

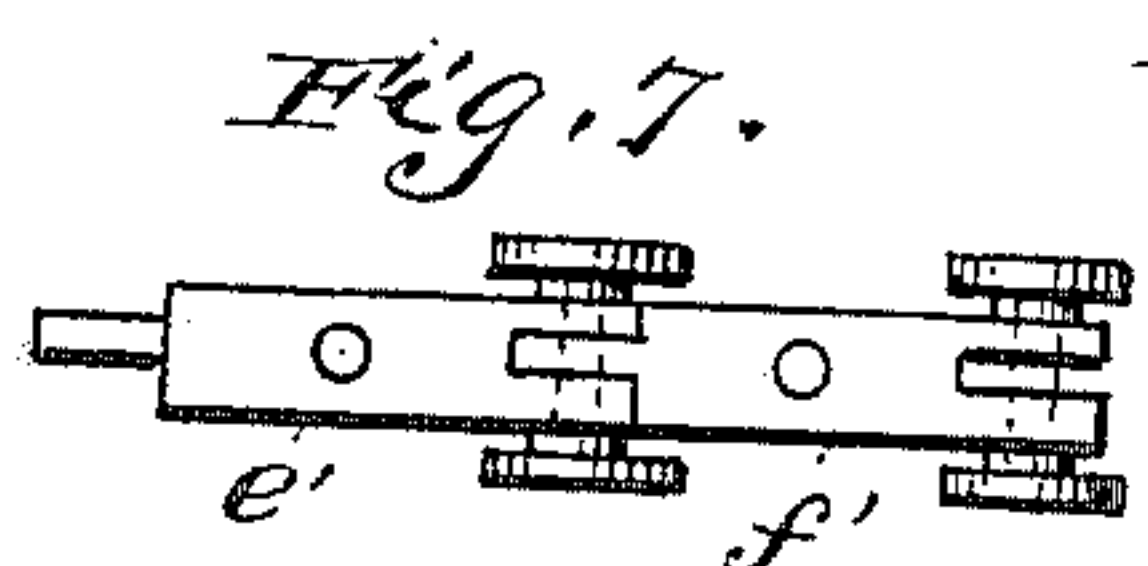
