

April 1, 1930.

R. V. L. HARTLEY

1,752,486

MAGNETIC DEVICE

Filed Oct. 30, 1926

Fig. 1

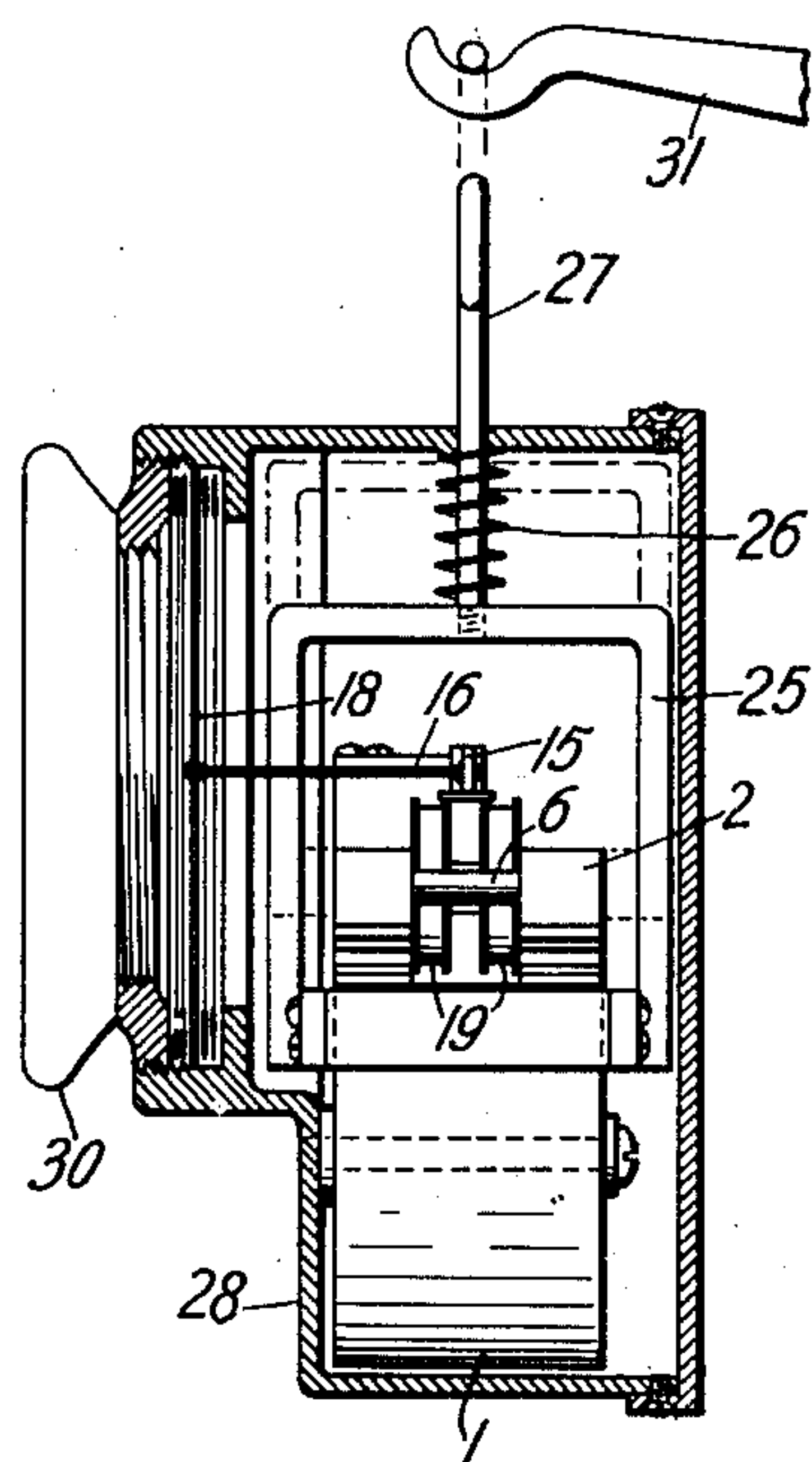


