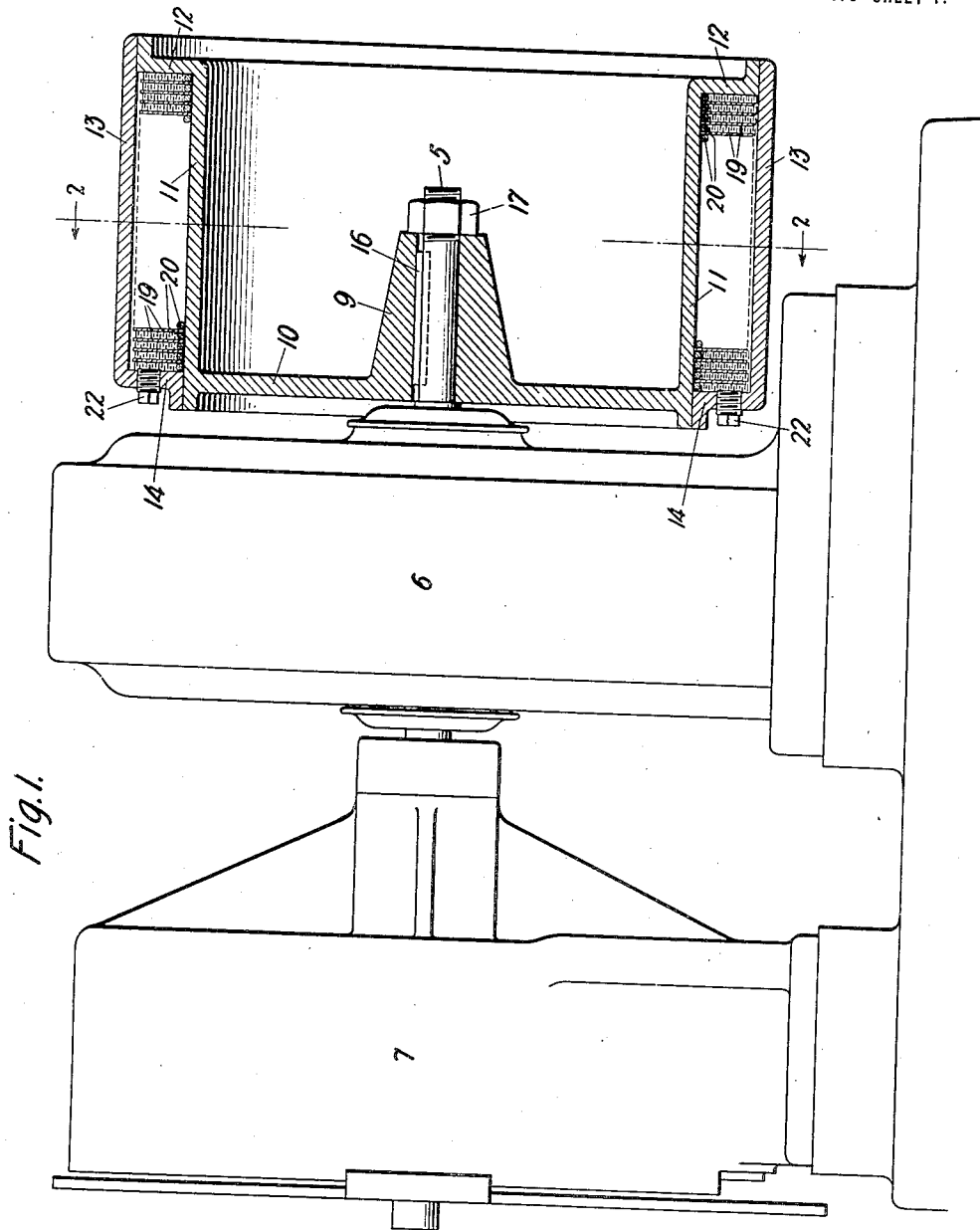


H. W. NICHOLS.
 FLUCTUATION DAMPING MEANS FOR ROTATABLE MEMBERS.
 APPLICATION FILED MAR. 22, 1915.

1,230,205.

Patented June 19, 1917.

2 SHEETS—SHEET 1.



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Fig. 4.

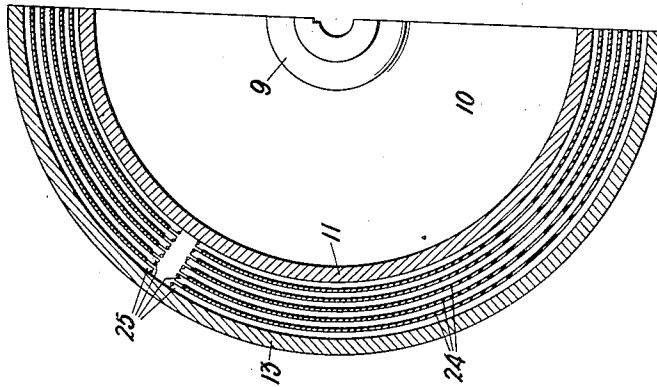


Fig. 3.