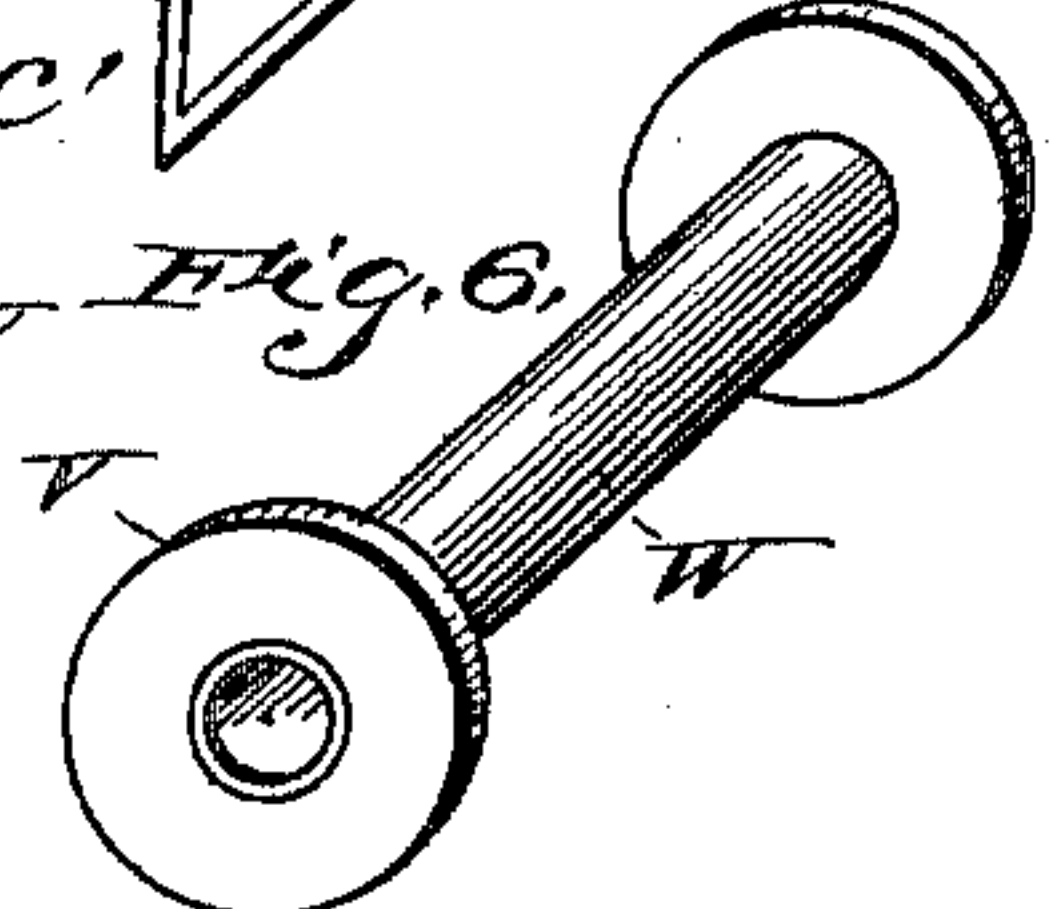
