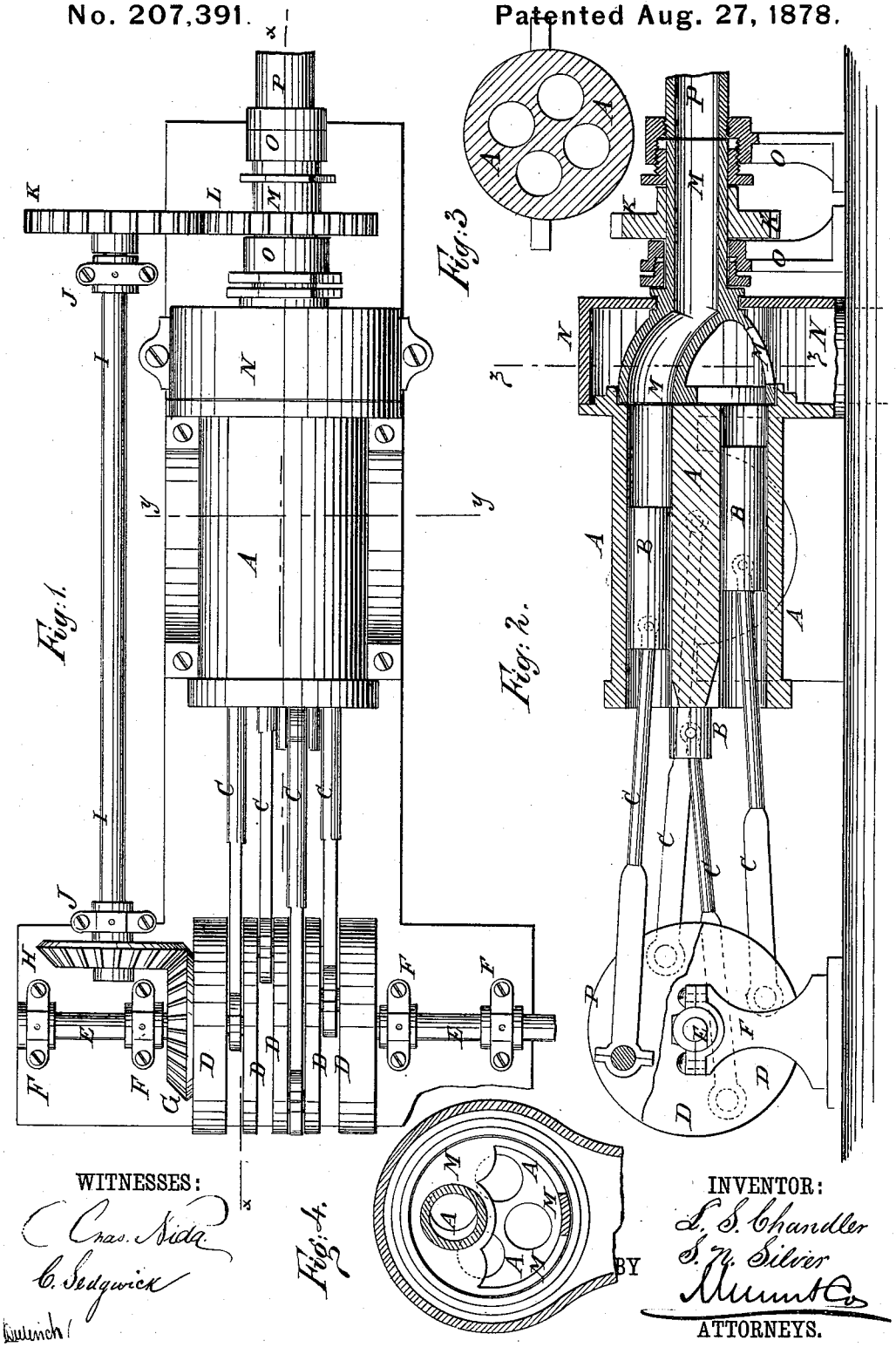
L. S. CHANDLER & S. N. SILVER.

