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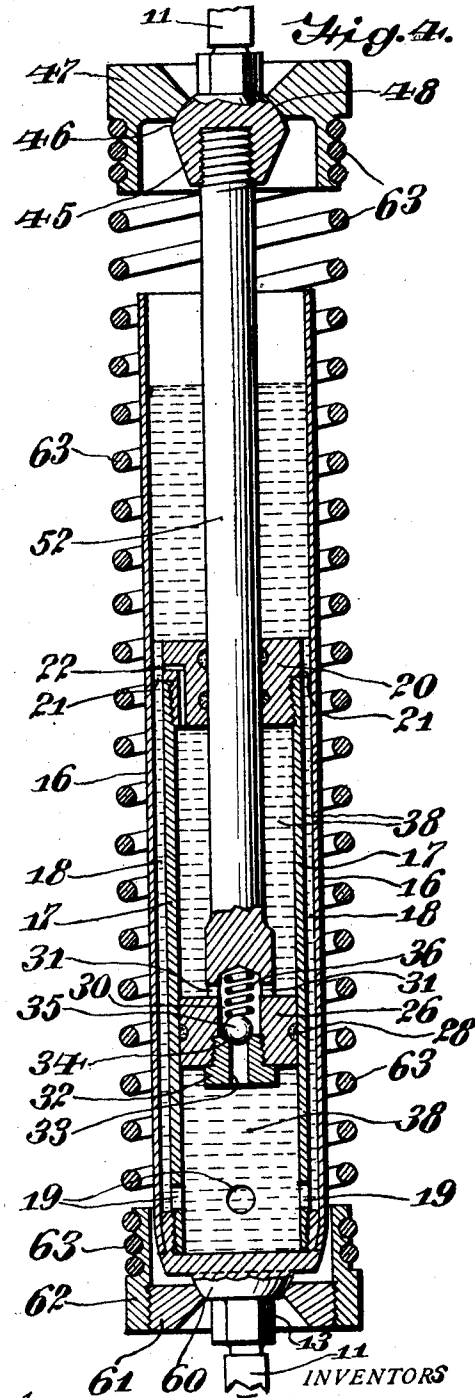
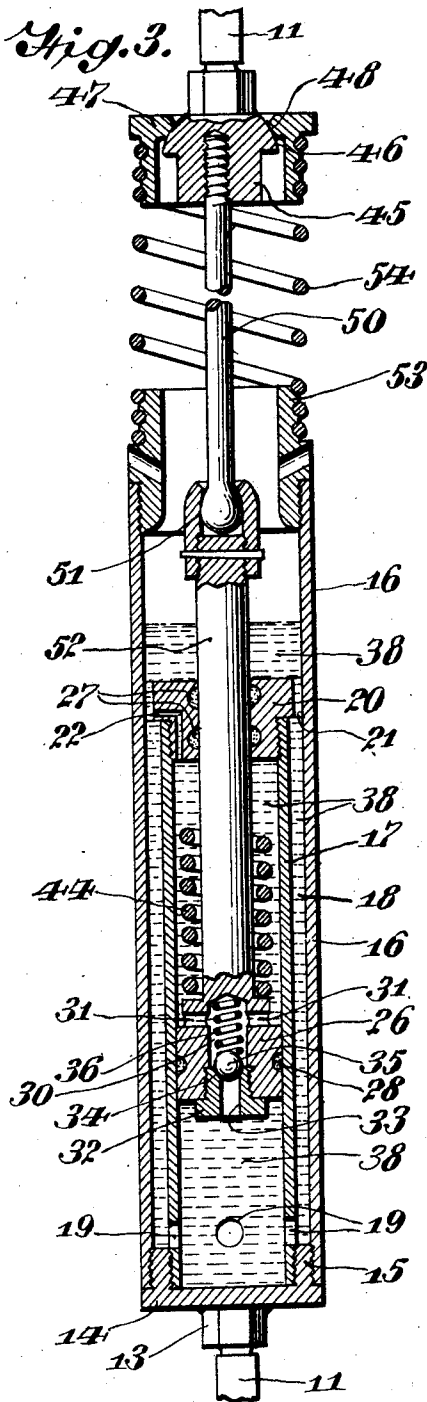
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PENDULUM LENS APPARATUS

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PENDULUM LENS APPARATUS.

