W. M. DAVIDSON.

BALANCING DEVICE.

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1,314,575. Patented Sept. 2, 1919.

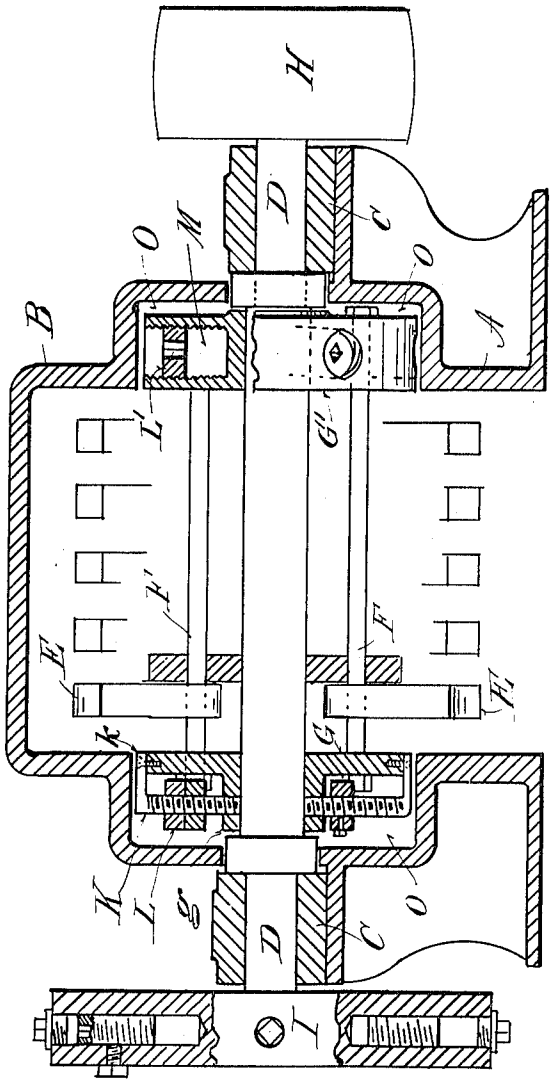


Fig. 1.

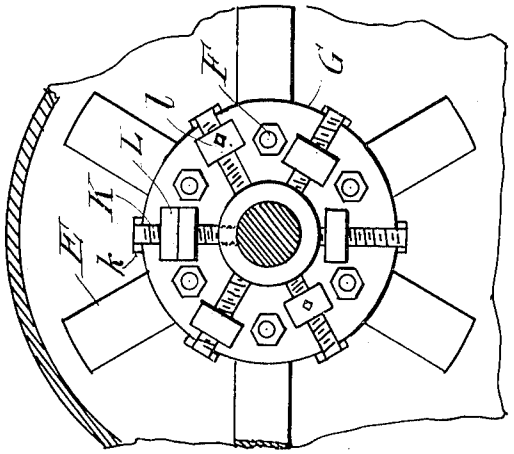


Fig. 2.

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BALANCING DEVICE.

1,314,575. Specification of Letters Patent. Patented Sept. 2, 1919.

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To all whom it may concern:

Be it known that I, WILLIAM M. DAVIDSON, a citizen of the United States, residing in city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Balancing Devices, of which the following is a specification.

This invention relates to certain new and useful improvements in balancing devices, the same being especially adapted to the rotor of a reducing machine such as a grinder or pulverizer of refractory material that requires a high rotary speed of said rotor and consequently as nearly perfect balance of the moving parts as it is practical to obtain.

The object of my invention is to provide means for obtaining the static balance, rotary balance and balance of said rotor with regard to any tendency to turn end for end in its bearings.

In the accompanying drawing on which like reference letters indicate corresponding parts, Figure 1 represents a vertical sectional view of a machine illustrating my invention, said section being taken along the axis of the shaft; and Fig. 2 an end view of balancing means of my design applied to an end disk on said shaft.

The letter A designates a casing for a reducing mill of any convenient and suitable style, provided with a cover B and having bearings C in which are mounted the end journals D of a shaft provided with hammers E mounted on hammer rods F carried by end disks G, or otherwise adapted to support said hammers which are preferably of the pivoted rotary type adapted to oscillate on said hammer rods.

