No. 789,206. PATENTED MAY 9, 1905.

R. CONRADER.

HOIST.

APPLICATION FILED MAR. 16, 1901.

2 SHEETS—SHEET 1.

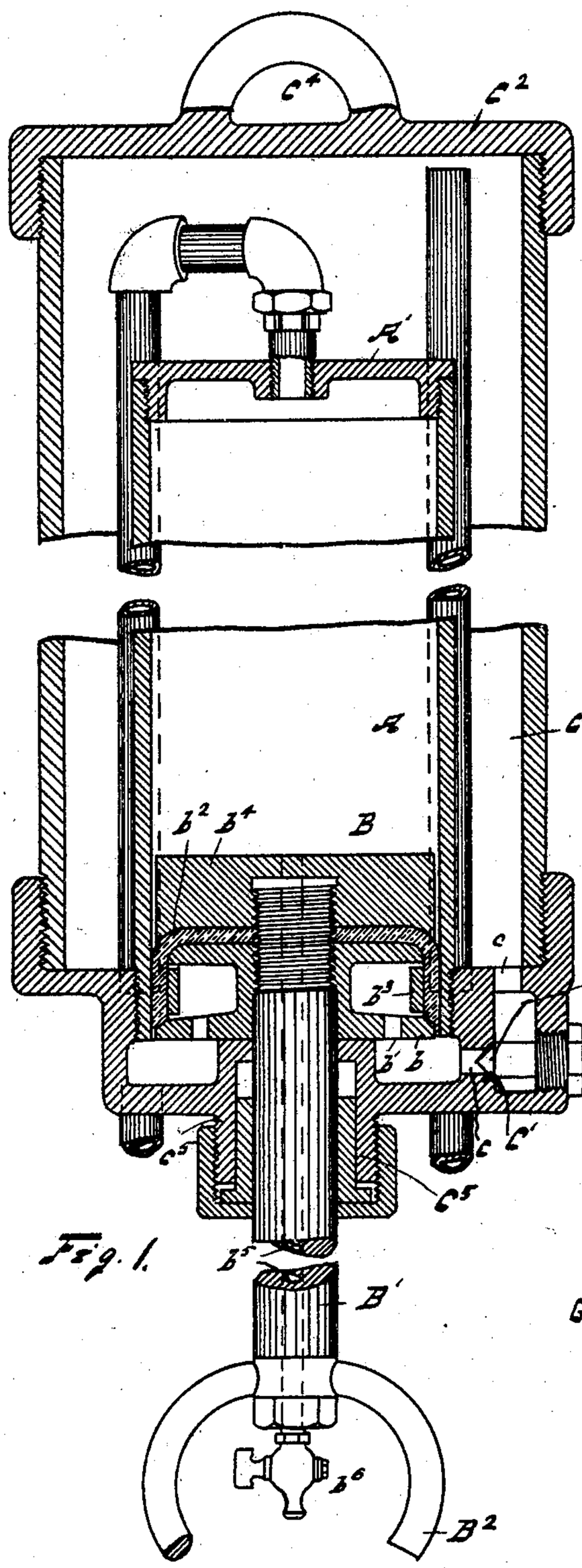


Fig. 1.

