No. 777,534. PATENTED DEC. 13, 1904.

C. VON PHILP.

CUSHIONING DEVICE.

APPLICATION FILED JULY 21, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

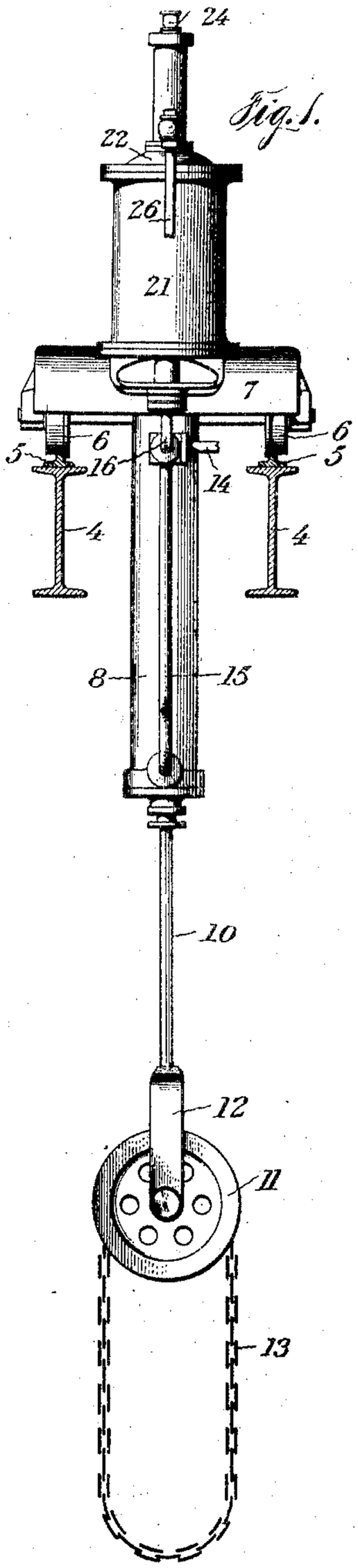
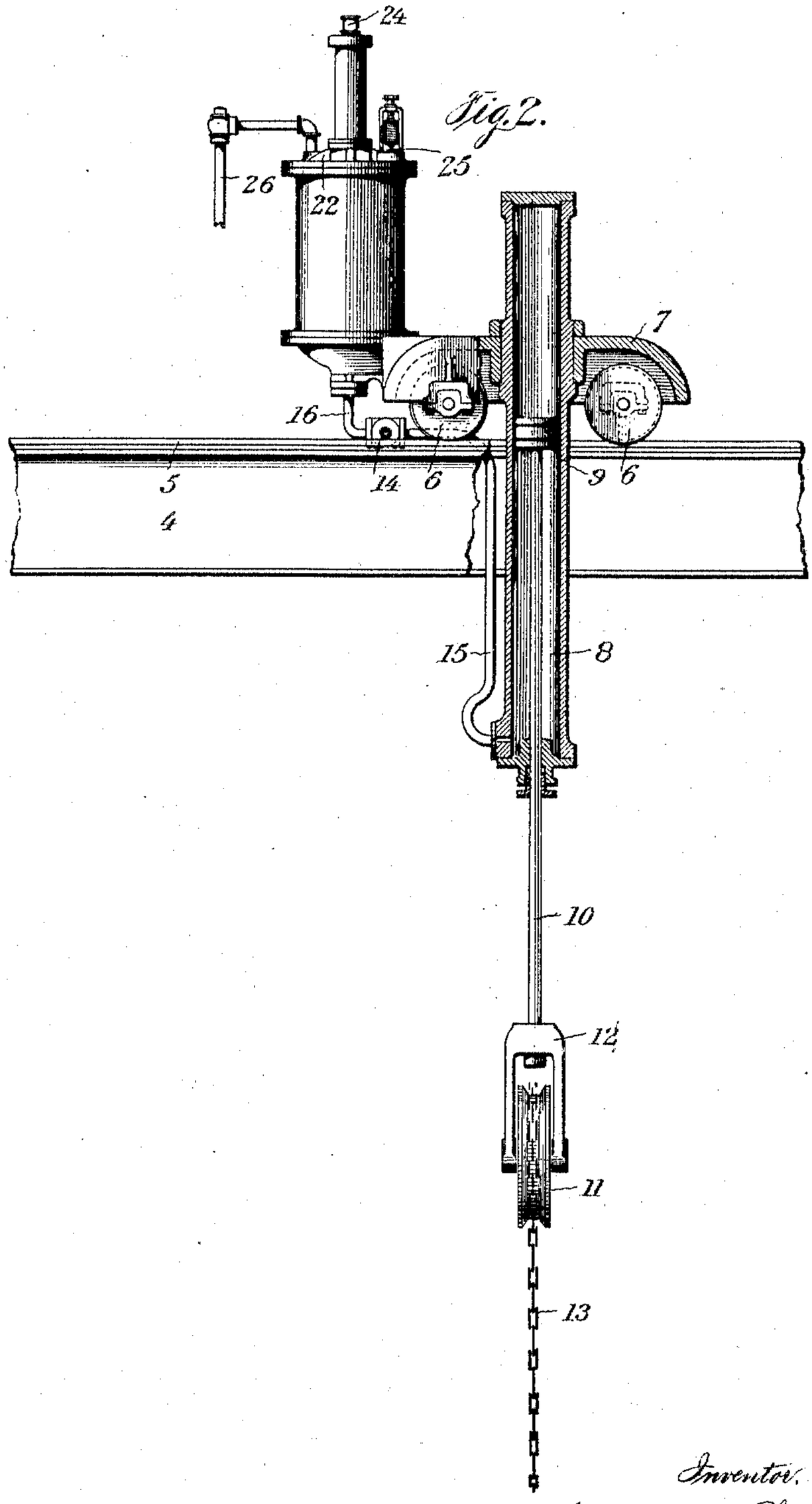


