

No. 890,994.

PATENTED JUNE 16, 1908.

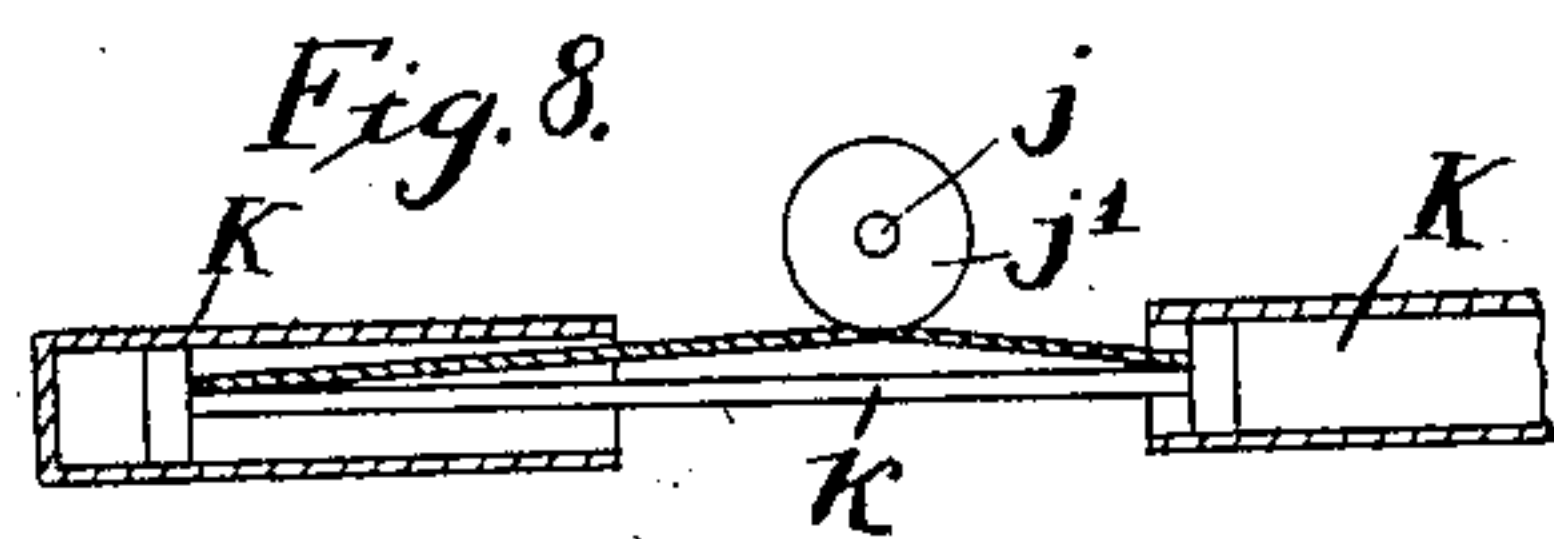