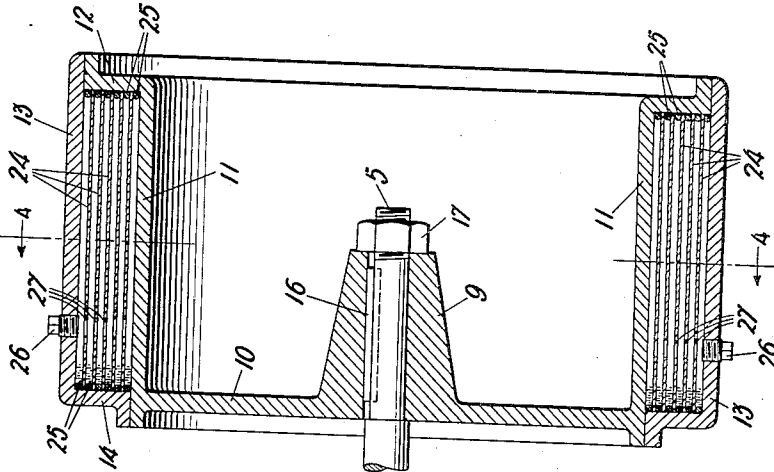
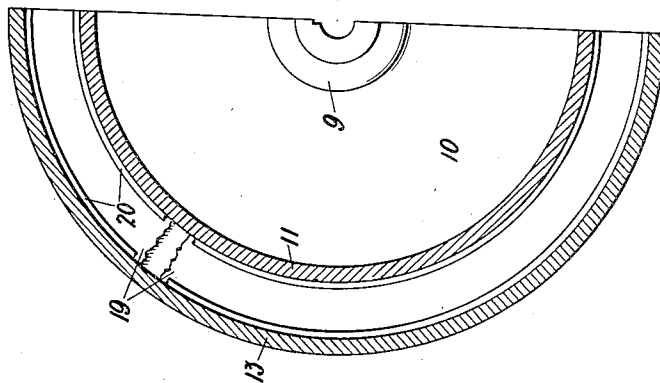


Fig. 2.



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UNITED STATES PATENT OFFICE.

HAROLD WILLIAM NICHOLS, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTERN ELECTRIC COMPANY, INCORPORATED, A CORPORATION OF NEW YORK.

FLUCTUATION-DAMPING MEANS FOR ROTATABLE MEMBERS.

1,230,205.

Specification of Letters Patent.

Patented June 19, 1917.

Application filed March 22, 1915. Serial No. 16,000.

To all whom it may concern:

Be it known that I, HAROLD W. NICHOLS, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Fluctuation-Damping Means for Rotatable Members, of which the following is a full, clear, concise, and exact description.

10 This invention relates to means for damping out fluctuations in the speed of a rotating member.

Fly-wheels containing liquids have been used for this purpose, and the general object of the invention is to render a fly-wheel of this type more efficient as a means for damping out fluctuations in speed and at the same time provide an easily assembled structure.

20 To this end, the present invention in a broad aspect consists in providing in a unitary fly-wheel chamber containing a liquid very large surfaces with which the liquid can frictionally engage and yet by which it will not be positively impeded in its direction of flow as the fluctuations in the speed of the fly-wheel take place. According to the present invention these large frictional surfaces between the liquid and the fly-wheel structure are obtained by providing in the liquid chamber sectional walls arranged substantially parallel to the path of movement of the chamber. These sectional walls may form planes or partitions in the liquid chamber perpendicular to the axis of the fly-wheel or they may be arranged concentrically and coaxial with the fly-wheel. In neither case do they form completely separated compartments as each partition or wall is provided with one or more openings through which the fluid in the chamber may pass from one compartment to another. In the preferred form of the invention hereinafter described the sectional walls in the liquid chamber are radial or perpendicular to the fly-wheel axis.

50 A very advantageous feature of this invention is the ease with which the entire structure can be assembled and the fluid chamber filled. By providing openings in each wall or partition so that the fluid in the chamber may flow from one compartment to another, the necessity of filling each compartment individually is eliminated.

In the improved structure herein disclosed the container is in reality a unitary chamber and all of its sections may be filled in one operation.

The invention is particularly useful in connection with printing telegraph apparatus although it is not limited to that particular field.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, in which Figure 1 is a side elevation, partly in section, showing a fly-wheel having the invention embodied therein mounted on a shaft with certain devices used in connection with printing telegraph systems; Fig. 2 is a fragmentary sectional elevation on the line 2—2 of Fig. 1; Fig. 3 is a sectional elevation showing a modified form of fly-wheel embodying the invention; and Fig. 4 is a fragmentary sectional elevation on the line 4—4 of Fig. 3.

