R. J. GOULD.

STEAM PUMPING ENGINE.

No. 92,957. Patented July 27, 1869.

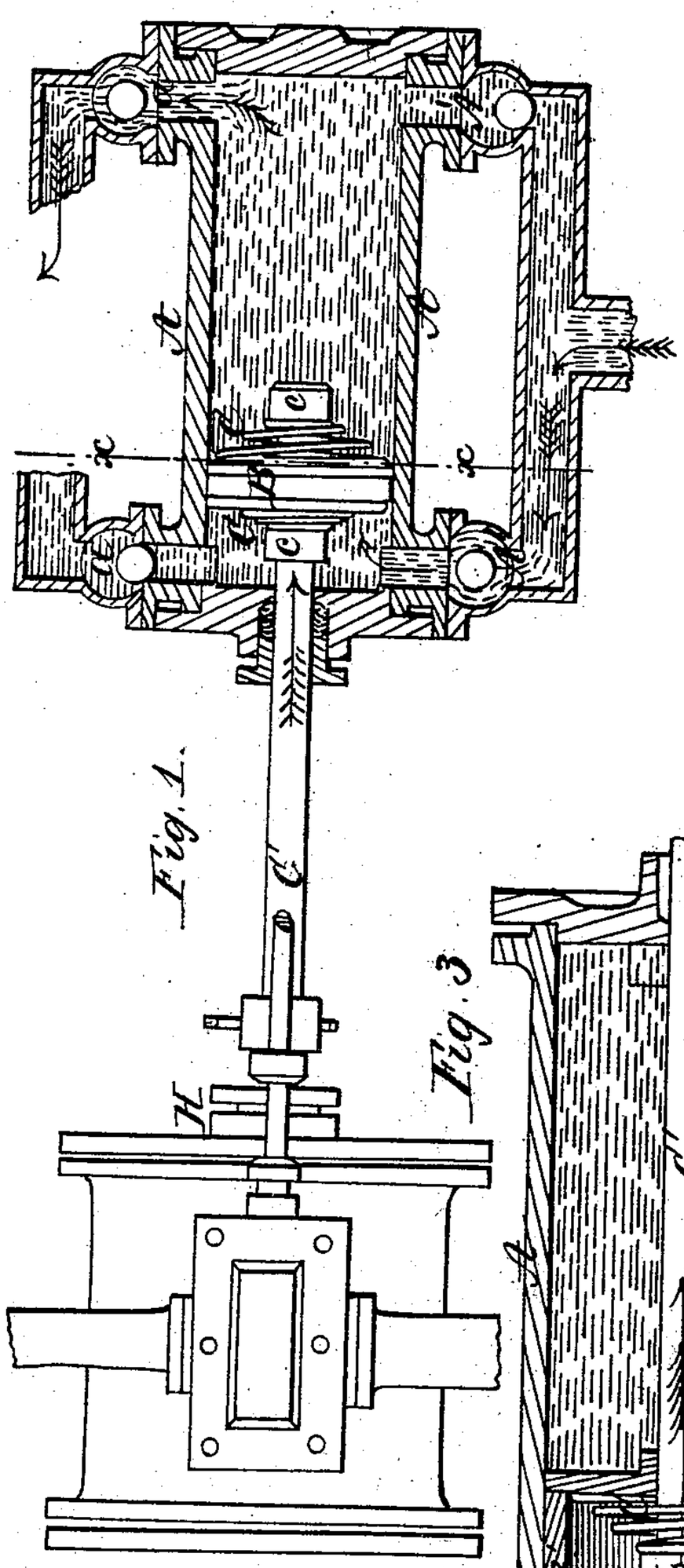

Fig. 1.

