

March 24, 1936.

F. L. RAGER

2,035,009

SHOCK ABSORBING DEVICE

Filed Feb. 28, 1935

3 Sheets-Sheet 1

FIG. 1.

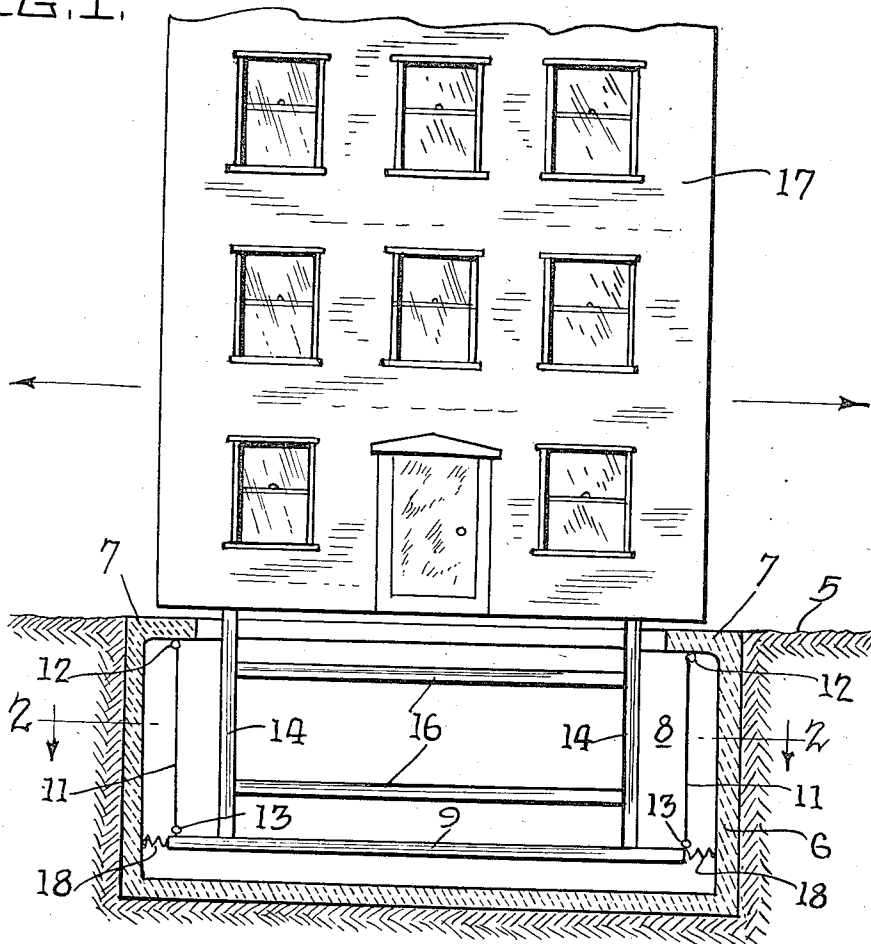
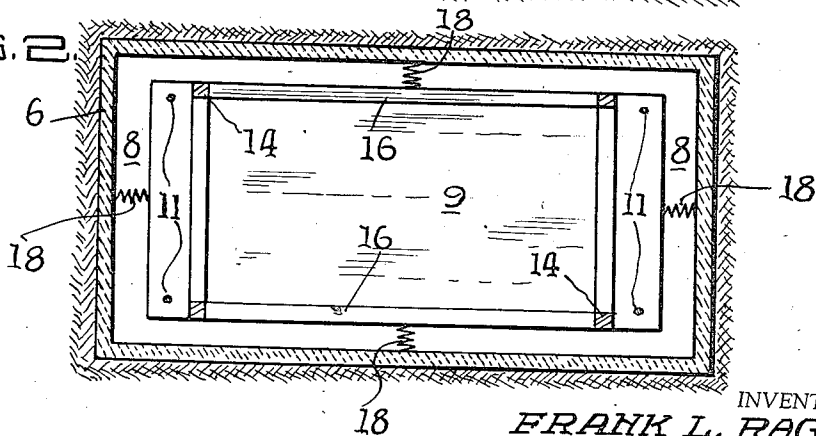


FIG. 2



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FIG. 3.

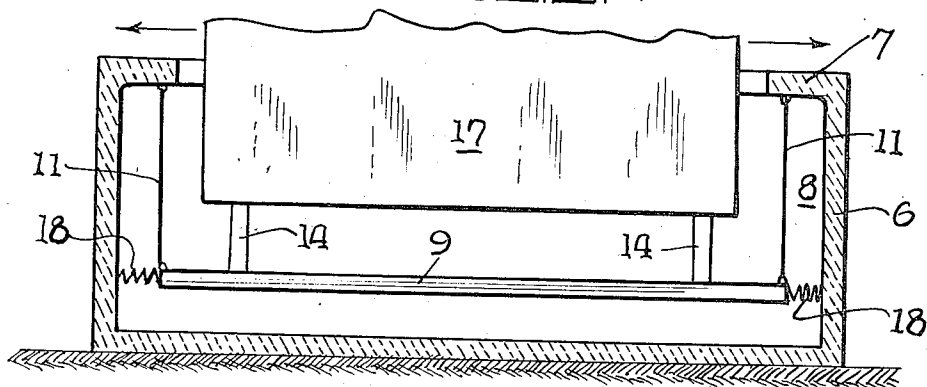


FIG. 4.