Fig. 2

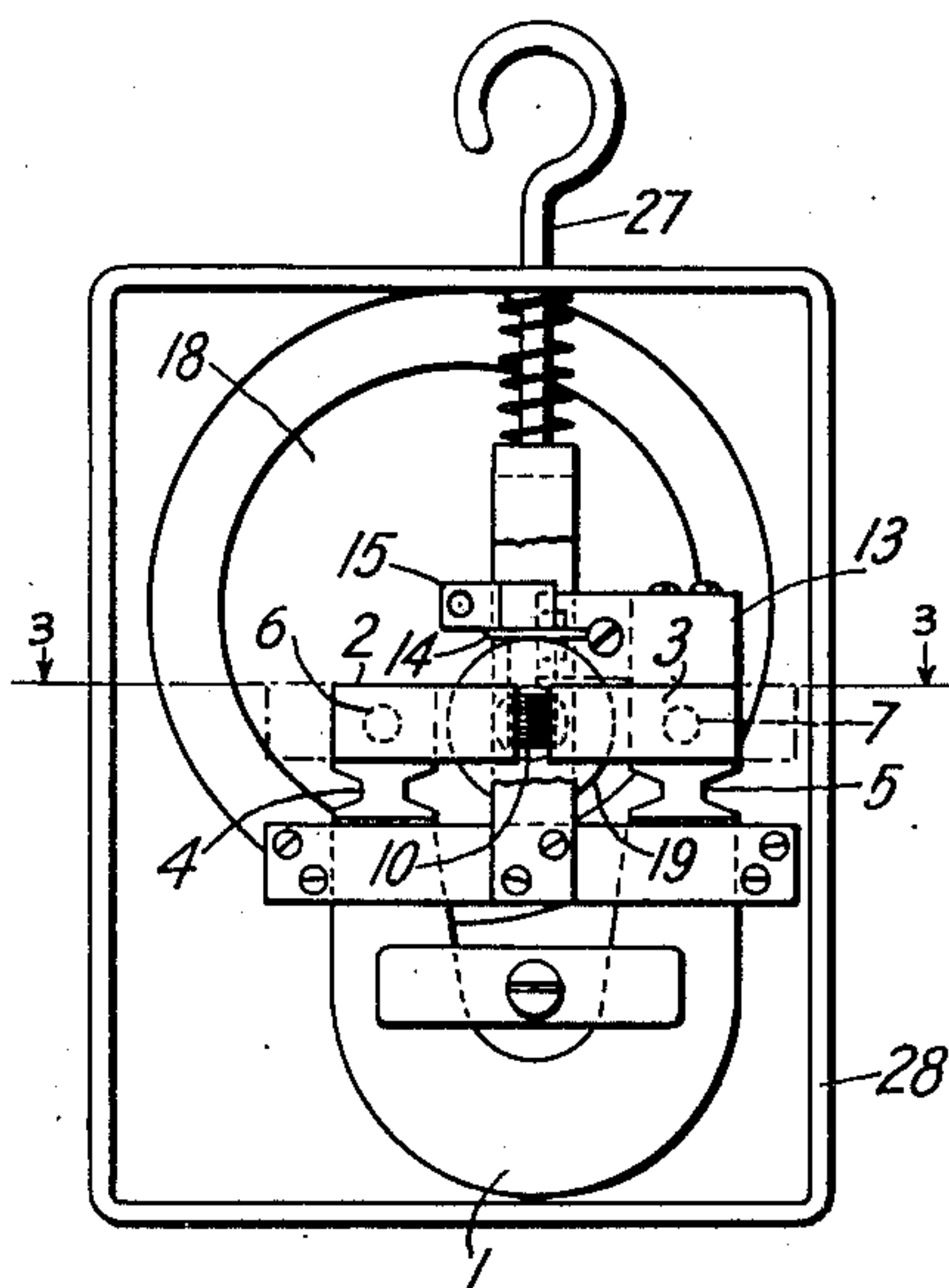


Fig. 3