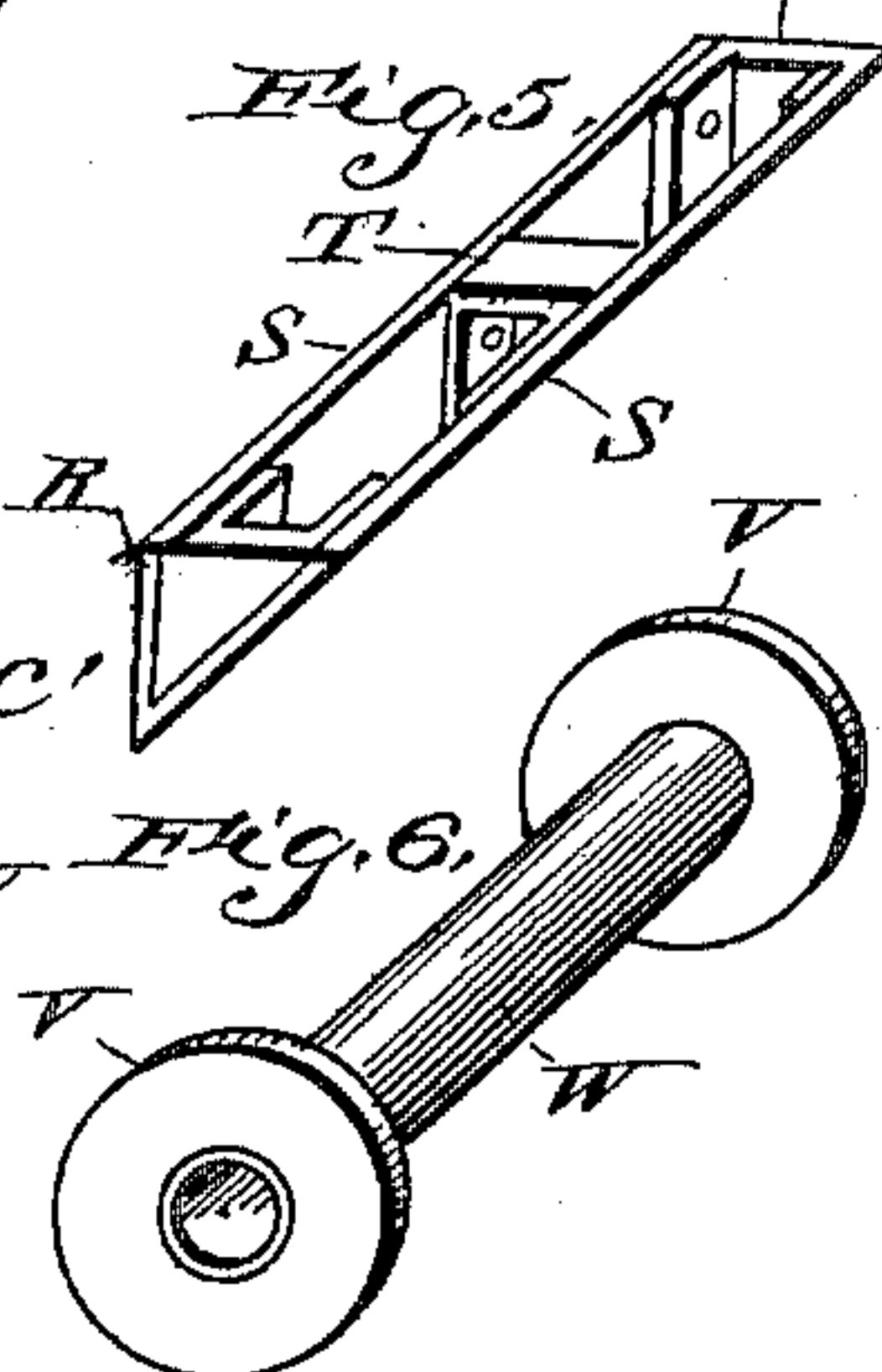
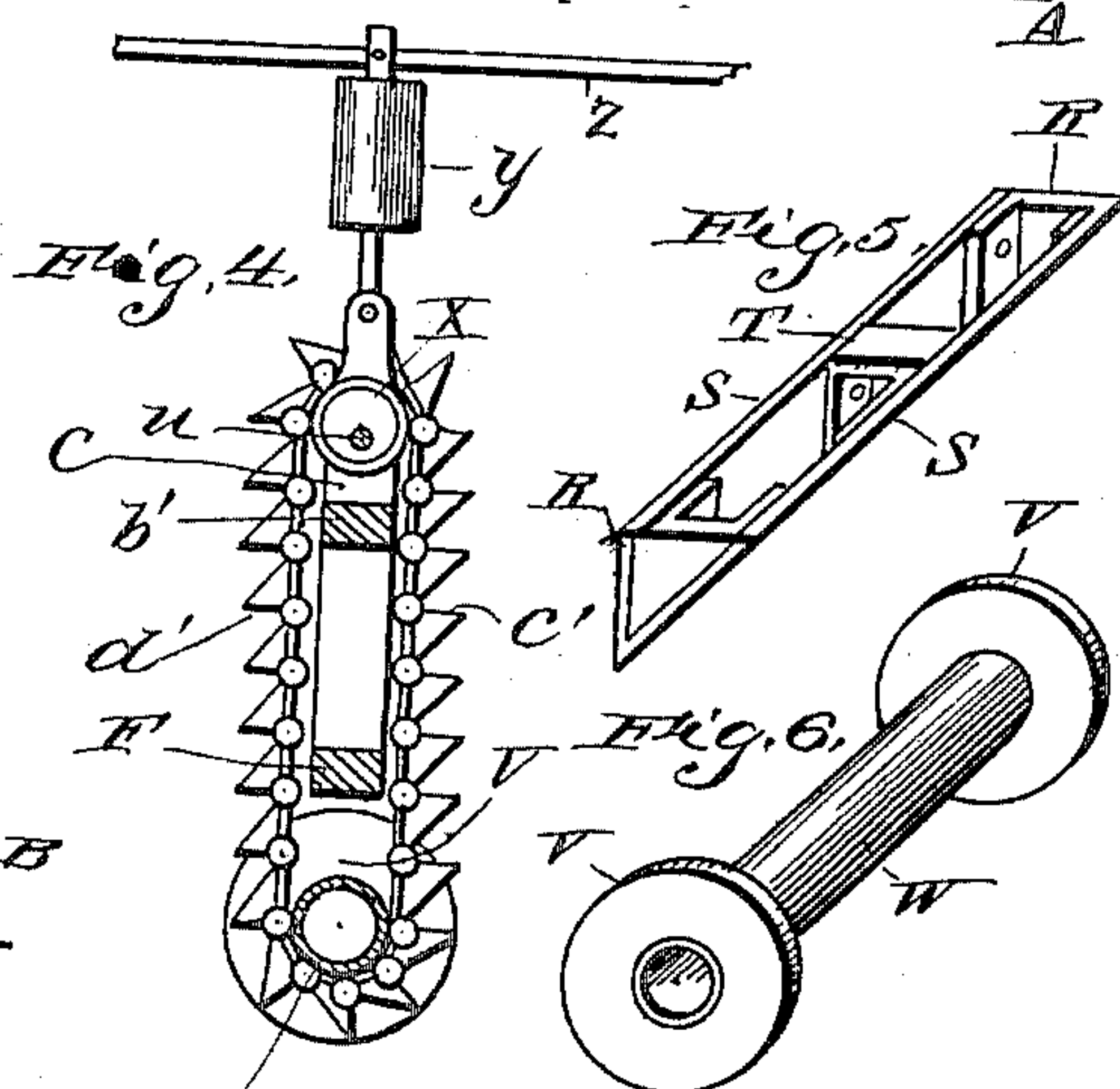