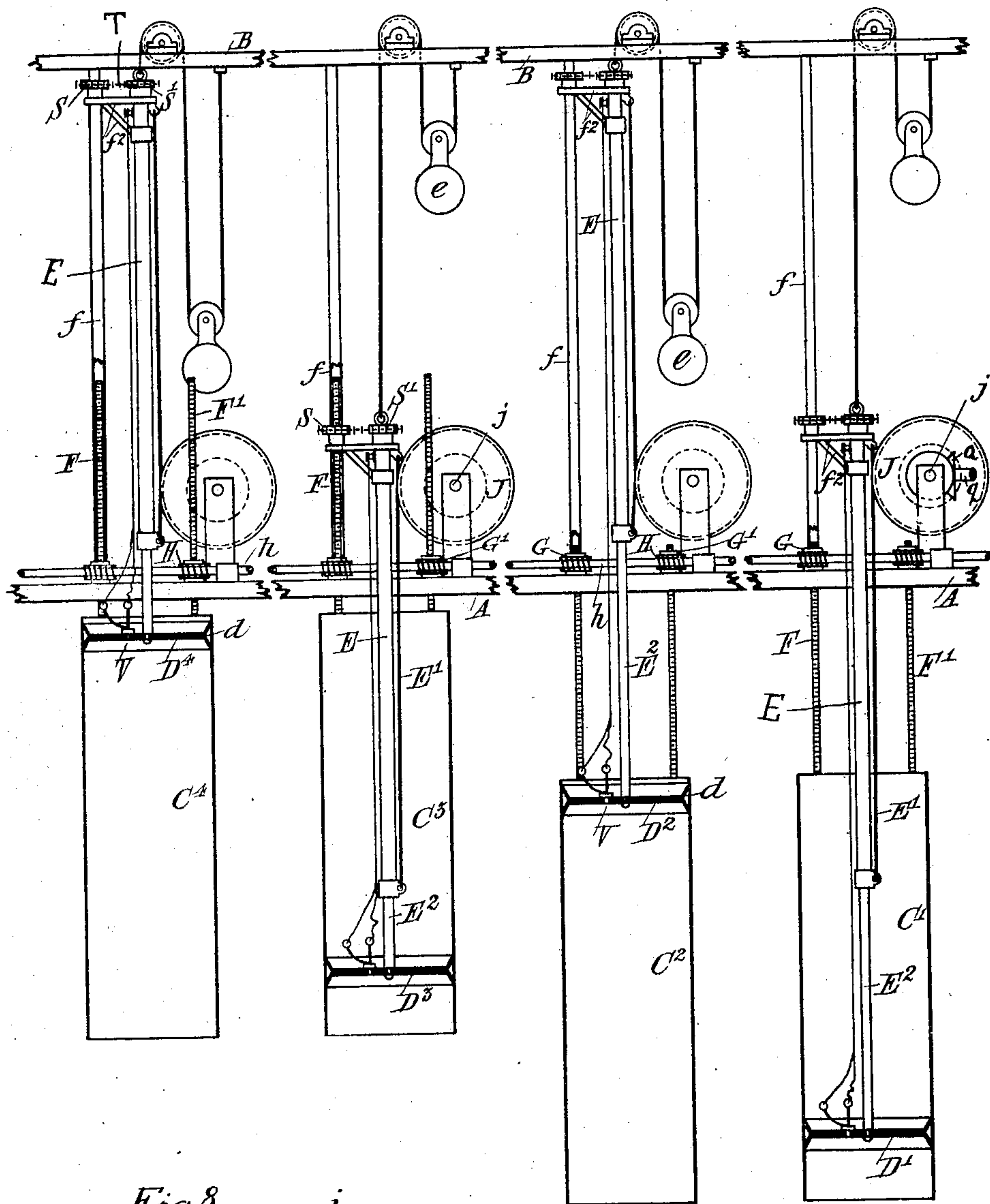
P. MORICE.