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In the case of signal lights upon steamships, boats, buoys, and the like, it is required that the signal light apparatus shall be maintained in a substantially upright or vertical position independently of the rolling or other movements of such ship, boat, buoy, or the like. One means heretofore employed for that purpose has consisted of means comprising a pendulum the latter being located or suspended at that point in the steamship, boat, buoy, or other floating object where there is a minimum of movement due to the rolling and pitching of such steamship, boat and the like. In such means usually the pendulum is suspended from a support consisting of a universal joint, for example, a Cardan joint, and connections, are provided between such support and the lens apparatus which in turn is likewise supported upon a universal or Cardan joint structure. Such connections operate to maintain the axis of the lens apparatus and of the pendulum substantially vertical. Hence it follows that if the pendulum depends in a vertical direction the lens apparatus will be supported with its axis extending in a substantially vertical direction.

It sometimes happens, as in the case of sudden horizontal movements of the steamship, boat, buoy, or the like, that the point or points of suspension of the pendulum get a horizontal movement, whereby the pendulum is caused to swing through a relatively large angle or arc. Thereby it may happen that the swinging movements of the pendulum will be in synchrony with the rolling or pitching movements of the steamship, boat, buoy, or the like. In both of these cases the pendulum may swing through relatively wide angles or arcs, thereby imparting relatively wide pivotal swinging movements to the lens apparatus which would be objectionable, and should be obviated or lessened to such extent as may be practicable.

The general object of our invention is to provide means in the connections between the pendulum and the lens apparatus of a pendulum lens apparatus which acts to retard and to control the swinging movements of the pendulum to thereby limit in large degree the extent of swinging movements of the pendulum as well as the duration thereof to

thereby also control the pivotal or swinging movements of the lens apparatus.

It also is an object of the invention to provide an improved and novel construction of connections between the pendulum and the lens apparatus, including means for causing and controlling the flow of a fluid, to regulate and control the swinging movements of the pendulum and thereby to regulate and control the pivotal or swinging movements of the lens apparatus.

Another object of the invention is to provide connections of novel construction between the pendulum and the lens apparatus including means whereby the oscillatory movements of the pendulum are retarded and thereby caused to cease after relatively short periods of time.

We shall not attempt to point out here all of the various objects and advantages of our invention, but other objects and advantages thereof will be referred to in the detailed description of the same which follows or will be apparent from such description.

In order that the invention may be readily understood and its practical advantages fully appreciated, reference should be had to the accompanying drawings in which we have illustrated certain forms of embodiment of devices constructed in accordance with and exemplifying the principles of the invention.

In the drawings:

Fig. 1 is a view partly in vertical section and partly in elevation of a pendulum lens apparatus embodying the invention;

Fig. 2 is a view in longitudinal section of a portion of one of the connections between the lens and the lens apparatus constructed in accordance with the invention;

Fig. 3 is a view similar to that of Fig. 2 showing a modified construction of connection embodying the invention; and

Fig. 4 is a similar view of another modified construction thereof.

In the drawings we have shown a lens apparatus, indicated as a whole at 1, which is supported upon a universal or Cardan joint structure which in turn is supported upon upright posts or standards 2. The Cardan joint structure comprises an inner member 2^a pivotally supported by means of trunnions 3, only one of which is shown in dotted lines in Fig. 1, which are mounted in bearings

upon the member 4 which is pivotally supported by means of trunnions 5 mounted in bearings at the upper ends of the posts or standards 2. The axes of the trunnions 3 extend at right angles to the axes of the trunnions 5 as indicated and as is common in such structures.

A pendulum 6 is suspended from an inner member 7 which is pivotally mounted by means of trunnions 8, one only of which is shown in dotted lines in Fig. 1 of the drawings, which are mounted in bearings upon the member 9 which is pivotally supported by means of trunnions 10 mounted in bearings at the lower ends of the posts or standards 2. The axes of the trunnions 8 extend at right angles to the axes of the trunnions 10 as illustrated.

Transmission or transference of the movements of the pendulum 6 to the lens apparatus 1 is effected through the connections or transmission means each of which comprises two rods 11 or 11^a. The connection may be executed between the members 2^a and 7 only, in which case three rods or wires, located at a triangular relation to each other, are employed. In any case the joints 11^b preferably consist of Cardan joints.