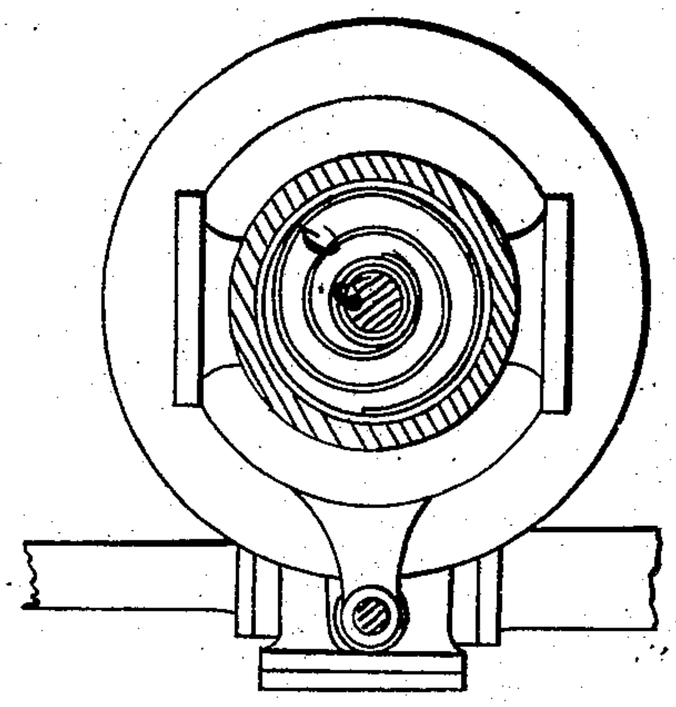

Fig. 2.