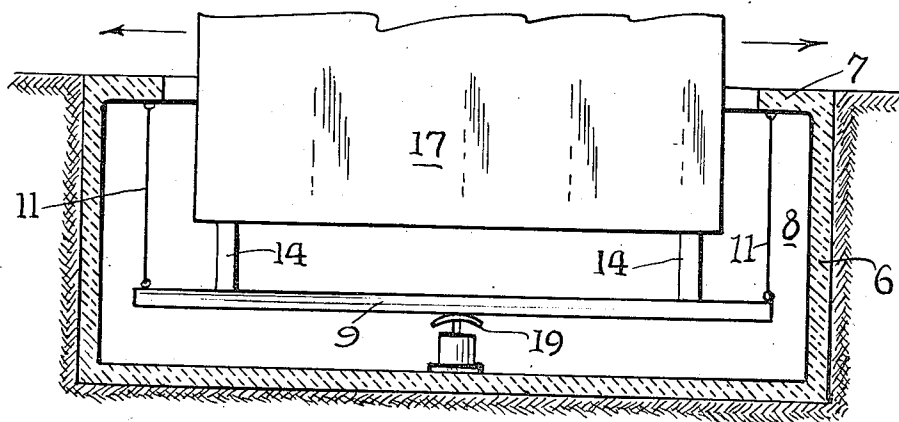
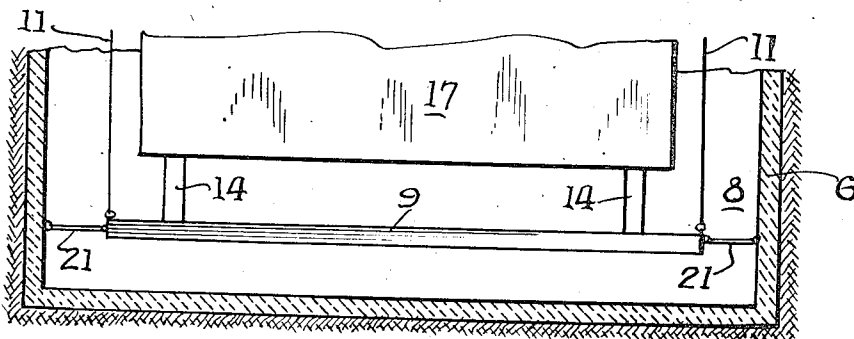


FIG. 5.

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FIG. 6.

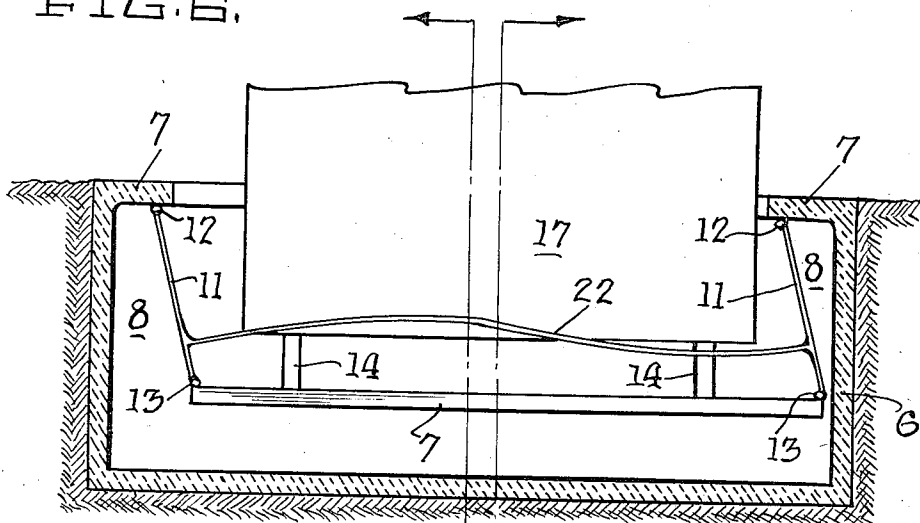
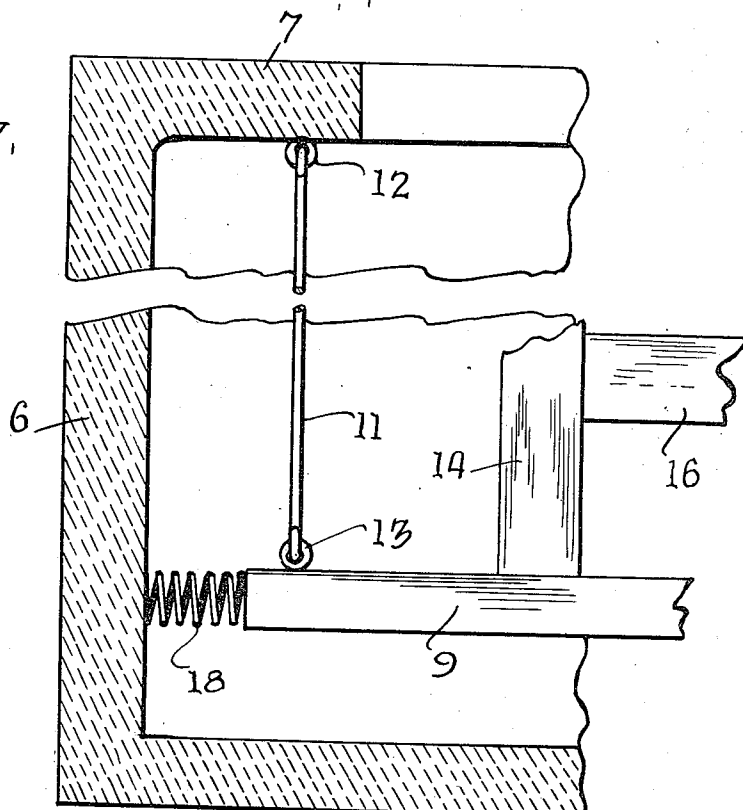