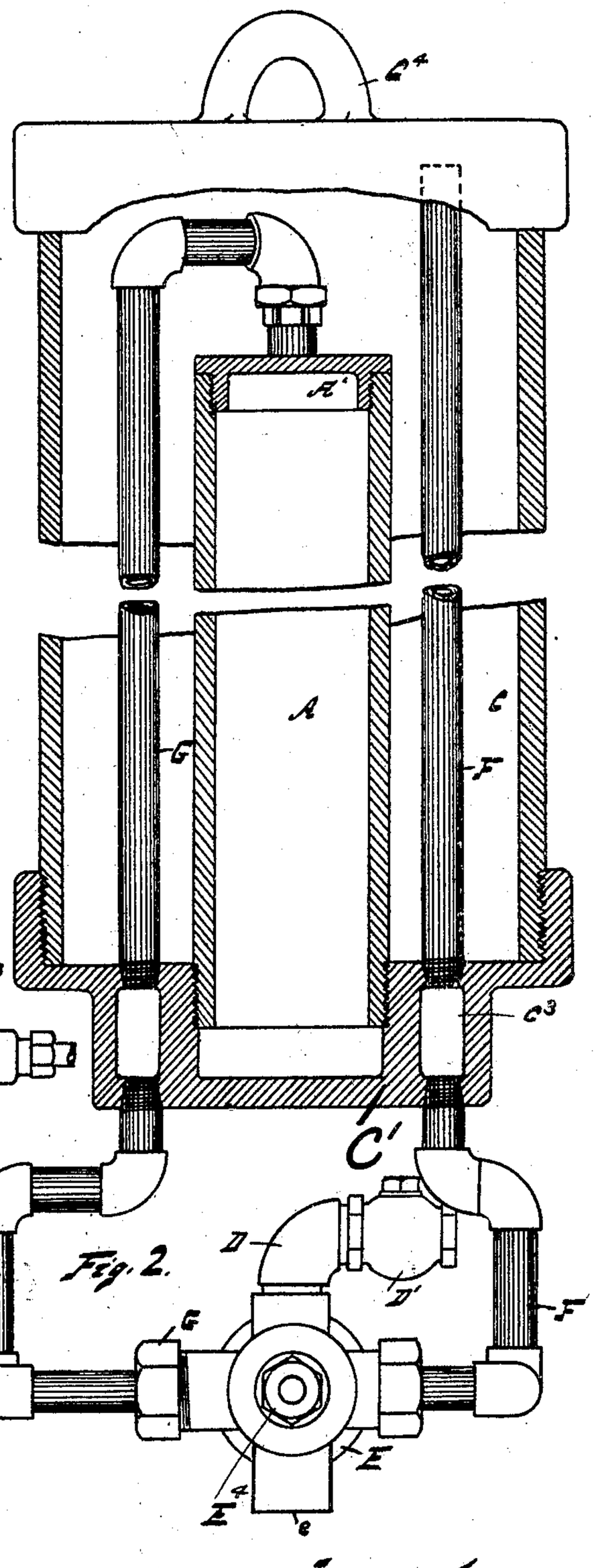


Fig. 2.

Witnesses
R. F. Lange
W. Morley

Inventor
Rudolph Conrader
by H. C. Dunn
Atty.

PHOTO-LITHOGRAPHED BY SACKETT & WILHELMS LITHO. & PT'G. CO. NEW YORK.

No. 789,206. PATENTED MAY 9, 1905.

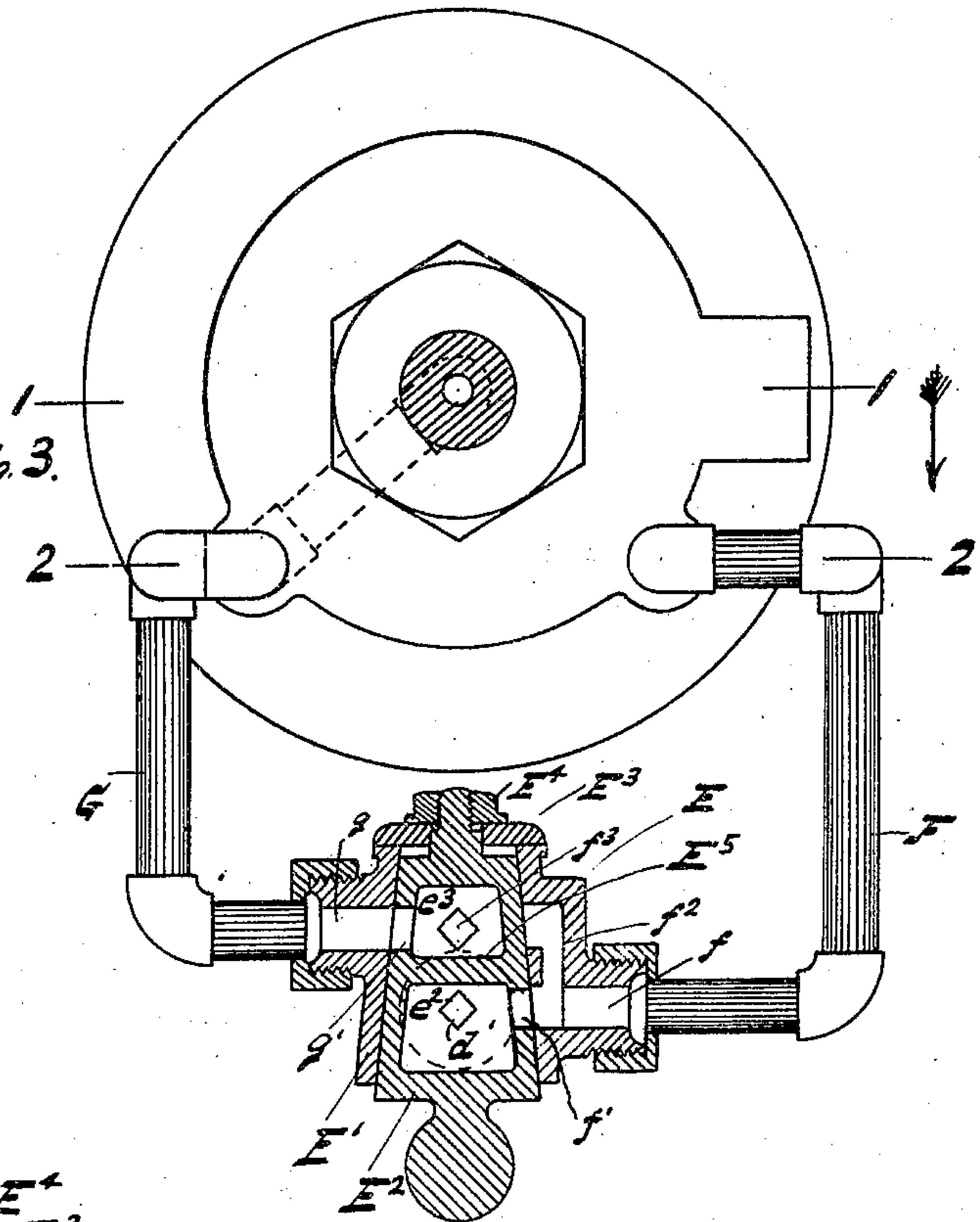
R. CONRADER.