Referring now to the construction as illustrated in Figs. 1 and 2, it will be noted that the rods or wires 11 of the respective connections are connected together by means of yielding connections indicated as a whole at 12. The transmission or transfer connections comprising the rods 11 and the connections between the inner ends of the latter are interposed between the members 2^a and 7 and are connected thereto as illustrated in Fig. 1 of the drawings, while the transmission or transfer connections including the rods 11^a and the means for connecting the inner ends thereof are connected at their opposite ends to the members 4 and 9. The respective connections are identical in construction; hence a description of one will suffice for all.

Except for the construction of the means for connecting the inner ends of the rods 11 and 11^a of the respective transmission connections, the construction as illustrated in Fig. 1 is already known and constitutes no part of our invention.

One form of embodiment of our invention is illustrated in detail in Fig. 2, in which the upper end of the lower rod 11 is connected at 13 to a cap 14 which is provided with an internally screw threaded annular portion 15 which is located between the lower ends of the tubes 16 and 17 the latter of which is located interiorly and concentrically of the former. The annular flange portion 15 is connected to both of the said tubes, its connection to the interior tube 17 being a screw threaded connection as shown. The tubes 16 and 17 are spaced from each other so as to

form an annular chamber 18. The interior of the tube 17 at its lower end is in communication with the annular chamber 18 through a plurality of openings 19. The upper end of said tube 17, which terminates a substantial distance below the upper end of the tube 16, is provided with a block or head 20 which fits closely within the tube 16 and is provided with longitudinally extending passageways 21 at intervals in the periphery thereof whereby communication between the annular chamber 18 and the portion of the tube 16 above the block or head 20 is effected. The interior of the upper end of the tube 17 is in communication with one or more of the passageways 21 through one or more smaller restricted passageways 22, the transverse areas of which may be varied. It will be seen, therefore, that the interior of the upper end portion of the interior tube 17 is in communication through the passageways 21 and 22 with the portion of the tube 16 above the block or head 20 and also with the annular chamber 18.

The lower end portion of the upper of the rods 11 of each transmission connection which includes the said rods 11 is provided with a reduced portion 25 which extends through the block or head 20 into the tube 17 and is provided upon its inner lower end with a head 26 constituting a piston which closely fits the interior of the said tube 17. For the purpose of rendering the joint between the reduced lower end portion 25 and the block or head 20 watertight we have provided packing rings as indicated at 27. Also for the purpose of rendering the joint between the piston head 26 and the tube 17 water-tight we have provided a packing ring 28. Instead of packing rings 27, 28 any other tightening means, such as labyrinth packings or the like may be used.

An axial opening 30 is provided through the head or piston 26 the inner end of which terminates in the lower end portion of the reduced part 25 at a point a short distance above the upper side of the piston head 26. Openings 31 are provided by means of which the said opening 30 is placed in communication with the interior of the tube 17 above the head 26 and below the block or head 20. The lower end of the opening 30 is provided with a detachable plug 32 having an axial opening 33 extending therethrough the upper inner end of which is provided with a valviseat 34 within which is adapted to be seated a ball valve 35 which normally is held upon its seat by a coiled spring 36 located in the said opening above the said valve. The lower end of the said spring is seated against or upon the valve 35 while the upper end thereof is seated against the inner end of the opening 30. The tendency of the said spring to expand normally holds or tends to hold the valve 35 in closed position.

The tubes 16 and 17 are provided with a

liquid 38 of suitable character, the top of said liquid being located a distance above the block or head 20 which occupies a fixed position in the tube 16. The said liquid preferably is of a viscous character.

A coiled spring 40 is located within the tube 17 with one end seated against the upper side of the piston 26 and with the other end against the inner side of the block or head 20. Motion or movement is transmitted from one of the rods 11 or 11^a of the respective connections to the other rod of the said connections through the said spring 40.

