, hoists, etc., operating by fluid pressure, comprising a source of pressure, a working cylinder, a main distributer situated between said source of pressure and said working cylinder, control pistons subject to the fluid pressure and situated between the main distributer and the working cylinder, inlet and exhaust pipes adapted to conduct pressure to and from said working cylinder, auxiliary distributers or valves controlling said inlet and exhaust pipes, means acting on said control pistons in a direction antagonistic to the fluid pressure slightly weaker in strength than the latter, levers engaged by said antagonistic means for acting on said auxiliary distributers or valves to close the same on a break occurring in the pressure connections of either end of the working cylinder, and a spindle to which all said levers are keyed, so that the movement of one control piston will operate all said levers.

3. A controlling device for Bessemer converters, hoists, etc., operating by fluid pressure, comprising a source of pressure, a working cylinder, a main distributer situated between said source of pressure and said working cylinder, control pistons subject to the fluid pressure and situated between the main distributers and the working cylinder, inlet and exhaust pipes adapted to conduct pressure to and from said working cylinder, auxiliary distributers or valves controlling said inlet and exhaust pipes, a Belleville spring acting on each control piston in a direction antagonistic to the fluid pressure and slightly weaker in strength than the latter, levers controlled by the Belleville springs, and adapted to close the auxiliary distributers or valves on a break occurring in the pressure connections of either end of the working cylinder, and a dash pot device for the ends of said control pistons.

4. A controlling device for Bessemer converters, hoists, etc., operating by fluid pressure, comprising a source of pressure, a working cylinder, a main distributer situated between said source of pressure and said working cylinder, two control pistons subject to fluid pressure and situated between the main distributer and the working cylinder, cylinders for said control pistons, inlet ports in the bodies of said control cylinders communicating with the bottom faces of the said control pistons, inlet and exhaust pipes adapted to conduct pressure to and from said working cylinder, auxiliary distributers or valves controlling said inlet and exhaust pipes, a Belleville spring acting on each control piston in a direction antagonistic to the fluid pressure and slightly weaker in strength than the latter, and levers controlled by the Belleville springs and adapted to close the auxiliary distributers or valves on a break occurring in the pressure connection to either end of the working cylinder.

5. A controlling device for Bessemer converters, hoists, etc., operating by fluid pressure, comprising a source of pressure, a working cylinder, a main distributer situated between said source of pressure and said cylinder, two control pistons subject to fluid pressure and situated between the main distributer and the working cylinder, cylinders for said control pistons, a circular conduit in each control cylinder body, inlet and exhaust pipes adapted to conduct pressure to and from said working cylinder, auxiliary distributers or valves controlling said inlet and exhaust pipes, a circular conduit in each auxiliary distributer or valve body, a Belleville spring acting on each control piston in a direction antagonistic to the fluid pressure and slightly weaker in strength than the latter, and levers controlled by the Belleville springs and pressure variation and adapted to bring into communication the circular conduits in the control cylinder bodies and in the auxiliary distributers or valves, and the respective inlet and exhaust pipes in the working cylinder.

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

JOSEPH HUBERT DEBAUCHE.

Witnesses:
REMY JEAN-BAPTISTE CORDICE,
WESSOR FRERE.