Hydraulic-Engines.

No. 207,391. Patented Aug. 27, 1878.



WITNESSES:

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UNITED STATES PATENT OFFICE.

LUCIUS S. CHANDLER AND SAMUEL N. SILVER, OF AUBURN, MAINE.

IMPROVEMENT IN HYDRAULIC ENGINES.

Specification forming part of Letters Patent No. **207,391**, dated August 27, 1878; application filed July 6, 1878.

To all whom it may concern:

Be it known that we, LUCIUS S. CHANDLER and SAMUEL N. SILVER, of Auburn, in the county of Androscoggin and State of Maine, have invented a new and useful Improvement in Water-Engines, &c., of which the following is a specification:

Figure 1 is a top view of our improved machine. Fig. 2 is a longitudinal section of the same, taken through the broken line *x x*, Fig. 1. Fig. 3 is a vertical cross-section of the cylinder, taken through the line *y y*, Fig. 1. Fig. 4 is a vertical cross-section of the valve and the exhaust-chamber, taken through the line *z z*, Fig. 2, and looking toward the cylinder.

Similar letters of reference indicate corresponding parts.

The object of this invention is to furnish a machine which may be used as a water-engine, a stationary or locomotive steam-engine, a water-pump, a steam-pump, or a steam fire-engine, and which shall be simple in construction and effective in operation, and shall be so constructed that it will work without pounding or back-pressure, and may be run at a high speed without impairing its efficiency.

The invention will first be described in connection with the drawing, and then pointed out in the claims.

A is the cylinder, which is formed of four (more or less, but preferably four) cylinders. The compound cylinder A may be cast solid, or it may be formed by connecting separate cylinders together.

In each of the cylinders works a piston or follower, B, to the outer end of which is pivoted the inner end of a connecting-rod or pitman, C. The outer ends of the connecting-rods C are pivoted to a set of cranks, crank-wheels, or eccentric-wheels, D, formed upon, connected with, or attached to the shaft E.

The shaft E revolves in bearings in suitable supports F, and from it power is taken when the machine is used as a steam or water engine, and to it power is applied when the machine is used as a pump. To the shaft E is attached a bevel-gear wheel, G, the teeth of which mesh into the teeth of the bevel-gear wheel H, attached to the end of the shaft I. The shaft I is placed parallel with the cylinder A, revolves in bearings in suitable supports J, and to its forward end is attached a gear-wheel, K, the teeth of which mesh into the teeth of the gear-wheel L, attached to the tube of the valve M. The valve M revolves in the valve-chest or exhaust-chamber N, with its face close to the end of the cylinder A.

The tube of the valve M revolves in bearings in suitable supports O, and to its outer end is coupled the end of a pipe, P, which serves as an inlet-pipe when the machine is used as an engine, and as a discharge-pipe when the machine is used as a pump. The inner end of the tube of the valve M, with the chamber N, is curved upward and inward, to bring it into such a position that it will come opposite the cavities of the cylinder A in succession. The face of the valve M is formed of a plate a little smaller than a semicircle, with an opening in the middle part of which the end of the valve-tube is connected, and a ring supported by an arm.

With this construction, as the valve begins to cover one cavity of the cylinder A, it begins to uncover the next cavity, and with the exhaust one cavity will always be wholly uncovered, and when the valve begins to uncover a second cavity it will begin to cover a third cavity, so that there will always be a free exhaust.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The combination, with the compound cylinder A, of the rotary valve M, the exhaust-chamber N, and the pipe P, as and for the purpose specified.

2. The combination of the four (more or less) cylinders A, the followers B, the connecting-rods C, the cranks, crank-wheels, or eccentric-wheels D, the shaft E, the two bevel-gear wheels G H, the shaft I, the two gear-wheels K L, the rotating valve M, the chamber N, and the pipe P, with each other, substantially as herein shown and described.

LUCIUS STOCKIN CHANDLER.
SAMUEL NORMAN SILVER.

Witnesses:
GEORGE C. WING,
CHARLES E. WING.