HOIST.

APPLICATION FILED MAR. 16, 1901.

2 SHEETS—SHEET 2.

Fig. 3.



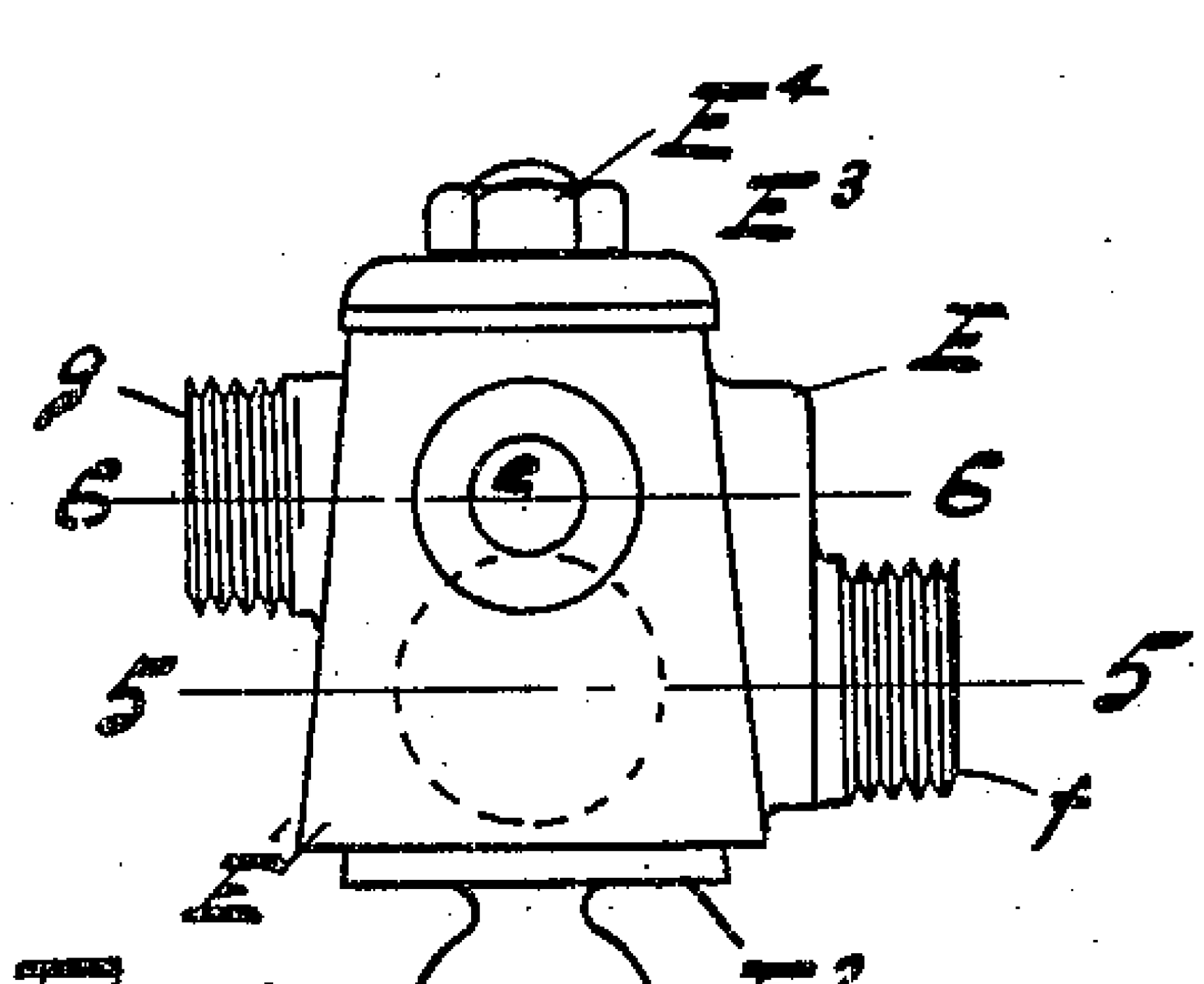


Fig. 4

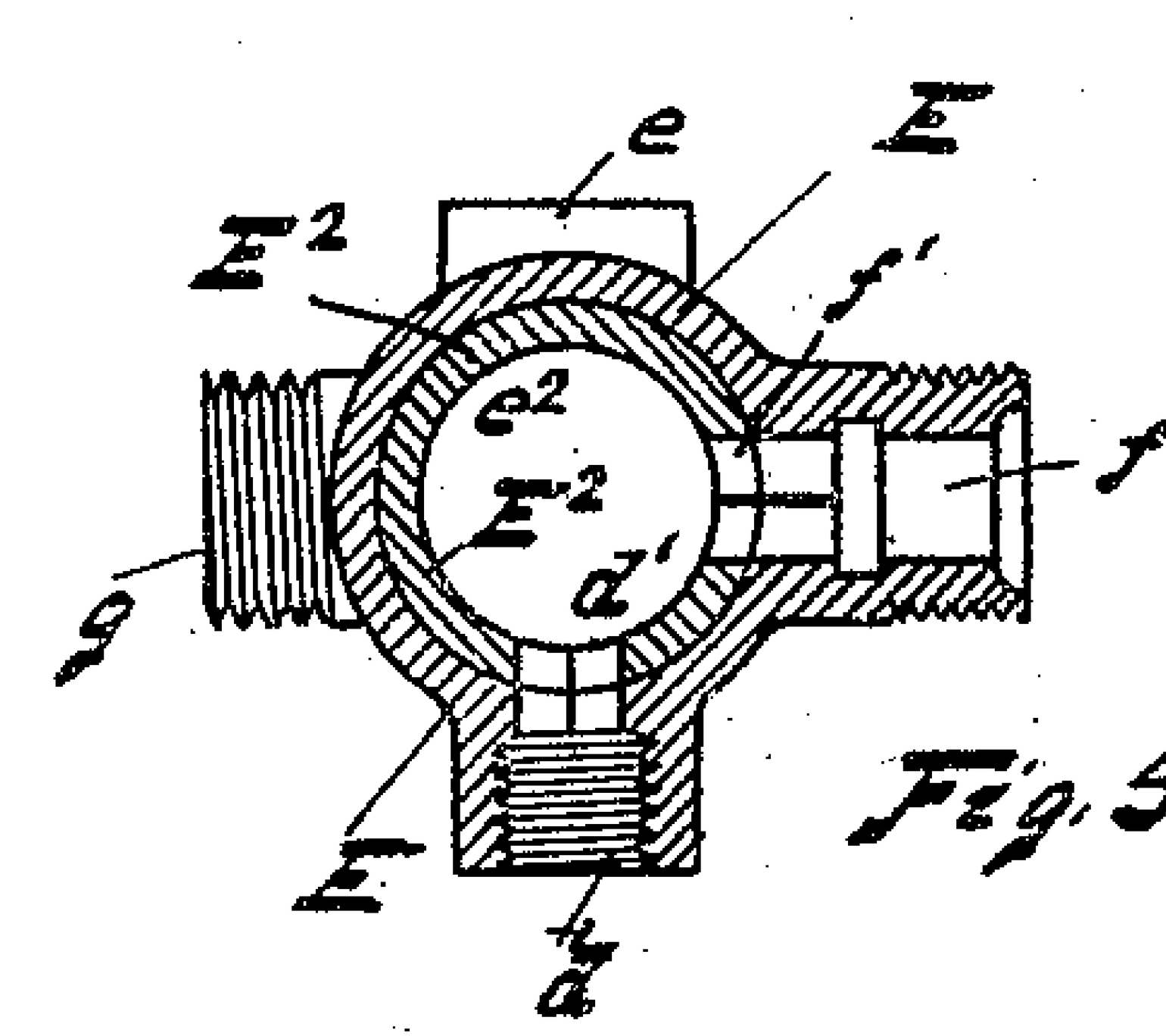


Fig. 5

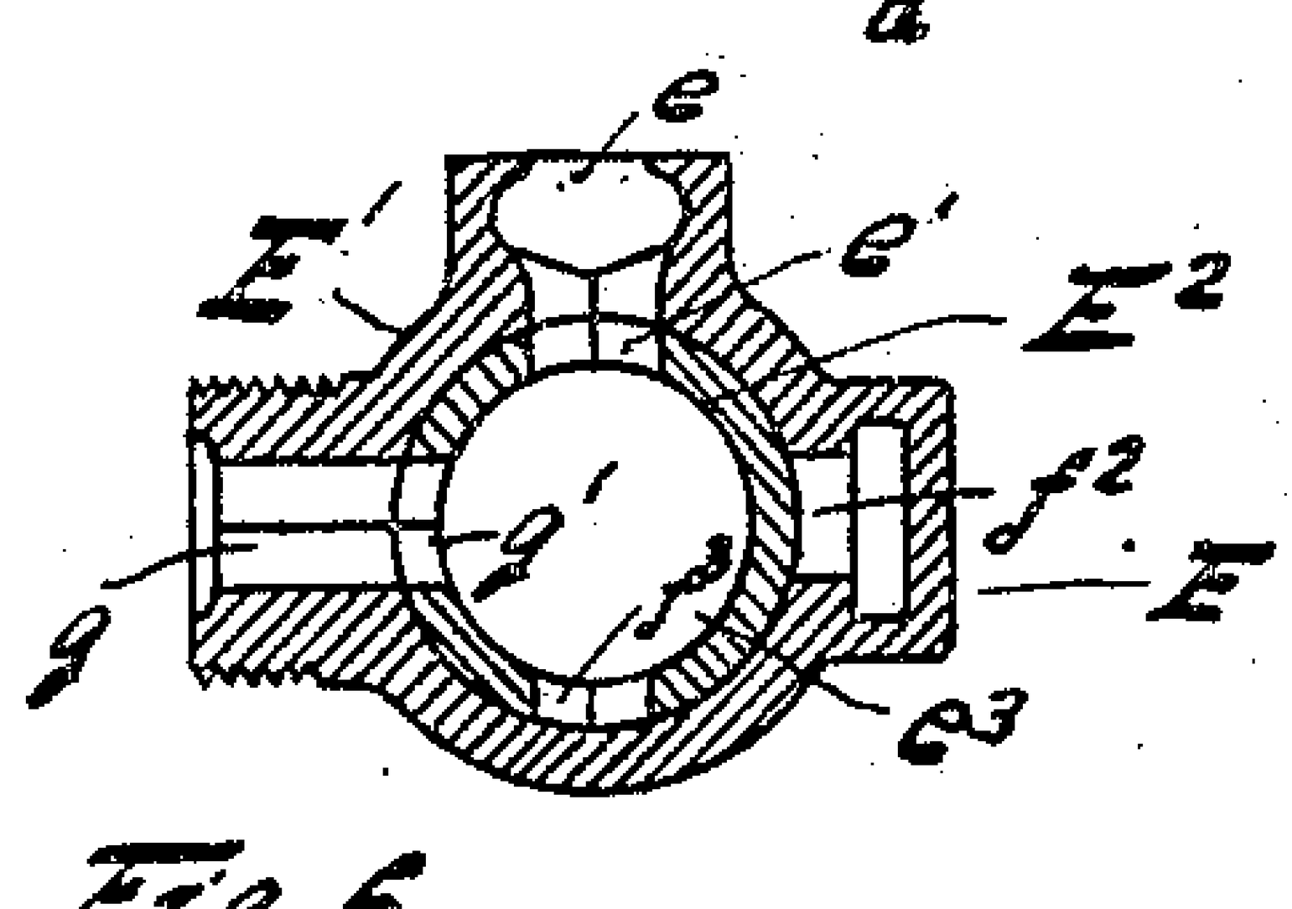


Fig. 6

Witnesses

R. F. Lanza

W. Marks Jr.

Inventor

Rudolph Conrader

by H. C. Lord

Atty.

No. 789,206. Patented May 9, 1905.

UNITED STATES PATENT OFFICE.

RUDOLPH CONRADER, OF ERIE, PENNSYLVANIA.

HOIST.

SPECIFICATION forming part of Letters Patent No. 789,206, dated May 9, 1905.

Application filed March 16, 1901. Serial No. 51,546.

To all whom it may concern:

Be it known that I, RUDOLPH CONRADER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Hoists; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to hoists; and it consists in certain improvements in the construction thereof, as will be hereinafter fully described, and pointed out in the claims.