Fig. 3

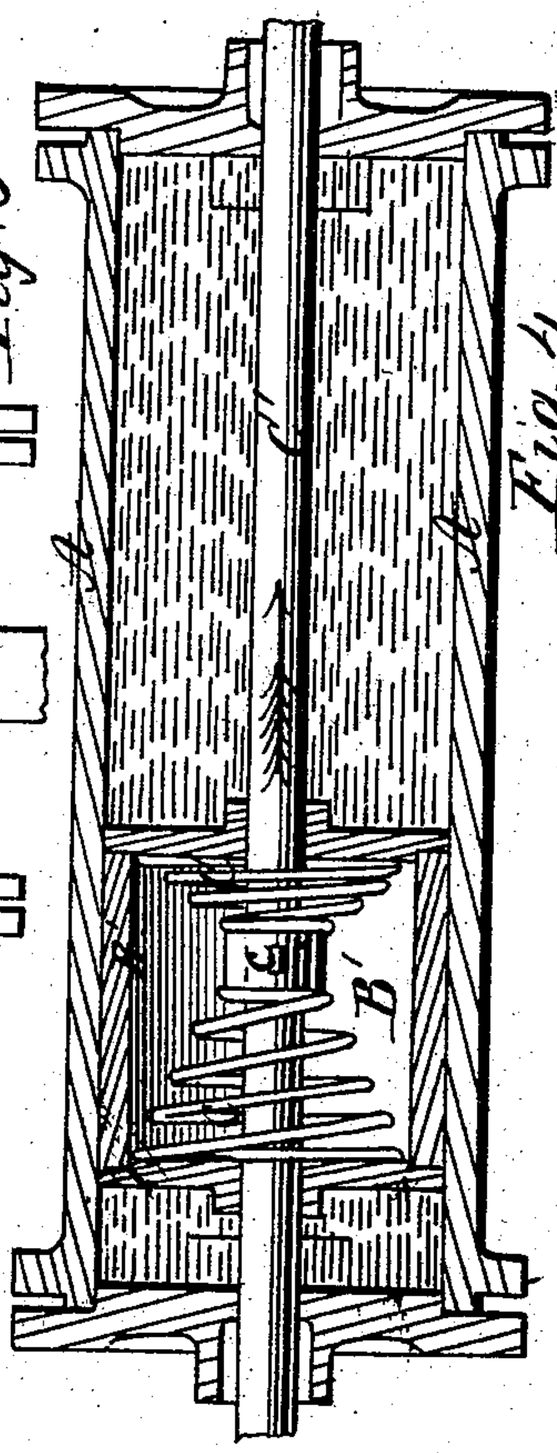

Fig. 4

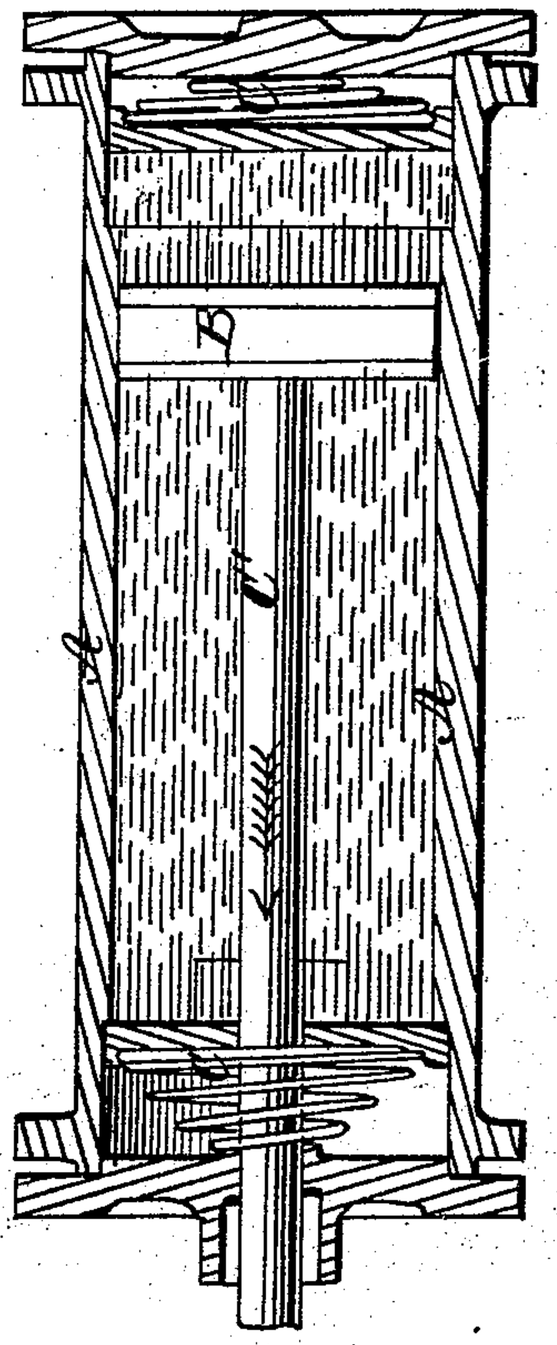

Fig. 5

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Letters Patent No. 92,957, *dated July* 27, 1869.

IMPROVEMENT IN STEAM-PUMPING ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ROSCOE J. GOULD, of the city of Newark, in the county of Essex, and State of New Jersey, have invented a new and useful Improvement in Steam-Pumps; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, which are made a part of this specification.

My invention consists in applying spiral or other properly-constructed springs to the piston-head of a steam-pump, or to a separate piston within the cylinder, or in other convenient location inside the pump-valves, or in a separate cylinder having communication inside the valves, in such a manner as to do away with the necessity of a fly-wheel to carry the stroke over the horizontal or perpendicular line, and also to form a "relief" to the pump, and to enable a higher pressure to be obtained under the same power than in the ordinary steam-pumps; and also to enable the pump to decrease the quantity of liquid discharged as the pressure increases.

In order that those skilled in the art may be enabled to manufacture my improvements, I subjoin the following description of it, reference being had to the drawing accompanying this specification, and making part of the same, in which—

Figure 1 shows a side elevation, with the pump in longitudinal section.

Figure 2, a transverse section on the line *x–x*, fig. 1, showing part of my improvement.

Figures 3 and 4 represent longitudinal sections of the pump, showing my improvement under modified forms.

Similar letters of reference refer to similar parts in the several figures.

A, fig. 1, represents a common cylinder of a steam-pump.

B, the piston-head.

A′ A′, the induction-ports.

a a, the eduction-ports.

C′, the piston-rod, connected with the steam-engine H, and which moves the piston B back and forth, when in operation.

C C are two spiral springs, coiled in the form of a cone, placed at either end of the piston-head B, held in position by any desired means, as, for instance, by rings *c c*, or shoulders, against which the top of the springs may rest.

The springs may be of any desirable shape, material, or kind, and arranged as in fig. 1, or they may be arranged and used as in fig. 3 or 4, or in any other manner by which the same effect is produced.

By preference, I apply the springs to the pump-piston, as the action is direct, and not liable to be neutralized by the cylinder not filling, or the formation of a partial vacuum which is not filled by the water.