Fig. 2.



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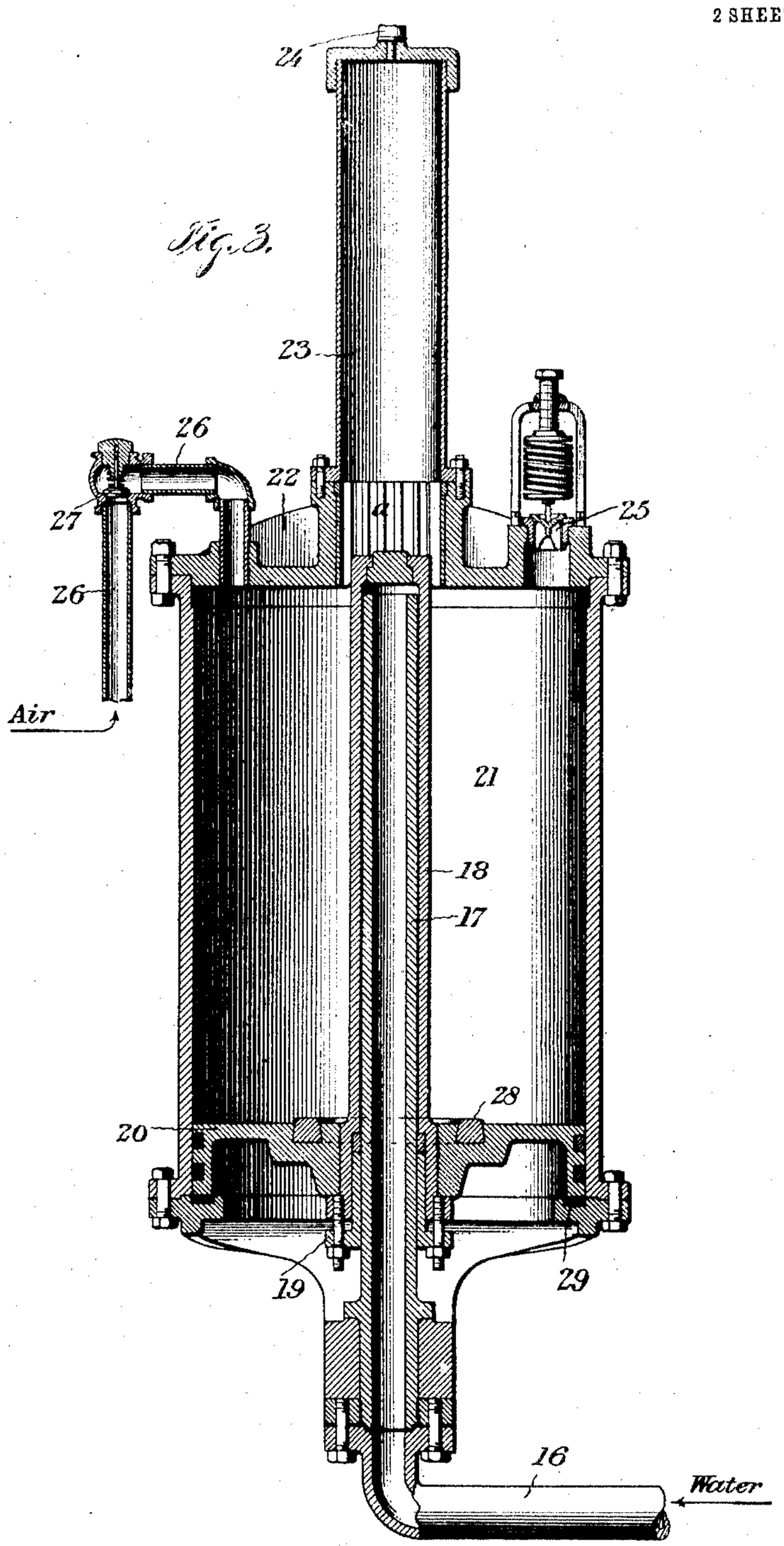
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