This invention is illustrated in the accompanying drawings, as follows: Figure 1 shows a section on the line 1 1 in Fig. 3. Fig. 2 is a section on the line 2 2 in Fig. 3, the piston being omitted and viewed in the same direction as in Fig. 1. Fig. 3 shows a bottom view of the device, the valve being in section. Fig. 4 shows a side view of the controlling-valve. Fig. 5 shows a section on the line 5 5 in Fig. 4. Fig. 6 shows a section of the valve on the line 6 6 in Fig. 4.

A marks the working cylinder. This may be made of drawn tubing. It is provided with the cap A′ and is screwed into the head C′.

The piston B is arranged to operate in the working cylinder. It comprises the main head *b*, having the perforations *b*′, the leather cup b^2, with its expanding-ring b^3, and a back plate b^4 for supporting the cup b^2. The piston-rod B′ is screwed into the head *b* and plate b^4 and extends through the stuffing-box C^5. The usual swiveled ring B^2 is secured to the end of the piston-rod. Extending through the rod is the passage b^5. This is normally closed by the cock b^6. The purpose of this passage is to draw off any oil that may leak by the piston.

The cylinder C surrounds the cylinder A and forms an oil-reservoir. It is provided with the heads C′ and C^2. A passage *c* leads from the cylinder C to the bottom of cylinder A. This passage is controlled by the valve C^3, so that any size opening may be given the passage desired. The capacity of the cylinder C is preferably sufficient to hold enough oil to fill the cylinder A, so that the piston B may be subjected only to liquid under pressure. The upper end of the cylinder C is provided with the usual ring C^4, by which it may be suspended.

The hoist is designed to operate as follows: Air is admitted above the oil in the cylinder C. This forces the oil through the passage *c*. The opening in the passage is proportioned to effect as slow a movement as desired. The oil acting on the piston lifts the ring B^2 and its load. When the desired lift is accomplished, the air-supply is shut off, and if it is desired that the hoist remain stationary for any length of time it may be locked by closing the valve C^3. When the piston is lowered, the air is allowed to exhaust from the cylinder C. Instead of going to the atmosphere, however, it is carried to the upper end of the cylinder A and there confined. It will readily be seen that the pressure of the exhaust-air above the piston is added to the load on the piston, so that a given downward movement of the piston is effected with a much smaller exhaust movement of air from the cylinder C than would be the case were the exhaust immediately to the atmosphere, and the air remaining in the cylinder C is therefore left at much higher pressure than as if the exhaust were direct to the atmosphere. When another lift is desired from the hoist, the air is allowed to exhaust from the cylinder A to the atmosphere and a fresh supply is admitted to the cylinder C. While the exhaust from the cylinder A and turning in of the supply to the cylinder C should be practically simultaneous, an exhaust movement should preferably slightly precede the other in order that no unnecessary pressure need be exerted in the cylinder C.

Bearing in mind the operation of the device, the mechanism for accomplishing it can be readily understood. The air-supply pipe D enters the controlling-valve E, and the air passing through this valve is carried by the pipe F to the top of the cylinder C. A pipe G carries the exhaust from the cylinder C, by way of the valve E and pipe G, to the top of the cylinder A. This pipe also carries the exhaust from the top of the cylinder A, by

way of the valve E, to the atmosphere. The valve E, which controls all these air movements, comprises the valve-body E′ and valve proper, E^2. The valve is tapered and provided with the usual washer E^3 and nut E^4. The valve E^2 is hollow, a partition E^5 separating it into two parts e^2 and e^3. The supply-pipe D connects with the passage d in the valve-body. With the valve turned as shown in the drawings the air passes from the passage d, through the port d' in the valve, into the part e^2, and thence through the port f' and passage f into the pipe F. At the same time the air is passing from the pipe G, through the passage g, port g', part e^3, port e', and passage e, to the atmosphere. With this position of the valve the hoist is lifting. When it is desired to lower, the valve is given a quarter-turn to the left. This will cut off the passage of the air through the port f' from the part e^2 and will bring the port e' into register with the passage g and the port f^3 into register with a by-pass f^2, leading from the passage f. This will also cut off the part e^3 from the passage e and the atmosphere. Air will then pass from the cylinder C, by the pipe F, passage f, by-pass f^2, port f^3, part e^3, port e', passage g, and pipe G, into the top of cylinder A. The downward movement of the piston takes place as soon as the air-pressure above the piston and the load or the hoist is equal to the pressure below the piston. The speed of this downward movement may be regulated by the size of the opening through the valve C^3.