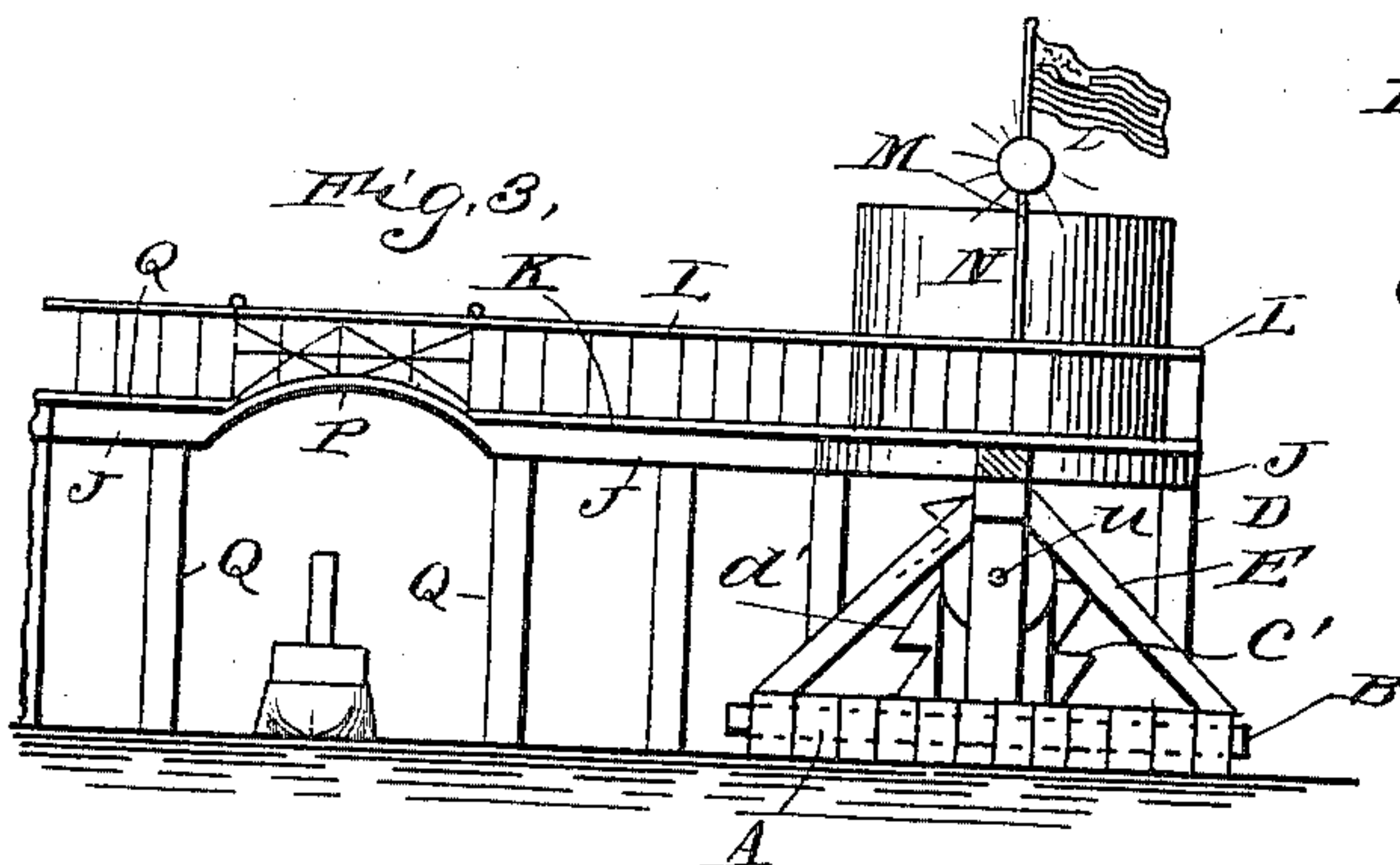