APPARATUS FOR UTILIZING THE FORCE OF THE WAVES OF THE SEA.

APPLICATION FILED JAN. 12, 1907.

3 SHEETS—SHEET 1.

Fig. 1



WITNESSES
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3 SHEETS—SHEET 2.

Fig. 2

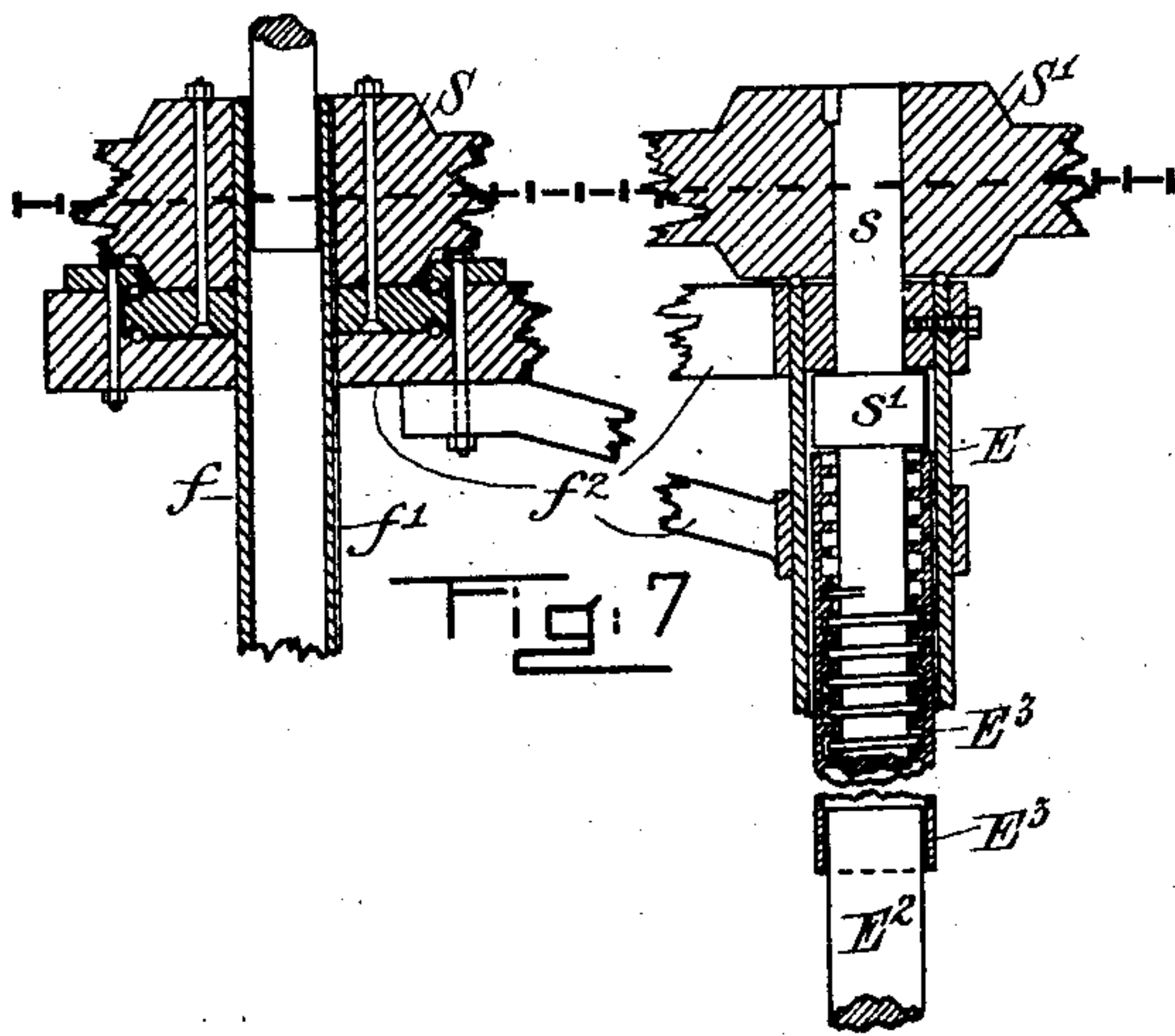
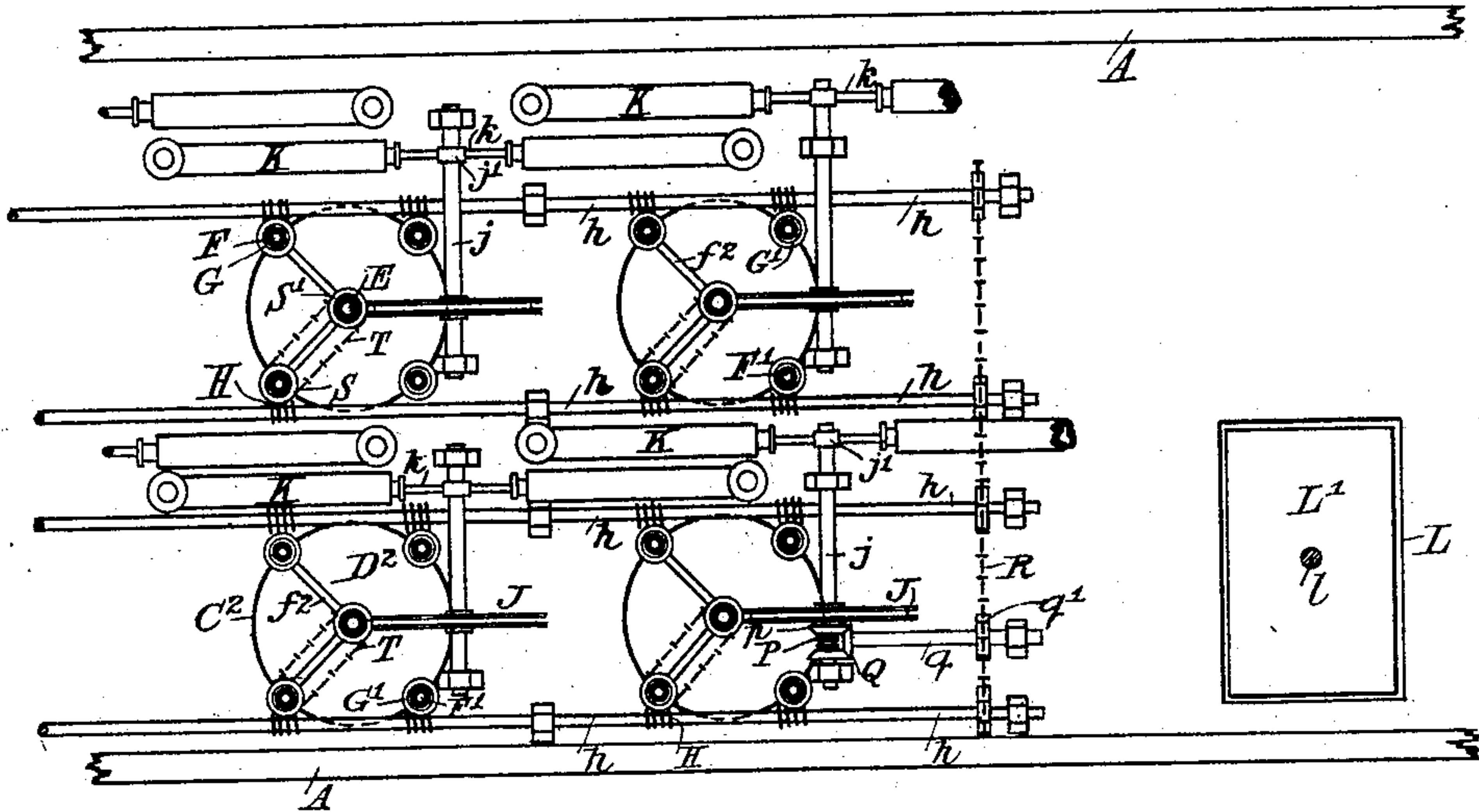