FIG. 7.



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SHOCK ABSORBING DEVICE

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Application February 28, 1935, Serial No. 8,726

8 Claims. (Cl. 72-77)

This invention relates to improvements in shock absorbing devices.

The principal object of the invention is to produce a supporting means for buildings, show-cases, book-racks, shelving and the like, which will be unaffected by earth movements.

A further object is to provide means whereby the support possesses a stability which will offset forces applied to the upper part of the structure, such as wind in the case of a building, or the leaning against in the case of a show case.

A further object is to produce a device of this character which may be employed with the ordinary building, irrespective of its size, without altering the structure or architecture of the building.

A still further object is to produce a device of this character which is simple and therefore one wherein the parts are not subject to derangement.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a side elevation of a building having my invention applied thereto, the supporting structure at a point beneath the ground being partly in cross section,

Fig. 2 is a cross sectional view taken on the line 2-2 of Fig. 1,

Fig. 3 is a modified form of my device showing the load broken away and the supporting structure above ground,

Fig. 4 is a view similar to Fig. 3, showing the supporting structure below ground and showing one form of stabilizer,

Fig. 5 is a view similar to Fig. 4, showing a different form of stabilizer,

Fig. 6 is a view similar to Fig. 5, showing a torsion stabilizer and the building moved as would occur during an earth shock, the movement, of course, being greatly exaggerated, and

Fig. 7 is an enlarged fragmentary view of one of the supporting links.

While my invention is equally applicable to any form of load, I have preferred to show the same as employed in connection with a building, and, therefore, throughout the specification I will refer only to a building, it being understood that the building merely represents a load which might be of any nature.

During an earthquake, the collapse of a building is caused by the fact that the earth momen-

tarly moves with relation to the weight of the building. This movement may be for example, from east to west. Therefore, as the earth moves towards the west, the weight of the building will all be thrown on the east wall, which if not sufficiently strong, is liable to collapse. There are many factors which enter into the collapse of the building, such as the period of vibration and the amplitude of the vibration. It is my object to provide means for absorbing this earth movement so that the same will not be transmitted to the supported structure. I, therefore, support my load (building in this case) upon a cradle, which cradle is suspended from a suitable support. It is obvious that such a structure would sway in the wind and therefore I provide equalizers to offset any forces tending to move the building from a point above the support.

In the accompanying drawings wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 5 designates the earth surface in which is positioned any convenient form of support 6. The support and structure may take the form of a cellar, the only essential being that an overhanging portion or anchorages 7 are provided with recesses or clearances 8 which are requisite to the perfect operation of my device. Mounted within the cellar is a cradle 9 suspended by hangers 11. The upper ends of the hangers are shown at 12 and the lower ends at 13. The construction of the hangers is best shown in Fig. 7, and it will be noted that a universal action is provided at both the top and the bottom of the hangers. Mounted upon the cradle 9 are supporting pillars 14. There are cross braces shown at 16, so that a building or load 17 may be carried thereby.