This construction results in several marked improvements, among which may be stated: By confining the exhaust against the lifting pressure for a downward movement of the hoist the volume of air for the ordinary operation of the hoist is much reduced. It will be noted also that no air passes from the shop into the cylinder A, the valve E opening the cylinder A to the atmosphere only with an exhaust movement of air from the cylinder A. Another advantage of this construction lies in the possibility where a check-valve D′ (or other valve) in the supply-pipe is provided of disconnecting the supply-pipe after a lift, running the hoist to another position, lowering the work, and then again lifting the parts after letting go of a part of the load. This is especially valuable for use in foundries, when a pot of molten iron may be lifted, carried to the mold, lowered and poured, and then the pot again lifted for the return movement. The oil forms an intermediate liquid-piston against which it is comparatively easy to keep the working piston tight. It also forms a medium by which a dash-pot effect is given to the movement of the hoist and also a medium by means of which the hoist may be instantly and positively locked in any position. The oil also lubricates all the working parts perfectly. By placing the reservoir-cylinder around the working cylinder and constructing the hoist so that this outside cylinder bears the lifting strain very light metal may be used for the working cylinder, ordinary drawn brass tubing answering the purpose very well. It will be noted that the plunger-cup b^2 is pressed into engagement with the walls of this cylinder A by the spring b^3 and that the spring b^3 is held in place by the supports formed at both sides of the spring by the head b. The outer flange of the head b is beveled, and the cup also is beveled, so that the edge of the head engages the head of the cup and prevents the curling in of the cup.

What I claim as new is—

1. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the entire exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; and a valve mechanism for controlling the supply fluid and the passage of fluid from the lifting to the counter-pressure side of the hoist, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist and for maintaining the connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement.

2. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; means for exhausting the confined counter-pressure fluid during a supply movement of the lifting fluid; and a valve mechanism for controlling the supply fluid, the passage of fluid from the lifting side of the hoist to the counter-pressure side and the exhaust of fluid from the counter-pressure side, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist to maintain a connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement and to close said connection during a supply movement of fluid.

3. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; means for exhausting the confined counter-pressure fluid during a supply movement of the lifting fluid; a valve mechanism for controlling the supply fluid, the passage of fluid from the lifting side of the hoist to the counter-pressure side and the exhaust of fluid from the counter-pressure side, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist to maintain a connection between the lifting and coun-

ter-pressure sides of the hoist during the entire lowering movement and to close said connection during a supply movement of fluid; and to open the counter-pressure side to the exhaust during a supply movement.

4. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; and a valve mechanism comprising a single valve element for controlling the supply fluid and the passage of fluid from the lifting to the counter-pressure side of the hoist, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist and to maintain a connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement.

5. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against a lifting pressure during a lowering movement; means for exhausting the confined counter-pressure fluid during a supply movement of the lifting fluid; and a valve mechanism comprising a single valve element for controlling the supply fluid and the passage of fluid from the lifting side to the counter-pressure side, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist and to maintain a connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement and to close said connection during a supply movement of fluid.

6. In a hoist, the combination of a lifting means; means for supplying fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; means for exhausting the confined counter-pressure fluid during a supply movement of the lifting fluid; a valve mechanism comprising a single valve element for controlling the supply fluid, the passage of fluid from the lifting side of the hoist to the counter-pressure side and the exhaust of fluid from the counter-pressure side, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist to maintain a connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement and to close said connection during a supply movement of fluid; and to open the counter-pressure side to the exhaust during a supply movement.

7. In a hoist, the combination with a cylinder having a piston traveling therein; of a valve device for controlling the admission into the cylinder, on one side of the piston, and for controlling the release of such pressure; and a pipe conducting the whole exhaust of the valve to the cylinder on the other side of the piston, which last-mentioned portion of the cylinder is entirely closed against the entrance of the ordinary outside air.

8. In a hoist, the combination with a cylinder having a piston traveling therein; of a valve device for controlling the admission into the cylinder, on one side of the piston; of a fresh supply of fluid-pressure at each lifting operation of the piston and for controlling the release of such pressure; and a pipe conducting the whole exhaust of the valve to the cylinder on the other side of the piston, which last-mentioned portion of the cylinder is entirely closed against the entrance of the ordinary outside air.

9. In a hoist, the combination with a cylinder having a piston traveling therein; of a valve device for controlling the admission into the cylinder, on one side of the piston and for controlling the release of such pressure; and a pipe conducting the whole exhaust of the valve to the cylinder on the other side of the piston, which last-mentioned portion of the cylinder is entirely closed against the entrance of the ordinary outside air and arranged to confine said exhaust to form a counter-pressure on the piston.