CASIMIR VON PHILP, OF WEST BETHLEHEM, PENNSYLVANIA.

CUSHIONING DEVICE.

SPECIFICATION forming part of Letters Patent No. 777,534, dated December 13, 1904.

Application filed July 21, 1904. Serial No. 217,555. (No model.)

To all whom it may concern:

Be it known that I, CASIMIR VON PHILP, a citizen of the United States, residing at West Bethlehem, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Cushioning Devices; 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates to cushioning devices for hydraulic cylinders subjected to shocks, and more particularly to air-cushions for the hydraulic cylinders of cranes and like machinery, as will hereinafter be more fully described and claimed.

Referring to the drawings, in which like parts are similarly designated, Figure 1 is an end view of a hydraulic crane having the cushioning-cylinder attached. Fig. 2 is a side view, partly in section. Fig. 3 is a section of the air cushioning-cylinder on a larger scale.

The numeral 4 indicates the girders or beams that support the overhead rails 5, on which the crane travels. The wheels 6 support the truck 7, which in turn carries the hydraulic lifting-cylinder 8. Within the cylinder is a piston 9 on the end of a rod 10, passing through the lower hydraulic-cylinder head. The wheel 11 is journaled in a yoke 12, swiveled on the end of the piston-rod 10. A chain 13 supports the load.

Water is supplied through pipe 14, having a cut-off valve, (not shown,) as is customary. This pipe has two branches, one, 15, entering the hydraulic crane-cylinder 8 at its lower end and below the lower limit of the piston therein. The other branch, 16, goes to the cushioning device, being directly connected to the hollow or tubular piston 17, on which reciprocates the cylinder 18, closed at one end and carrying at its opposite end a packing-gland 19 and an air-piston 20. The air-piston 20 operates in the air-cylinder 21, whose cover 22 is provided with a tubular extension or bonnet 23, into which the water-cylinder 18 of the cushioning device is free to move when actuated by a shock. The upper end of the water-cylinder 18 is guided in a spider-bearing *a*, set in the cover 22 and just below the bonnet 23. At the end of the tubular extension or bonnet is a suitable oil-cup 24, from which the air-piston is lubricated. The cover 22 of the air-cylinder 21 has a loaded safety-valve 25 and an air-inlet pipe 26, in which is a back-pressure or check valve 27. The air-piston 20 is provided with a wooden, rubber, or other buffer 28, that may strike against the cover 22 in exceptional cases. The piston 20 when in its lowermost position seats on a cushion-ring 29, of rubber, leather, wood, or other suitable substance.