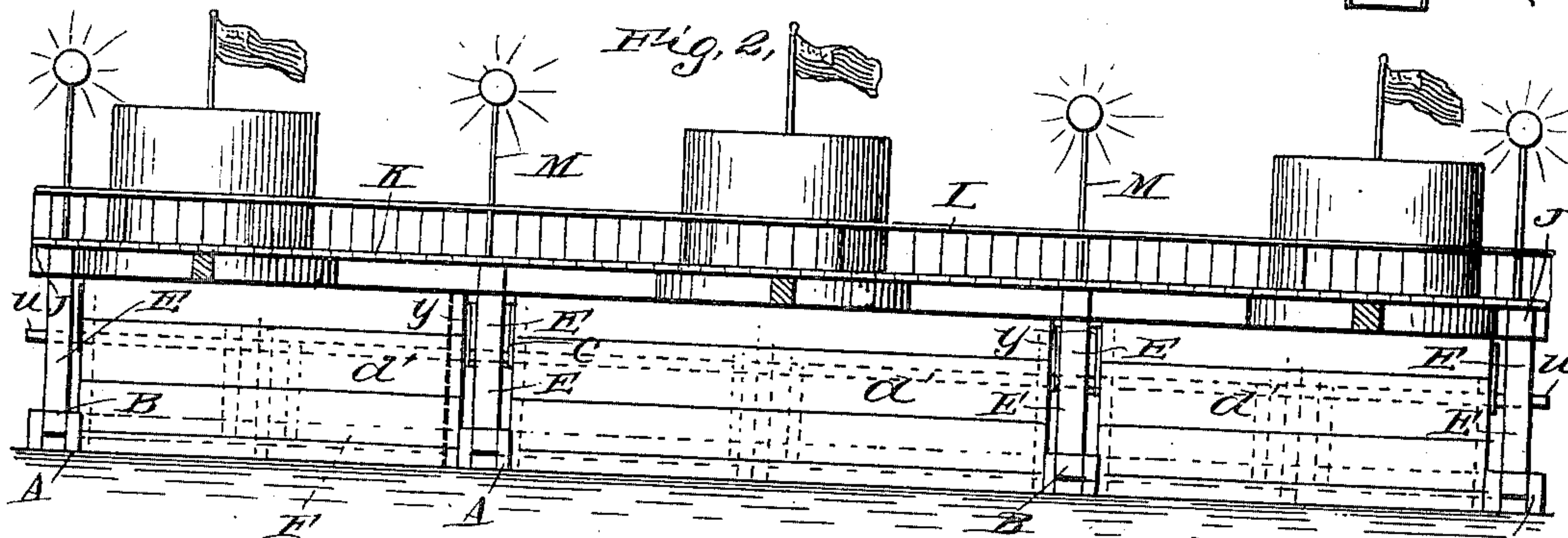