10. In a hoist, the combination with a cylinder having a piston traveling therein; of a valve device for controlling the admission into the cylinder, on one side of the piston and for controlling the release of such pressure; and a pipe conducting the whole exhaust of the valve to the cylinder on the other side of the piston, which last-mentioned portion of the cylinder is entirely closed against the entrance of the ordinary outside air and arranged to confine said exhaust to form a counter-pressure on the piston, the said valve device being arranged to control the exhaust therefrom.

11. In a hoist, the combination with a cylinder having a piston traveling therein; of a valve device for controlling the admission into the cylinder, on one side of the piston; fresh supply of fluid-pressure at each lifting operation of the piston and for controlling the release of such pressure; and a pipe conducting the whole exhaust of the valve to the cylinder on the other side of the piston, which last-mentioned portion of the cylinder is entirely closed against the entrance of the ordinary outside air and arranged to confine said exhaust to form a counter-pressure on the piston.

12. In a hoist, the combination of a lifting means; means for supplying the fluid-pressure to said means; means for confining the exhaust fluid from the lifting side of the hoist to exert a counter-pressure against the lifting pressure during a lowering movement; means for exhausting the confined counter-pressure

fluid during a supply movement of the lifting fluid; and a valve mechanism for controlling the supply fluid, the passage of fluid from the lifting side of the hoist to the counter-pressure side and the exhaust of fluid from the counter-pressure side, said valve mechanism being arranged to cut off the supply while connecting the lifting and counter-pressure sides of the hoist to maintain a connection between the lifting and counter-pressure sides of the hoist during the entire lowering movement to close said connection during a supply movement of fluid, and to open the exhaust from said counter-pressure side and to close the supply during said exhaust movement.

13. In a hoist, the combination of the cylinder; a piston in said cylinder; a single valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply and the exhaust from the upper end of the cylinder; and the connection between the ends of the cylinder.

14. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply and the exhaust from the upper end of the cylinder, and the connection between the ends of the cylinder, the arrangement of the valve being to close the supply and exhaust during a connection between the ends of the cylinder and to maintain a connection between the ends of the cylinder during the entire lowering movement.

15. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply to and exhaust from the said cylinder, and the connection between the ends of the cylinder, the arrangement of the valve being to close the supply and exhaust during a connection between the ends of the cylinder, to maintain a connection between the ends of the cylinder during the entire lowering movement and to open the exhaust during the supply.

16. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply to and exhaust from the said cylinder, the connection between the ends of the cylinder; and means for closing the supply-passage during the exhaust.

17. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply of the exhaust from the upper end of the cylinder; the connection between the ends of the cylinder, the arrangement of the valve being to close the supply and exhaust during a connection between the ends of the cylinder, and to open the exhaust during the supply; and means for closing the supply-passage during the opening of the exhaust.

18. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply of the exhaust from the upper end of the cylinder; the connection between the ends of the cylinder, the arrangement of the valve being to close the supply and exhaust during a connection between the ends of the cylinder; and the valve, D′, in the supply-pipe.

19. In a hoist, the combination of the cylinder; a piston in said cylinder; a valve; a pipe or passage leading from said valve to said cylinder below said piston; a pipe or passage leading from said valve to the upper end of the cylinder; a supply pipe or passage leading to said valve, said valve being arranged to control the supply to the exhaust from the upper end of the cylinder; and the connection between the ends of the cylinder, said valve comprising the body having the passage d, f, f^2, g and e, and the valve proper having the parts e^2 and e^3, and ports d', f', f^3, g' and e'.

20. In a hoist, the combination of the working cylinder; a second cylinder surrounding the working cylinder; said outside cylinder being fluid-tight; means for supply connections with said outside cylinder; a reduced passage connecting said cylinders; a piston in said working cylinder; a piston-rod extending therefrom; and a drain-passage extending through said piston and piston-rod.

21. In a hoist, the combination of the working cylinder, A; the piston, B, therein; the rod, B′, extending therefrom; the cylinder, C, surrounding the cylinder, A; the passage, c, between the cylinders; the valve, C^3, controlling said passage; the supply, D; the valve, D′, therein; the pipe, F, leading within and to the top of the cylinder, C; the pipe, G, leading within the cylinder, C, to the top of the cylinder, A; the valve, E, comprising the body, E′, having the passage, d, connecting

with the supply-pipe, D; the passage, f, and by-pass, f^2, connected with the pipe F; the passage, g, connected with the pipe, G, and the passage, e; the single valve proper or element, E^2, having the two parts, e^2 and e^3, and the ports, d', f', f^3, g' and e'; the said outer cylinder being arranged to bear the load.

In testimony whereof I affix my signature in presence of two witnesses.

RUDOLPH CONRADER.

Witnesses:
H. C. LORD,
R. F. LANZA