If the pendulum 6 should swing as a result of movements of the steamship, boat, float, buoy or the like, on which it is suspended such movements will be transmitted to certain of the transmission connections depending upon the direction of movement of the said pendulum. Assuming that the connection illustrated in Fig. 2 is affected, it will be apparent that movement of the head or piston 26 in one direction or the other with respect to the tube 17 will be caused. If the movement of the head or piston 26 be upward with respect to the tube 17 it will be apparent that such movement will be resisted not only by the spring 40 but also will be controlled or partially controlled by the speed of discharge or rate of flow of the liquid from the tube 17 through the passageway or passageways 22 into the passageway or passageways 21. The rate of flow of the liquid through these passageways may be controlled not only by the transverse area of the passageway 22 but also by the character of the liquid as to its viscosity. A more viscous liquid will flow through openings of the same transverse area with less rapidity than will one of greater fluidity or mobility. On the other hand, assume that the relative movements of the rods 11 or 11^a of a connection are such as to effect downward movement of the head or piston 26 in the tube 17. In that event the valve 35 will be lifted from its seat, in consequence of which there would be a flow of liquid through the passageway or passageways 31.

It will be understood that in operation the pendulum 6 would oscillate in case there were movements such as to cause oscillation thereof, and that as a result of such oscillation the relative movements of the rods 11 or 11^a of the respective connections would be such as to cause the piston or head 26 to move back and forth in the tube 17 to effect a pumping action upon the liquid within the tubes 16 and 17, the flow thereof through the passageways 22 being retarded for the reasons above indicated. It will be apparent, therefore, that the movements of the pendulum will be retarded and that therefore it will more quickly come to rest and that in consequence the lens apparatus will be retained under greater control and in a more nearly upright or vertical position.

In Fig. 3 of the drawings we have shown a construction in which the parts 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 28, 30, 31, 32, 33, 34, 35 and 36 are substantially identical with the parts correspondingly numbered in Fig. 2 of the drawings. A coiled spring 44 is located within the tube 17 which spring is coiled around the connecting rod to be hereinafter described which is connected with the piston 26. The purpose of the spring 44 is to prevent the piston 26 and the block or head 20 from striking against each other during the operation of the apparatus.

The upper of each of the rods 11 (or 11^a as the case may be) is provided at its lower end with a head 45 the upper surface of which is spherical as indicated at 46 and constitutes a supporting bearing for a cap-like member 47 having a central opening the inner lower annular surface of which is spherical, as indicated at 48. The rod 50 has screw threaded connection at its upper end to the head 45 and at its lower end is connected by a universal ball joint connection, as indicated at 51, to the upper end of a connecting rod or extension 52 the lower end of which is provided with the piston 26. The upper end of the tube 16 is provided with a detachable tubular member or section 53 the upper end of which is spaced from the lower end or edge of the cap-like member 47. The two members 47 and 53 are connected by means of a coiled spring 54 the upper end of which is coiled about the lower portion of the member 47, while the lower end thereof is coiled about the upper end portion of the member 53.

In Fig. 4 we have shown a further modification of the structure embodying our invention, in which the structure shown is similar to that illustrated in Fig. 3, the difference being that in Fig. 4 the connection at 13 is provided with a spherical portion 60 which constitutes a bearing for the spherical inner surface of the annular member 61 to which a tubular section 62 has screw threaded connection as illustrated. The cap-like member 47 and the tubular section 62 are connected by means of a coiled spring 63 the tendency of which is to draw the two parts 62 and 47 and the parts associated therewith toward each other.

The function and operation of the connections as shown in Figs. 3 and 4 are substantially the same as the function and operation of the connections shown in Fig. 2, hence we shall not repeat with respect to the constructions shown in these Figs. 3 and 4 what we have already said with respect to the construction shown in Fig. 2.

It will be seen that by our invention we have provided the transmission connections between the pendulum and the lens apparatus of a pendulum lens apparatus with means whereby the oscillatory movements of the pendulum may be retarded and controlled, the effect being to produce a like action upon the lens ap-

paratus which is connected by the said connections to the pendulum.

Each of the connections interposed between the pendulum and the lens structure comprises means including a dash pot device for retarding the relative movements between the pendulum and the lens apparatus.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. In a pendulum lens apparatus, the combination of a pendulum, a lens support, a connection between the said pendulum and the said support, which connection comprises means whereby the movements of the pendulum are retarded.

2. A pendulum lens apparatus, comprising a connection between a pendulum and a lens apparatus, which connection comprises yielding means tending to effect retardation of the movements of the said pendulum.

3. A pendulum lens apparatus, comprising a pendulum and a lens, and a connection between the said pendulum and lens whereby the oscillatory movements of the former are adapted to be transmitted to the latter, said connection comprising members movable toward and from each other, and yielding means between said members for transferring movement from one to the other thereof.