The springs may be enclosed in a hollow piston-head, B′, fig. 3, as seen by C C, allowing the apex of the conical springs to rest against the ring *c*, (or this may be a shoulder turned on the shaft,) and the bases resting against the opposite inner surface of the ends of the piston, as seen in the drawing; or they may be arranged in a separate cylinder, having connection inside the pump-valves, or in the heads of the pump, as shown in fig. 4, or at any convenient position where they may receive the pressure of the liquid inside the valves. This piston-head is, when the springs are applied to it, movable upon the shaft to the extent to which the conical or other springs will permit by compression in either direction.

The operation of my improvement is as follows:

Supposing the piston B to be at the commencement of its stroke in the direction indicated by the arrow, fig. 1, the motion of the shaft C′ propels it in the direction of the arrow. The resistance which it meets from the water tends to push back the movable head upon the rod, until stopped by the spring, when compressed sufficiently to balance the pressure. This gives less stroke to the pump-piston, in proportion to the stroke of the propelling-rod, than in ordinary pumps, the springs acting as described hereafter, to aid in obtaining the objects named. When the return-stroke is made, the action of the springs is reversed.

Fig. 3 shows the piston B, just starting upon its return-stroke, as denoted by the arrow.

In fig. 4 the piston B is represented as just upon the point of changing stroke, the arrow showing the direction in which it is about to move.

In each of the figures, 1, 3, and 4, the springs are represented in the positions they occupy at the times designated above by the letter C.

These springs act as a relief to the driving-power, receiving a portion of the force when it is exerted, and giving it out at the time of the stroke when the steam-valve has not opened sufficiently to allow the steam to exert its full force against the piston, and the piston has not recovered its speed.

The impetus given the piston-head B by the springs acting upon it, carries it beyond the perpendicular or horizontal line of the stroke of the shaft, in the same manner and with all the efficiency of the fly-wheel, and has the advantage, over all other agencies used for the same purpose, of decreasing the weight of the machinery, adding to the power of the pump, by enabling all the force to be applied directly to it, instead of a portion being necessarily given to driving the fly-wheel itself.

In the case of springs, there is no loss of power but that occasioned by the friction within the spring itself.

By allowing the pump-piston an end-play upon its rod, and controlling the same by springs, its stroke is shortened in proportion to the amount of pressure on

its surface; therefore less liquid will be discharged by the pump as the pressure increases, and the power required is in proportion to the amount of liquid discharged.

The steam-piston or other motor travels over more space in the stroke than the pump-piston, and hence the latter does not use as much power as though the stroke were of equal length.

The principal duty of the spring is to relieve the steam-piston of the load at the turn of the stroke, until the steam-valve has opened and headway gained by the piston, which is the result of the reaction of the spring in the direction of the reversed stroke of the piston-rod, thus allowing the piston to change the stroke without sticking, and commence the new stroke with greater force and speed.

The spring-piston excels the ordinary balance-wheel by increasing in efficiency as the load increases, not being governed by the speed, as in case of the fly-wheel, but by the resistance which compresses the spring to a great or less degree.

When the piston-rod, fig. 1, has moved in the direction of the arrow to the end of the stroke, the liquid being discharged is under pressure, giving the movable piston-head a foundation which sustains the spring while it is reacting on the piston-rod in the direction of the return-stroke.

The piston-head being movable on the rod, and prevented by the springs from a very sudden motion on the change of the stroke, the pressure on the liquid is not suddenly acquired, and the pump is relieved from that violent action common at high pressures.

The objects of my invention may be summed up as follows:

First, to provide a substitute for the fly-wheel.

Second, to provide a substitute for the relief-cock in pumps.

Third, to automatically equalize the pressure on the water.

Fourth, to decrease the quantity of water discharged as the resistance or water-pressure increases.

Fifth, to obtain higher water-pressure with the same power of steam.

In the drawings, fig. 1 represents the preferred form of my invention; but I have also represented and referred to modifications, which I regard as mechanical equivalents thereof.

What I claim, and desire to secure by Letters Patent, is—

The combination of springs C with steam-pumps, as shown in fig. 1 of the drawings, or in any other mechanically-equivalent way to produce the same effect.

ROSCOE J. GOULD.

Witnesses:
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