Referring to Fig. 1, the preferred form of the invention is shown as applied to the shaft 5 of a synchronous motor 6 which drives a brush distributor 7 of a kind well known in the printing telegraph art. It is to be understood, however, that the present invention is not limited to use in connection with printing telegraph apparatus.

In Figs. 1 and 2 the fly-wheel embodying the preferred form of the invention is shown as comprising a hub portion 9, a web portion 10 and a hollow rim portion, the form of all of these parts being obvious from the drawings. As shown, the inner wall 11 and one of the end walls 12 of the hollow rim portion are made integral with the hub and the spoke portions of the wheel; and the outer wall 13 and the other end wall 14 of said hollow rim portion are formed by a casing which may be shrunk upon or otherwise suitably secured to the portions 11 and 12. The hub 9 may be secured to the shaft 5 in any suitable manner as by a key 16 and a nut 17.

100 Within the chamber formed by the hollow rim portion of the fly-wheel are sectional walls which, in the embodiment of the invention shown in Figs. 1 and 2, are radial and consist of a plurality of flat rings 19 which are held apart by spacing rings 20. The chamber in which the rings 19 form sectional walls is nearly filled with a liquid

such as mercury which can be introduced through holes which are shown as closed by plugs 22. The rings 19 are either made to fit the chamber rather loosely or have holes in them to allow free passage of the liquid throughout the chamber during the filling operation.

In the form of the invention illustrated in Figs. 3 and 4, the fly-wheel is shown secured to a shaft 5 and as being of the same general form as the fly-wheel shown in Figs. 1 and 2, this being indicated by the use of the same reference characters to refer to the same parts in both embodiments of the invention which are illustrated. In the fly-wheel shown in Figs. 3 and 4, however, the sectional walls in the chamber formed by the hollow rim portion, instead of being radial are concentric with the axis of the wheel. As shown, said walls consist of hollow cylinders 24 which are concentrically arranged and are held apart by spacing rings 25 arranged at each end of the chamber. A liquid, such as mercury, may be introduced into the chamber through openings in the shell 13, closed by plugs 26. The partitions 24 are either made to fit the chamber loosely or are provided with perforations 27 which permit the chamber to be readily filled by the liquid.

It is evident that, in either the fly-wheel shown in Figs. 1 and 2 or the fly-wheel shown in Figs. 3 and 4, the sectional walls in the chamber formed by the hollow rim are substantially parallel to the path of movement of said chamber, that they present a large surface with which the liquid can engage and that they do not divide the chamber into completely separated sections. The result of this arrangement is that the area of frictional contact between the liquid and the body of the fly-wheel is made very large without, however, positively impeding the mercury in the direction in which it tends to flow as fluctuations in the speed of the fly-wheel take place and that, in assembling, the various sections may be readily filled with the damping fluid. It has been found that this form of fly-wheel is highly efficient as a means for damping out fluctuations in the speed of a shaft to which it is applied. Generally speaking, it is advantageous to make the ratio of the moment of inertia of the mercury to the moment of inertia of the body of the fly-wheel and the parts rotating with it as large as possible;

and it has been found that a ratio of about four to one is highly satisfactory in connection with the printing telegraph apparatus to which the invention is herein shown as applied. It is, of course, desirable to make the friction between the liquid and the surfaces with which it engages as large as possible. To this end, as many sectional walls as possible should be used, care being taken not to make the space between the walls so small as to cause the liquid to be positively held against movement between them, which would of course impair the efficiency of the fly-wheel as a means for damping out fluctuations. A space of about one-sixteenth of an inch has been found to be satisfactory when mercury is employed. Another factor which affects the efficiency of the fly-wheel as a damping device is the viscosity of the liquid employed. For this reason, an amalgam of mercury and some metal such as cadmium may be used for the purpose of obtaining a greater damping effect than is obtained by the use of pure mercury.

What is claimed is:

1. A fly-wheel having a unitary chamber containing a liquid and sectional walls substantially parallel to the path of movement of said chamber.
2. A fly-wheel having concentric with its axis a unitary chamber containing a liquid and sectional walls arranged substantially parallel to the path of movement of said chamber.
3. A fly-wheel having a hollow rim portion containing a liquid and sectional walls partially dividing said rim portion and arranged substantially parallel to the path of movement thereof.
4. A fly-wheel having concentric with its axis a chamber containing a liquid and annular sectional walls extending radially in said chamber.
5. A fly-wheel having concentric with its axis a chamber containing a liquid, a plurality of flat rings, and means for maintaining said rings separated from one another to form radial sectional walls in said chamber.

In witness whereof, I hereunto subscribe my name this 20th day of March, A. D., 1915.

HAROLD WILLIAM NICHOLS.

Witnesses:

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