Fig. 7

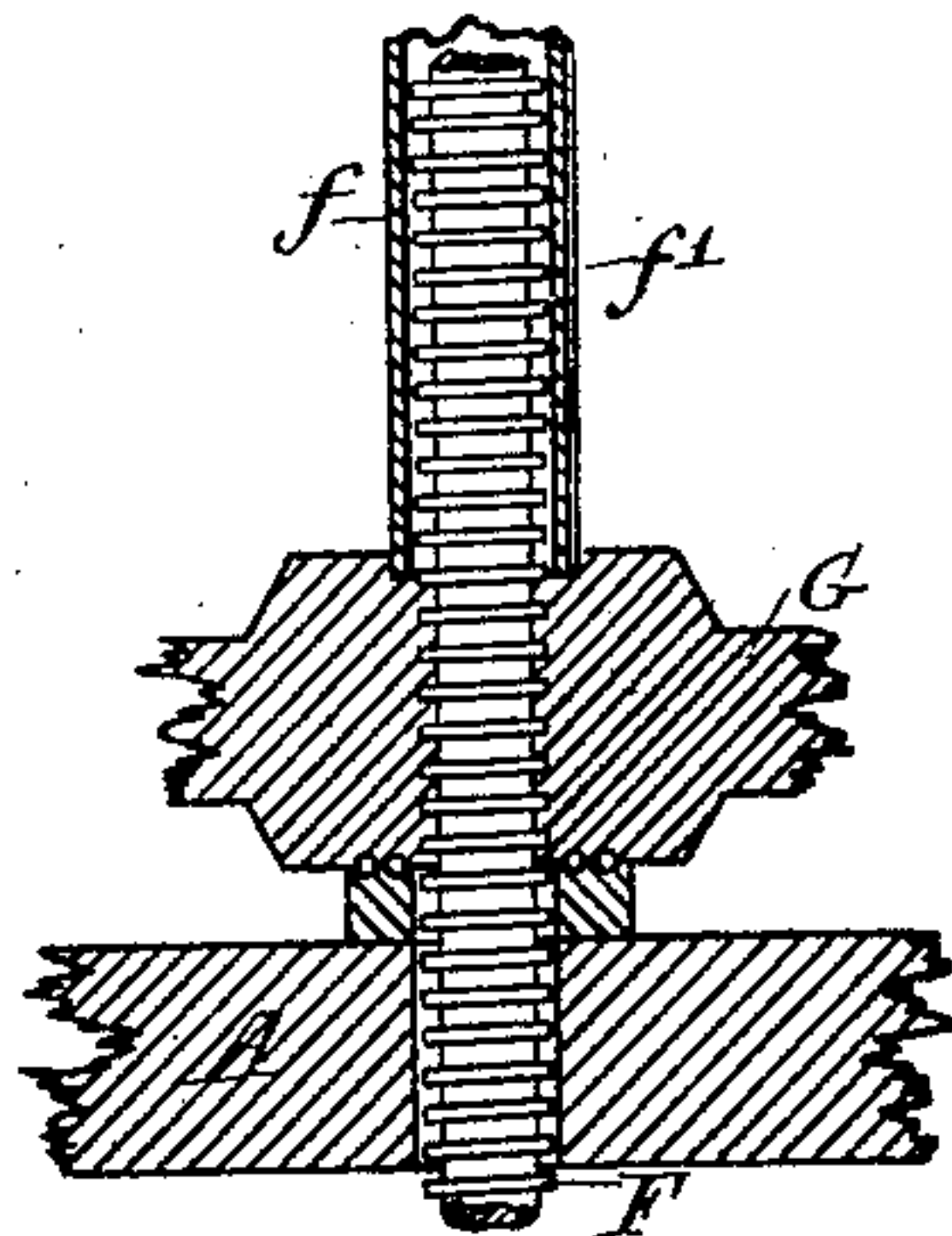


Fig. 6

WITNESSES

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR UTILIZING THE FORCE OF THE WAVES OF THE SEA.

No. 890,994.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed January 12, 1907. Serial No. 352,032.

To all whom it may concern:

Be it known that I, PETER MORICE, a subject of Great Britain, residing at Claude avenue, Neutral Bay, North Sydney, county of Cumberland, State of New South Wales, Commonwealth of Australia, have invented new and useful Improvements in Improved Apparatus for Utilizing the Force of the Waves of the Sea, of which the following is a specification.

This invention is adapted to be applied in any location where the undulating movements of the waves of the sea may be felt, therefore the apparatus may be installed either on a sea-girt rock, on the sea shore, or on board ship.

In giving effect to the invention, a platform is constructed in any suitable position, and from the platform is raised an overhead frame to support and give rigidity to the working parts. Below the platform are suspended a number of bottomless cylinders which contain easy fitting pistons or disks. The cylinders are adapted to rise and fall automatically as the tide rises and falls, but the pistons only rise and fall when acted upon by a wave. It is important that there should be a cushion of air between the underneath of the piston or disk and the water below. As the pistons or disks are raised or lowered by the wave force they will cause compression pumps to be operated to compress air which may be stored in any appropriate manner.