The operation is as follows: The load—for example, a heavy bar to be forged—is secured by chain 13 to the crane. The operator admits water through pipe 14, which passes through branch pipe 15 to the crane-cylinder 8 and lifts the piston 9 and load, and at the same time water passes by pipe 16 to the piston 17. Thus the weight of the piece to be operated upon is supported on the water in the crane-cylinder which is directly connected to the cylinder 18 through pipes 16 and 15. The air-supply pipe 26 is always in communication with a receiver or other source of air-supply which is kept at constant pressure somewhat lower than the water-pressure. The pressure per square inch of the air is less than that of the water, but owing to the difference in the areas of the respective surfaces acted upon the total downward pressure of the air on piston 20 is slightly in excess of the total upward pressure of the water in cylinder 18, so that under normal conditions the piston 20 will be in its lowest position, as shown in Fig. 3. Now when a downward shock, as from the blow of a hammer on the piece to be forged, is transmitted to the piston 9 the pressure of the water in both the crane-cylinder 8 and cylinder 18 suddenly rises, so that the total pressure of the water against the cylinder 18 is greater than the total pressure of the air on piston 20, whereupon piston 20 and cylinder 18 rise, compressing the air in the air-cylinder 21 and al-

lowing the water to run from the crane-cylinder 8 into the cylinder 18, thereby absorbing the shock. The upward movement of the piston 20 compresses the air in cylinder 21, said air being prevented from escaping from the cylinder by the check-valve 27. The pressure in cylinder 21 is prevented from reaching a dangerous point by the safety-valve 25, that opens before the pressure reaches too high a point and vents some of the compressed air. When the shock has subsided, the air in cylinder 21, which has been compressed to a pressure above normal, expands and forces the piston 20 down to its normal position. If any air has been vented from the cylinder 21 through the safety-valve 25, so that in the descent of piston 20 the normal air-pressure is reached before piston 20 has reached its lowest position, then more air will enter through the pipe 26 and check-valve 27.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination with a hydraulic cylinder, of a cushioning device to take up the shock transmitted to the water in the hydraulic cylinder, substantially as described.

2. The combination with a hydraulic cylinder and piston, of an independent piston having a water connection with the hydraulic cylinder and means to maintain air-pressure on the independent piston, substantially as described.

3. The combination with a hydraulic lifting-cylinder and piston, of a movable hydraulic cylinder having a water connection with the hydraulic lifting-cylinder and means to maintain a counter air-pressure on the movable cylinder, substantially as described.

4. The combination with a hydraulic lifting-cylinder and its piston, of a tubular piston, a cylinder movable thereon, a pipe connection between the tubular piston and lifting-cylinder, means to exert a counter-pressure of air on the movable cylinder and means to relieve the air-pressure thereon when said counter-pressure reaches a predetermined point, substantially as described.

5. The combination with a hydraulic lifting-cylinder and its piston, of a tubular piston, a cylinder movable thereon, a pipe connection between the tubular piston and the lifting-cylinder, an air-piston on the movable cylinder, an air-cylinder in which said piston works, and means to supply air under pressure to the air-cylinder, substantially as described.

6. The combination with a hydraulic lifting-cylinder and its piston, of a tubular piston, a cylinder movable thereon, a water-pipe connecting the tubular piston and hydraulic cylinder, an air-piston on the movable cylinder, an air-cylinder concentric with the tubular piston, means to supply air to the air-cylinder and a safety-valve thereon, substantially as described.

7. The combination with a hydraulic lifting-cylinder and its piston, of an air-cylinder having a smaller extension or bonnet, an air-piston movable therein, a movable cylinder closed at one end and connected to the air-piston and movable in the bonnet, a tubular piston fixed in and concentric with the air-piston on which the movable cylinder reciprocates, and a pipe connection between the tubular piston and the lifting-cylinder, substantially as described.

8. The combination with a hydraulic crane, its lifting-cylinder and piston, of an air-cylinder carried by the crane and open at its lower end, a limit-ring at the lower end of said cylinder, an air-piston therein, a movable cylinder closed at its upper end and secured to the air-piston at its lower end, a tubular open-ended piston in the latter, a pipe connecting said piston with the water-space of the lifting-cylinder, an air-supply, a check-valve in the air-supply and a safety-valve on the air-cylinder, substantially as described.

9. The combination with a hydraulic lifting-cylinder and its piston, of an independent pneumatic cushioning device connected to the water end of the hydraulic cylinder, substantially as described.

10. The combination with a hydraulic lifting-cylinder and its piston, of means to force water below the piston and an independent pneumatic cushioning device having a pipe connection with the water-space of the hydraulic cylinder, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CASIMIR VON PHILP.

Witnesses:
E. B. HOFFMAN,
R. J. ZENVECK.