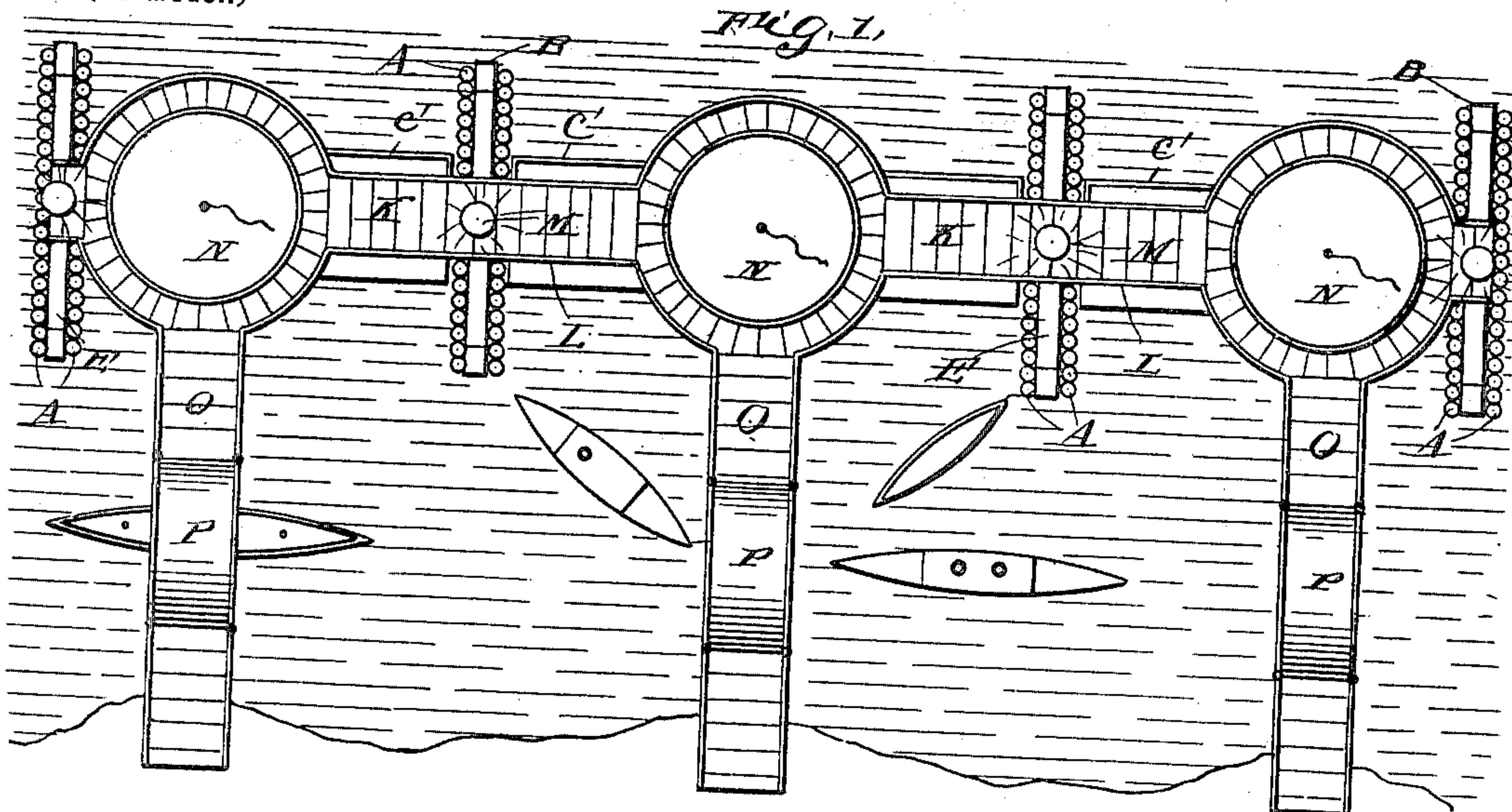
No. 660,035.