There are numerous details which will hereafter be fully explained.

In the accompanying drawings:—Figure 1 is a side elevation of part of the installation, the cylinders being in section. Fig: 2 is a plan of part of an installation. Fig: 3 is a side elevation (partly in section) of one cylinder showing the operation of the tide gear. Fig: 4 is a partially diagrammatic view of the clutch gear whereby the tide regulating parts are operated, the clutch being shown in a neutral position. Fig: 5 is a similar view showing the clutch in an engaged position. Fig: 6 is a sectional view of the screw gear for raising and lowering the cylinders to suit the height of the tide. Fig: 7 is a sectional view of the screw gear for adjusting the length of the piston rod to suit the height of the tide. Fig: 8 is a sectional detail view of the pumps K.

A is the platform, B the overhead frame; C^1, C^2, C^3, C^4 , are pairs of cylinders, as they would be at low tide and high tide; D^1, D^2, D^3, D^4 , are the pistons or disks which are adapted to rise and fall, with facility, within the cylinders. The pistons or disks are provided with suitable leather packings d . A piston rod E projects vertically upwards from each piston. When a wave impinges against a cylinder, the piston will be forced upwards, as shown in the cylinders C^2 and C^4 . The pistons and piston rods are counterbalanced by a weight e , in a manner that is well understood. The cylinders should be braced, in any suitable manner, in order to resist, in a measure, the impact of the waves. These braces are not shown in the drawings.

The cylinders are suspended from the platforms, in a peculiar manner, by means of four screw rods F, F^1 , to each cylinder. The screw rods F, F^1 , pass through tapped nuts G, G^1 , that are secured to the platform A. The peripheries of the nuts G, G^1 are formed as worm wheels that are adapted to gear with worms H on the horizontal rods h , that are rotated in a manner to be described hereafter in connection with the tide gear. The screw rods F, and worm nuts G, are shown in sectional detail at Fig: 6. A cord E^1 is attached to near the bottom and to near the top of the piston rod, intermediately passing round a pulley J, so that, as the piston rises and falls, the pulley J will have a reciprocary rotary motion imparted to it. The pulley J is keyed on a shaft that rocks with the pulley, and at the extremity of the shaft j (see Figs. 2 and 8) means are provided at j^1 for imparting a reciprocary motion to the piston rods k, k of the pumps K, and thereby compresses air (or does other work) which may be stored in any convenient manner.

In order to regulate the cylinders to the varying heights of the tides, special apparatus is employed which operates automatically. A special well L is placed in such a position as to be beyond the reach of impact from the waves, but is open to tide water. Within the well is suspended, by a rod l , a loaded float L^1 . On the top of the rod is a ring l^1 to which both ends of a cord M are secured. The direction of the cord will now be followed. From the ring l^1 it will proceed up-

wards, over a pulley m secured to the frame B, thence downwards round one sheave of a double pulley N, thence vertically upward (following the direction of the arrows) over a pulley n , thence diagonally downward round the other sheave of the double pulley N, thence round a guide pulley n^1 back to the ring l^1 on the rod l . As the float L^1 lifts on a rising tide, the lower part of the cord M will be hauled upon by the ring l^1 , that rises with the float, causing the cord to be moved in the direction indicated by the arrows. As the cord rises towards the pulley n , it will raise the arm o of the parallel motion O (as seen in Fig: 4) and cause it to assume the position as seen in Fig: 5. The parallel motion is connected to the clutch P and, when the arm o is raised by the movement of the cord M, the clutch will engage with the bevel wheel p as seen in Fig: 5. The face of the bevel wheel is formed into ratchet teeth with which pawls on the clutch engage. Thus, the clutch will cause rotation of the bevel wheel in only one direction. The clutch is feathered on to the shaft j so as to be capable of a lateral movement limited to the distance between the faces of the bevel wheels which are free to rotate on the shaft j . The disposition of this gear may be seen on a small scale in Fig: 2. In Fig: 4 the clutch gear is shown in a neutral position doing no work. In Figs: 2 and 5 the clutch gear is operating the intermediate bevel wheel Q and driving the shaft q and the sprocket wheel q^1 , that gears with the chain R that gears with sprockets on the worm shafts h . All these parts are automatically thrown in and out of gear by the rising and falling of the float L^1 , in the well L. The parallel motion is supported on an adjusting rod S^* (Fig: 3) that is carried by the cylinder C^1 . Its position is indicated by a thick line marked C; and because the appliance would be invisible in Fig: 3, it has been shown on a larger scale at Figs: 4 and 5.