In Figs. 1, 2, 3, and 7, I have shown spring equalizers 18. The purpose of these equalizers is as follows: When the load is under a static condition, as indicated in these figures, the springs 18 are sufficient to prevent an ordinary external force, such as wind, to move the building, or load, relative to the supporting foundation. However, when a severe shock takes place, such as in an earthquake due to the inertia of the building, the springs 18 will expand or contract, as the case may be, thus allowing the earth to move without moving the building. Consequently the earth will return to its quiescent condition before vibration can be set up in the building.

In Fig. 4 I have illustrated a similar equalizing device, which consists of a hydraulically actuated shoe 19, which presses against the under surface of the cradle 9. The frictional engagement is

sufficient to hold the cradle against external forces, but will not cause the cradle to move relative to the earth when an earth shock occurs.

In the form shown in Fig. 5, I have substituted straps 21, which straps will function as follows: When the earth shock occurs, and assuming the shock was in the direction of the left of the drawing, then the strap at the left of the drawing would break, while the one at the right of the drawing will buckle. In this case, the building would remain stationary and the foundation would move towards the left.

In the form shown in Fig. 6, a torsion rod is securely anchored to the hangers 11, therefore, as the hangers tend to move out of vertical alignment, a twist is thrown in to the torsion rod 22, which torsion rod acts to equalize external forces in the same manner as the springs 18.

Means shown at stabilizers or equalizers are mechanical and hydraulic but means electrically controlled can be also satisfactorily installed or any combination of the three.

It might be mentioned that earth shocks are lateral to the perpendicular. It is to be, therefore, noted that the upper ends of the hangers will be free to move with the earth shocks, while the lower ends of said hangers (being at the center of motion) remain stationary. Thus said hangers absorb the earth shocks and prevent such shocks from being transmitted to the load carried by the cradle. It is obvious that the hangers remain substantially in alignment with the perpendicular, during an earth shock.

It may be necessary in some types of construction to combine the two foundations shown in Figs. 1 and 3, yet these foundations would not be connected, take for example a large building on a sloping hillside each elevation would require a separate foundation, yet the cradle would be interconnected. Another example is the pilings under a pier, each piling could be considered a separate foundation yet the decking of the pier (the cradle) would be interconnected.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes relative to the material, size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:—

1. A shock absorbing device including a foundation having walls provided with recesses, a cradle depending in said foundation and carrying a structure, anchors carried by the foundation, hangers secured to said anchors and to said cradle, said hangers lying wholly within the recesses of said foundation.

2. A shock absorbing device including a foundation having vertically arranged recessed walls, a cradle depending in said foundation and carrying a load thereon, anchors carried by the foundation, hangers interposed between said anchors and said cradle, the upper end of said hangers being secured to said anchors, the lower end to

said cradle, said hangers lying within the recesses of said foundation.

3. A shock absorbing device including a foundation having vertically arranged recesses in the walls thereof, a load supporting cradle depending from said foundation, anchors carried by the foundation, hangers secured at their upper ends to said anchors, and at their lower ends to said cradle, said hangers being universally connected, whereby movement of said cradle with relation to said foundation may take place in any direction, and shock absorbing means interposed between said anchors and said cradle.

4. A shock absorbing device including foundations having vertically arranged recesses in the walls thereof, a load supporting cradle depending from said foundations, anchors carried by the foundations, hangers secured at their upper ends to said anchors and at their lower ends to said cradle, said hangers being universally connected, whereby movement of said cradle with relation to said foundations may take place in any direction, and shock absorbing means interposed between said anchors and said cradle.

5. A shock absorbing device including foundations having vertically arranged clearances within the sides thereof, a load supporting cradle depending from said foundations, anchors carried by the foundations, hangers secured at their ends to said anchors and at their lower ends to said cradle, said hangers being universally connected, whereby movement of said cradle with relation to said foundations may take place in any direction, and shock absorbing means interposed between said anchors and said cradle.

6. A shock absorbing device including a foundation having vertically arranged walls provided with a recess, a cradle depending in said foundation and carrying a structure, hangers secured to said foundation and to said cradle, said hangers lying wholly within the recess of said foundation, and stabilizing means interposed between said foundation and said cradle and in substantially horizontal alignment therewith.

7. A shock absorbing device including a foundation having a recess, a cradle depending into the recess of said foundation and adapted to carry a load, pivotal means between the cradle and the foundation, and springs bearing against the foundation and said cradle to resist movement of the cradle due to external forces acting on the load and adapted to yield and permit relative movement of the foundation and cradle when said foundation is acted upon by forces due to an earthquake.

8. A shock absorbing device including a foundation having a recess, a cradle depending into the recess of said foundation and adapted to carry a load, pivotal means between the cradle and foundation, and shock absorbing means connected to said cradle and foundation to resist movement of the cradle due to external forces acting on the load and adapted to yield and permit relative movement of the foundation and cradle when said foundation is acted upon by forces due to an earthquake.

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