On opposite ends of said shaft are mounted a pulley H and a flywheel I as shown in Fig. 1. In my endeavor to obtain a true rotary balance for the rotor above described, I have carefully balanced each intermediate disk, pivoted hammer and hammer support contained in said rotor, so that when the rotor is assembled the balance of the combined parts is approximately correct. I have found it necessary however, due to inaccurate workmanship and other causes, to provide other balancing means such as herein illustrated. It will be seen from Fig. 2 that the hammer rods F are uniformly spaced circumferentially in said disks G—G′, and it is therefore necessary in providing such balancing means, to locate them intermediately of said rods as shown in Fig. 2.

I am aware that it is old in practice to provide weights that are secured to rotary members, and designed to effect proper balance thereof.

In my construction however, I aim to provide means whereby said weights are readily adjustable radially, so that when the cover is removed from said machine to give access to the rotor, the proper adjustment may be readily made.

The hubs *g* of said end disks are provided with tapped holes in each of which are inserted a bolt K radiating from the center of the shaft and located a suitable distance away from the disk itself to allow of the turning of weights L, preferably cylindrical, and adapted to be fixed on said bolt K either by a set screw *l*, or by providing such weights in duplicate whereby they may be jammed together like jam nuts when properly adjusted on said bolt. The other or outer end of said bolt is preferably provided with a lug *k* that is fastened to the periphery of the disk by a screw. The bolt K is thus firmly supported in a radial position and the movable weight may be readily adjusted radially between the hammer rod nuts or any pair of them, and the said balancing weights may be secured or mounted adjustably between each pair and at different radial distance from the center to effect a proper balancing of the rotor as above described.

While it is desirable to secure a rotary balance, it is also desirable to overcome the tendency of the shaft to turn end for end, due to a difference of balance with regard to the bearings; that is to say, while the rotor may be in proper rotary balance, the rotor as a whole may tend to turn in a horizontal plane, so that if the bearings were flexible the shaft would bend one bearing in one direction and the other bearing in the opposite direction, or "end for end" as commonly stated. I have therefore provided a disk G′ opposite the disk G and similarly provided with balancing weights either of the style described for disk G, or otherwise,—such as by providing a wide disk in which are bored and threaded radial holes M in which are adjustably mounted threaded weights L′ having a square hole in the center, or other-

wise adapted for radial adjustments of the respective weight.

In the preferred form of cover I have provided a safety recess O, which is similarly formed in the body casing A, and in this recess the end disks are mounted so as to make the inner face of each disk flush with the inner face of said cover and casing, as shown in Fig. 1. If for any reason a movable weight or other part should become loose, it would not therefore find its way into the reducing chamber of the cover and body casing between the sides.

This same method of balancing the disk is applicable to the flywheel I. On account of the difference in density of any large casting such as a flywheel, a lack of balance is often found even though the casting may be turned up.

A similar arrangement of pockets such as shown in the disk G′ is preferred for the flywheel, and in such pockets radially adjustable weights, either by threaded engagement or by loosely inserted weights secured in proper adjusted position by set screws, may be employed.

I claim:

1. The combination with a rotor shaft and end disks on said shaft each having a side hub, of a device of the character described comprising radial bolts threaded into the side hub of said disks, each of said bolts having a lug fastened to the periphery of said disk, and movable weights adjustably mounted on said bolts substantially as described.

2. The combination with a rotor having a disk at each end, and a casing provided with a safety recess for each disk, of a balancing device comprising movable weights adjustably mounted on said disk and within said recess, and thereby prevented from entering said casing between the disks, in case of detachment.

3. The combination with a rotor and a casing having suitable bearings for the shaft of said rotor, of end disks mounted on said shaft, and each provided with a balancing device of the character described, comprising movable, adjustable weights coöperating with each other to attain an end for end balance of said shaft and rotor as well as a rotary balance thereof.

In testimony whereof I have affixed my signature.

WILLIAM M. DAVIDSON.