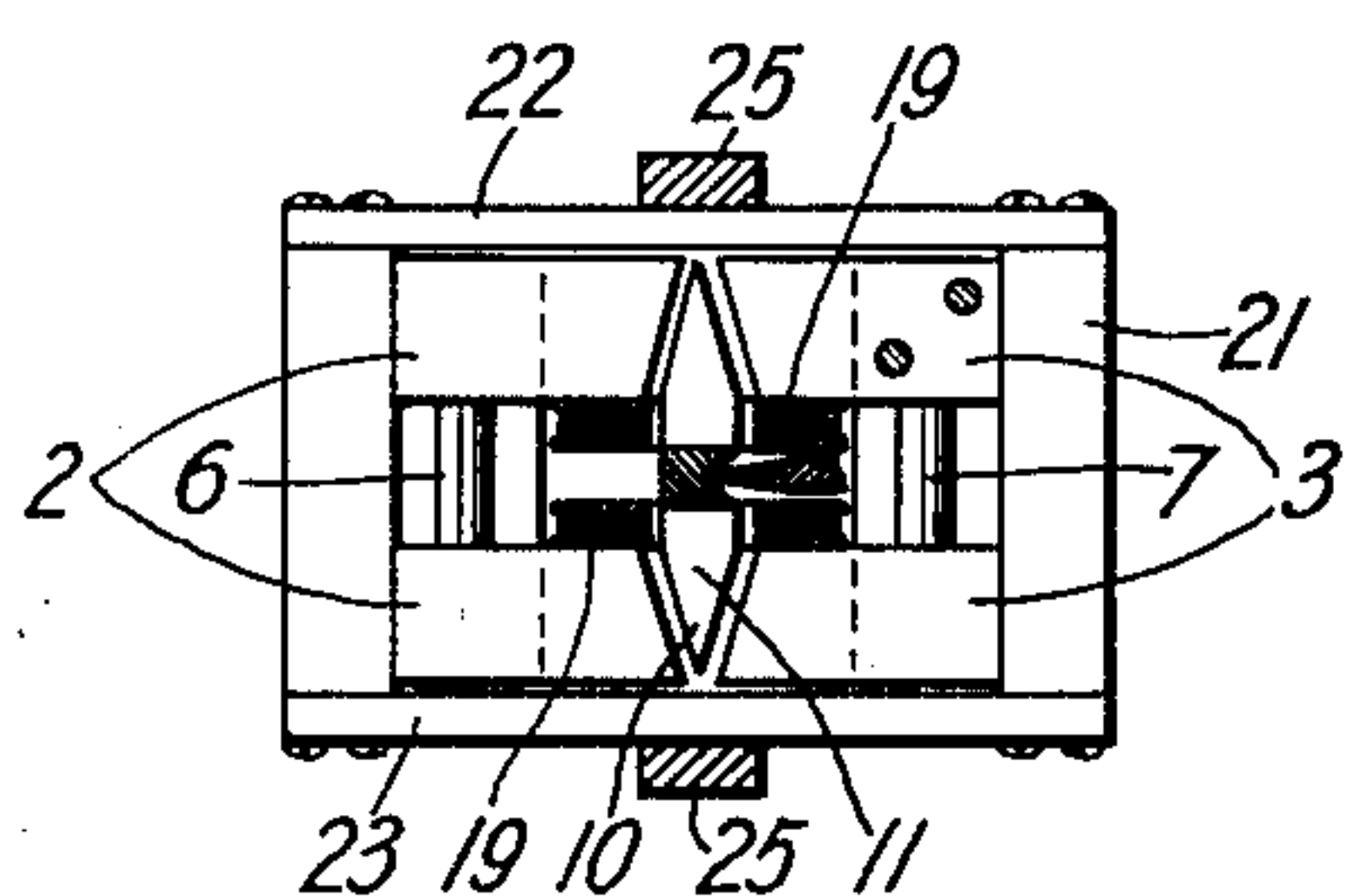
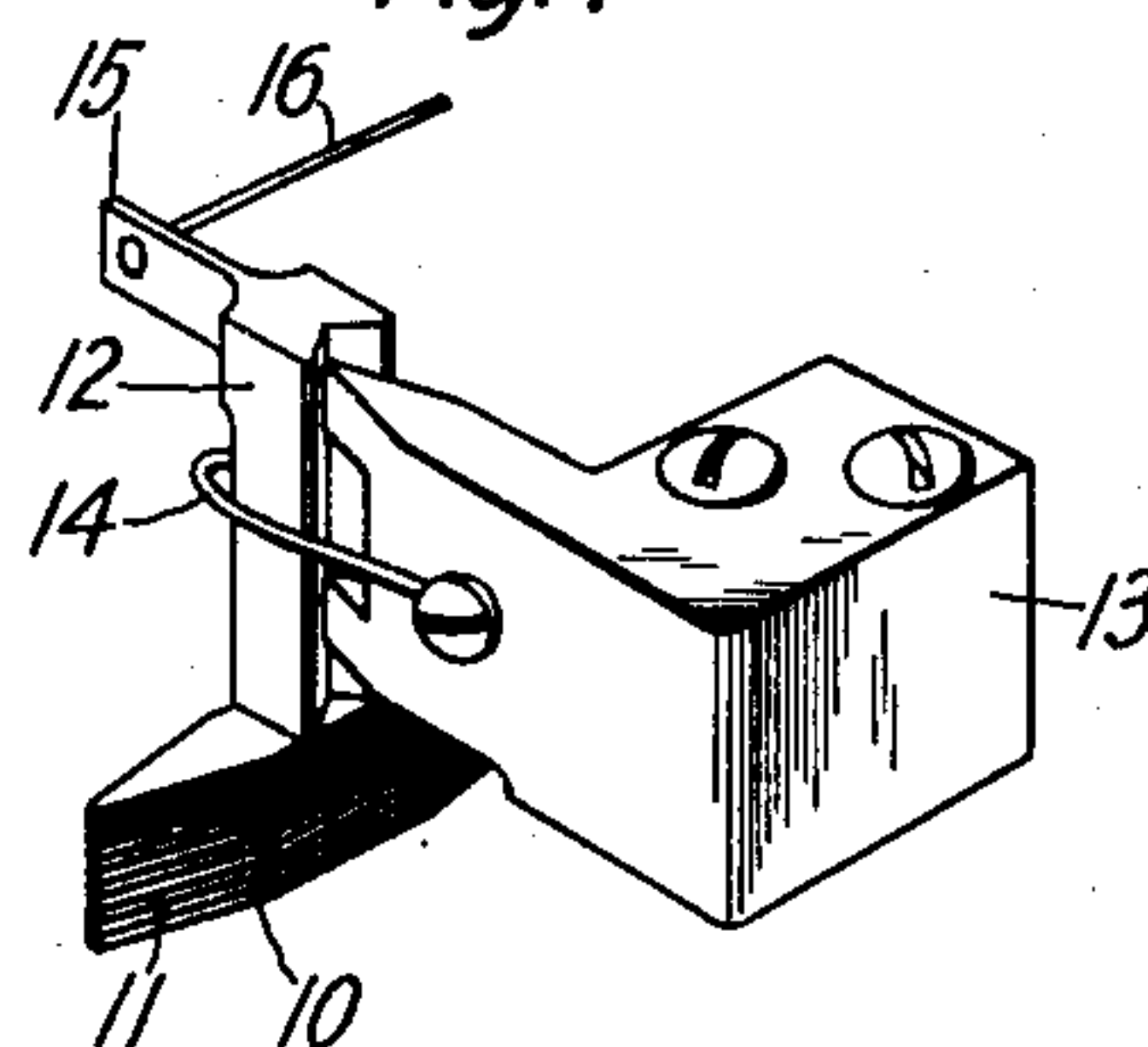