G. N. TODD.
WAVE MOTOR.

Patented Oct. 16, 1900.

(Application filed May 24, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

GEORGE N. TODD, OF LOS ANGELES, CALIFORNIA.

WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 660,035, dated October 16, 1900.

Application filed May 24, 1899. Serial No. 718,115. (No model.)

To all whom it may concern:

Be it known that I, GEORGE N. TODD, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Wave-Motors; and I do 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 the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel "wave-motor," consisting of an endless chain of troughs arranged to form a vertical rotatable sea-wall or breakwater rotated by the ocean-waves rolling and falling into the troughs, continually filling and sinking them, and thereby rotating said sea-wall of troughs, and thereby actuating air-pumps, storing compressed air in reservoirs or air-compressors, from which steady power is derived to operate dynamos, generate electricity, and drive other mechanical devices, the primal object of this invention being to form a series of troughs in an endless chain or apron arranged as a rotatable vertical sea-wall or breakwater operated by the sea-waves rolling into, filling, and sinking said troughs.

The second object is to secure said rotatable trough-chain upon a foundation of piles driven into the bed or sea-bottom, supporting suitable bridgework.

The third object is to obtain power from the rotation of said trough-chain by the sea-waves and to thereby operate other mechanical devices.

The fourth object is to store power derived from the rotation of said trough-chain by the sea-waves, whereby other mechanical devices may be steadily and evenly operated.

The fifth object is to form an ocean or sea rotatable wall or breakwater, rotated by the action of the waves, to obtain power therefrom, and to form a smooth-water or quiet anchorage for boats between said sea-wall and the shore.

The sixth object is to form the top of said sea-wall into a walk or promenade for pedestrians, to connect the said walk to the shore

by foot pier-bridges, and to light the same with electricity generated by power derived from the rotating of said sea-wall.

The seventh object is to provide said trough-chain with an anchor-roller forming a sinker and roller-bearing for one end of said trough-chain, sunk down in the water below lowest-tide levels, and to provide the upper end of said trough-chain with a drive-shaft and sprockets actuated by a chain provided with rollers forming carriage-links bolted to each end of said troughs.

The eighth object is to form the rotatable sea-wall in sections and connect these sections together to form any desired length.

These several objects are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of my invention. Fig. 2 is an ocean-front view thereof. Fig. 3 is an end or side view thereof. Fig. 4 is an enlarged detail end view of the trough-chain, its air-pump, central timber braces, and its anchor-roller with flange removed from one end thereof, the downward and under flow of the water being illustrated by dotted lines and arrows. Fig. 5 is a perspective plan view of one of the troughs. Fig. 6 is a perspective plan view of the anchor-roller. Fig. 7 is a plan view of the trough-chain carriage-links and its wheels and rollers.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, in Fig. 1, A indicates a series of piles driven into the ocean bed or bottom, a timber B being bolted to said piles and resting upon a row of piles underneath it, forming a foundation and support for said timber B, to which latter is secured a central upright piece C, provided with braces D E, the upright pieces C being also connected together by longitudinal timbers F at the bottom, as indicated by dotted longitudinal lines in Fig. 2 and further illustrated in Fig. 4. The tops of the upright pieces C are also connected together by a longitudinal timber-piece G, to and across which are secured cross-pieces J, supported by the vertical braces D, the longitudinal pieces G being covered with planks K to form a pedestrian-walk provided with a hand-railing L, electric lights and lamps M,

and circular air compressors or reservoirs N, the walk and railing being made also circular around them. As this structure pile foundation and framework is built out in the ocean beyond any low-tide effects, it is connected to the shore by neat foot-bridges O, with railings and connecting-drawbridges P for the passage of the masts of vessels, the bridges O being supported by piles Q, driven into the ocean bed or bottom, as seen in Fig. 3, thus practically forming ocean promenade-piers provided with air-reservoirs or compressor-tanks N, which form the foundation, support, and framework of my ocean-motor.

The motor consists of a series of troughs, as in Fig. 5, provided with end pieces R, formed of metal in triangle shape with flanged edges, to which are bolted planks S, forming the sides or walls, and strengthened by metallic braces T, placed at distances along the length of the trough, as may be necessary. These troughs are bolted to chains formed of links provided with rollers and forming carriages, as seen in Fig. 7, thus forming an endless chain of troughs, which are mounted upon sprockets and a top drive-shaft U, and a bottom idler forming a roller sinker or anchor whereby the bottom of the trough-chain is kept under water. This roller-anchor is made by casting two wheels V and securing them fast on each end of a pipe W, as seen in Fig. 6, the wheels V being large enough in diameter to guide the ends of the troughs and prevent their riding upon the wheels V or out of the roller. The ends of the drive-shaft U may be cranked or provided with eccentrics X, coupled to the shaft of an air-pump Y, swiveled or universally jointed onto an air-pipe Z, whereby air is forced by the pump Y into the pipe Z and thereby conducted to the reservoir or air-compressor N. The drive-shaft U is journaled to rotate in the upright timbers C, as seen in Fig. 2 and indicated by the longitudinal dotted lines, the ends of the shaft U showing on each end of Fig. 2. This shaft U is also provided with extra supporting-pieces and bearings a' , as seen in Fig. 4 and indicated by dotted lines in Fig. 2. These brace-pieces are secured to the longitudinal timber F at the bottom, and to another longitudinal timber b' at the top, which also form surfaces for the wheels of the chain-links to roll against, the chain being made to travel freely, surrounding these timbers, by means of the open water-space between the two end pile foundations. The chain-troughs filling and closing this space form thereby an ocean rotatable wall or breakwater, the troughs on the ocean side standing with their mouths open upward, as indicated by c' in Fig. 1, whereby the ocean-waves roll into and sink them, thus rotating the entire trough-chain, the troughs on the land side being bottom up, as indicated by d' , whereby they empty out the water. This rotatable sea-wall thus presents an obstruction to the ocean-waves rolling on the shore, and they dash upon the troughs, filling