4. A pendulum lens apparatus in which a connection between the pendulum and the lens apparatus for transmitting the movements of the former to the latter comprises members, movable toward and from each other, yielding means whereby movements of the said members are transmitted from one to the other, and means operating to retard the movements of said members toward or from each other whereby retardation of the movements of the pendulum is effected.

5. A pendulum lens apparatus in which a connection between the pendulum and lens apparatus for transmitting movement of the former to the latter comprises a plurality of members telescopically connected, which members are relatively movable toward and from each other, and means for retarding the relative movements of said members.

6. A pendulum lens apparatus in which a connection between the pendulum and the lens apparatus for transmitting movements of the former to the latter comprises a plurality of rods, yielding means for transmitting movements of one of said members to the other, and means for retarding the relative movements of said members.

7. A pendulum lens apparatus in which a connection between the pendulum and the lens apparatus for transmitting the movements of the former to the latter comprises a plurality of rods, the inner end of one of which is connected to the closed lower ends of two concentric tubes, the diameter of one of which is substantially less than that of the

other to provide an intermediate annular space, the opposite end of the inner of said tubes being provided with a head which fits closely within the exterior tube, which head has one or more passageways to effect communication between the upper end portion of the exterior tube and with the said annular space, and the inner end of the other of said rods extending through said head into the inner tube and terminating in a piston which is movable therein, said piston being provided with a valve controlled opening for effecting communication between the portions of the said inner tube upon opposite sides of the said piston and the said inner tube having openings in its upper end which communicate with the first named openings.

8. A pendulum lens apparatus, comprising a connection between the pendulum and the lens apparatus, which connection comprises a couple of rods, the lower end of one of which is operatively connected to the pendulum and the upper end of the other one of which is operatively connected to the lens apparatus, a couple of concentric tubes the exterior diameter of the inner tube being substantially less than the internal diameter of the exterior tube, and the lower ends of the said tubes being closed, and the upper end of the lower of said rods being connected to the said closed ends, and the inner tube being of a length less than that of the exterior tube and provided at its upper end with a head which fits closely within the exterior tube, said head having one or more channels extending therethrough and providing communication between the space between the inner and exterior tubes and the portion of the exterior tube above the said head, and the upper end of the interior tube being provided with lateral openings which are in communication with the first named openings through the said head, and the lower end of the other of said rods extending through said head into the tube and terminating in a piston head which is provided with a valve controlled opening therethrough by means of which communication may be effected between the portions of the inner tube upon opposite sides of the said piston head, yielding means interposed between the said piston head and the said interior tube for transmitting the longitudinal movements of the said rods to each other, and means within said tubes for resisting and retarding the relative movements of the said rods.

9. A pendulum lens apparatus in which a connection between the pendulum and the lens apparatus for transmitting the movements of the former to the latter comprises a couple of rods arranged in succession, the lower end of the lower rod having operative connection with the said pendulum, and the upper end of the upper rod having operative connection with the said lens apparatus, tubular members interposed between the said

rods, and means within said tubular members for regulating and controlling the relative movements of said rods axially with respect to each other.

5 10. A pendulum lens apparatus in which a connection between the pendulum and the lens apparatus for transmitting the movements of the former to the latter comprises a plurality of rods, and yielding means for connecting
10 the opposing upper and lower ends of said rods and adapted to transmit the movements of one to the other.

11. In a pendulum lens apparatus, the combination of a pendulum, a lens support, a
15 connection between the said pendulum and the said support, which connection comprises a dash pot whereby relative movements between the pendulum and the said lens apparatus are retarded.

20 12. In a pendulum lens apparatus, the com-

bination of a pendulum, a pivoted support for the pendulum, a lens, a pivoted support for the said lens, connections between the said supports, and means included in each of said connections to retard the movements of the said pendulum. 25

13. In a pendulum lens apparatus, the combination of a pendulum, a Cardan joint for supporting said pendulum, a lens, a Cardan joint for supporting said lens, and a plurality
30 of connections between the said Cardan joints, each of said connections including yielding means whereby movements of the said pendulum are retarded.

In testimony that we claim the foregoing as
our invention we have hereunto signed our
names this 19th day of October, A. D. 1927. 35

SVEN AUGUST ESKILSON.
HUGO ABRAMSON.