In connection with the tide regulating appliances, the suspending rods F are incased, above the platform A, in sleeves f which are firmly secured to the worm-nuts G (as may be seen in Fig: 6) and will revolve with them, the sleeves extending to the top of the frame B, and each being provided with a key way f^1 as shown in Figs: 6 and 7.

All the piston rods are made telescopic. The bottom ends of the piston rods are solid rods E^2 which terminate in hollow extensions E^3 (Fig: 7) the upper ends of which are tapped with a female thread. When the tide is high, the whole of the hollow extension E^3 and part of the solid part E^2 of each piston rod will be telescoped into an outer sleeve or casing E. The upper end of each piston rod is maintained in a vertical position by a double bracket f^2 one end of which embraces the casing f of the suspending rods F while the

other end embraces the case E of the piston rod. The bracket f^2 is really carried by the casing E of the piston rod and moves up and down with the piston rod as the piston is acted upon by a wave. Above the brackets f^2 are mounted sprocket wheels S, S^1 . The sprocket S is keyed on to the casing f of the suspending rod F and adapted to slide up and down the key way f^1 as the piston rod and bracket f^2 rise and fall. The sprocket S^1 is placed above the casing E of the piston rod and is provided with a counter spindle s which fits into the top of the casing E. The spindle s is provided with a collar s^1 . The lower end of the spindle s is threaded with a male thread that gears with the female thread within the hollow extension E^3 of the piston rod.

The operation of these appliances is as follows:—When the worm shaft h are caused to rotate, (as hereinbefore described) the worm nuts G and the casings f of the suspending rods F will also be thereby rotated, causing the rotation of the sprockets S which gear, by chains T, with the sprockets S^1 . By their rotation, the sprockets S^1 will, through their screw gear below, force down the piston rods E^2 , E^3 , thereby lengthening the piston rods proportionately to the elevation of the cylinders, according to the state of the tide.

It is important to note that if an installation be made on board ship, the whole of the tide gear appliances may be dispensed with.

In order that there shall not be too much air below the piston, when the latter is introduced into the cylinder, a suitable valve V should be placed in the piston. This valve must be adapted to be operated from above in any suitable manner so that it shall not be necessary for an attendant to enter the cylinder in order to work the valve when the piston is introduced into the cylinder.

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

1. In apparatus for utilizing the force of the waves of the sea, a platform A, one or more cylinders, open at both ends, pendent therefrom, means for automatically controlling the position of the cylinders by the tide, easy fitting pistons or disks within the cylinders, piston rods rising vertically from the cylinders, and means for connecting the piston rods with compression pumps, as and for the purpose set forth.

2. In apparatus for utilizing the force of the waves of the sea, a platform such as A, one or more cylinders, open at both ends, pendent therefrom, means for adjusting the height of the cylinder below the platform to the varying height of the tide water, piston rods rising vertically from the cylinders, means for connecting the piston rods to compression pumps, a tide well such as L beyond the reach of the waves, a float and rod,

within the well, adapted to rise and fall with the tide, and means for connecting the float and rod in the tide well with the gear for adjusting the height of the cylinders whereby
5 such adjustment may be effected automatically, as specified.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

PETER MORICE.

Witnesses:

MANFIELD NEWTON,
ALBERT MASSEY.