and sinking one after the other continually, thereby rotating the chain, and thereby operating the air-pumps Y and charging the reservoirs N with compressed air. The ocean-waves striking upon and sinking the troughs in their efforts to reach the shore, cause an underflow and suction force of the water, as indicated by the dotted lines and arrows in Fig. 4, so that the combined stroke, fall, weight, flow, rush, and suction undertow force of the ocean is brought to bear upon the troughs of my wave-motor, thereby developing a force and power not possible in any other form of wave-motor, as by my system I attain all the results in engineering in damming up water and bringing its force to bear upon an overshot wheel or turbine. The power of my device is only limited by its length, by the size of the troughs, and by their leverage upon the shaft U. It will also be obvious that, in breaking the force of the ocean-waves and converting their power into compressed air, the said power is thus stored to be easily available for use in a steady even-running power in generating electricity and in the operation of divers forms of mechanical contrivances and that also a quiet anchorage or harbor is obtained for boats between the rotatable sea-wall and the shore, as illustrated in Figs. 1 and 3.

In the operation of my invention the rising and rolling of a wave causes it to rush upon and into a trough above the level of the water, filling and sinking it, thereby turning the shaft U, operating the air-pump Y, and storing air in the compressor N by means of proper pipe connections Z. This operation is continually kept up by the incessant action of the ocean-waves, and thereby power developed and stored whereby a dynamo can be operated, electricity generated, and power conducted to operate other mechanical devices.

Having described my invention, what I claim is—

1. A rotatable ocean-wall or breakwater, consisting of a series of endless chains or troughs or water-buckets, connected together and forming a rotatable ocean-wall or breakwater, rotated by the ocean-waves.

2. Two end supports for a wave-motor, each end support consisting of a row of piles, A, driven in an ocean bed or bottom, secured to a joint tie-timber B; an upright timber C, and braces E; all arranged and adapted to form an end support for an endless chain of troughs or water-buckets; each of said end supports being connected and tied together by longitudinal girders G over the top of said trough-chain, and by timbers b' and F within said trough-chain.

3. A rotatable wave-motor consisting of an endless chain of troughs or water-buckets; a drive-shaft and sprockets; a roller-anchor or weight-spool.

4. A rotatable wave-motor consisting of an endless chain of troughs or water-buckets; a

drive-shaft and sprockets; a roller-anchor or weight-spool, consisting of a metal wheel or disk secured on each end of an iron pipe.

5 5. A rotatable wave-motor consisting of an endless chain of troughs or water-buckets, each trough being formed of two board sides S bolted to metallic end pieces R and secured to a chain; arranged and adapted to be rotated by the ocean-waves.

10 6. A rotatable wave-motor, consisting of an endless chain of links, provided with rollers forming carriages; troughs or water-buckets secured to said links.

7. A support or supports secured to the ocean bed or bottom, a wave-motor consisting 15 of a series of troughs arranged to form a series of endless chains secured to said support, being arranged and adapted to be actuated by the ocean-waves and to form an ocean-wall or breakwater. 20

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

GEORGE N. TODD.

Witnesses:

KATE L. LUCE,
JAMES P. CLARK.