Fig. 4



Inventor:
Ralph V. L. Hartley
by E. V. Briggs
Attorney.

UNITED STATES PATENT OFFICE

RALPH V. L. HARTLEY, OF SOUTH ORANGE, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MAGNETIC DEVICE

Application filed October 30, 1926. Serial No. 145,143.

This invention relates to magnetic devices and more particularly to an arrangement for controlling the response of a signal actuated device such as a telephone receiver.

5 According to this invention there is provided a receiving device in which the path for the variable flux component produced by the variable energizing current is normally restricted by the use in this path of magnetic
10 inserts of "permalloy" or other suitable material to limit the maximum effective flux through the structure. "Permalloy" may be defined as an alloy containing nickel to the extent of 30% or more, balance chiefly iron,
15 and having the characteristic property of high initial permeability. One variety of permalloy adaptable for this use is composed of $78\frac{1}{2}\%$ nickel and $21\frac{1}{2}\%$ iron. In order to overcome this limiting effect, members or
20 bars of magnetic material are employed to provide a substitute short circuiting path for the variable flux component. These members may be moved in or out of the path traversed by the variable flux component and thus cause
25 the sensitivity of this structure to acoustic effects to be changed at will.

A device constructed in accordance with this principle may take the form of an electromagnetic structure of the type disclosed
30 in a patent of Edward L. Norton, No. 1,733,554, granted Oct. 29, 1929, modified in accordance with this invention. In this construction the pole-piece on either side of the armature is split transversely and a section
35 of "permalloy" inserted between the split parts of such proportions as to restrict the variable flux component to a certain maximum. Hence, if this construction is employed, the invention may be practiced by
40 inserting bars of magnetic material in the structure in such a manner that they may be moved across the split parts of the pole-pieces in a position to provide a substitute short circuiting path for the variable flux
45 component or moved into a position away from the pole-pieces not traversed by the variable flux component. Hence, if these bars are moved into the path of the variable flux component it will not be restricted in its
50 effect on the armature as the bars are of

sufficient cross section to permit the free passage of any desired amount of flux commensurate with the general design of the structure, whereas if the bars are moved out of this path, the maximum flux that may become effective in actuating the armature will be restricted by the characteristics of the inserts. This embodiment of the invention is described in detail hereinafter and illustrated in the accompanying drawings.

Fig. 1 is a side elevational view, partly in cross-section, of a telephone receiver containing electromagnetic elements constructed in accordance with this invention. Fig. 2 is a back elevational view of the electromagnetic elements shown in Fig. 1, with the back plate removed. Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2 while Fig. 4 shows the armature of the electromagnetic device and its suspension means.

Referring now to the drawing, the electromagnetic device comprises a permanent U-shaped magnet 1, on the ends of which are mounted metallic pole-pieces 2 and 3 which are separated from direct connection with these ends by means of "permalloy" members 4 and 5. These members are provided to obtain uniformly magnetic action from magnets varying in strength, as described and shown in the patent of H. C. Harrison, No. 1,709,571, granted April 16, 1929.

It will be noted that the pole-pieces 2 and 3 are each split in two parts and connected together, respectively, by pins or inserts 6 and 7 of small cross-section. These pins are preferably made of "permalloy" or other suitable magnetic material as will be more fully explained hereinafter. Between the pole-pieces 2 and 3 is mounted the armature 10 having wedge-shaped extensions 11 in a position to be acted upon by the separate parts of the pole-pieces 2 and 3. This arrangement is clearly shown in Fig. 3. The armature is secured to mounting member 12 extending at a right angle to the extensions 11. This member is provided with a groove registering with a knife-edged portion extending from the mounting block 13, that is attached by means of screws to the upper surface of one part of the pole-piece 3. The armature is

held in place by a spring 14 secured at one end to the mounting block 13 and extending beyond and over the member 12 so as to press it against the knife edge on block 13. The angular extension 15 on the member 12 is employed to transmit motions from the armature to the diaphragm 18 through the connecting rod 16. The energizing coils 19 for the armature are mounted on either side of the member 12 and the armature 10 so that the armature is free to move in and be influenced by electromagnetic fields produced by the coils when energized by fluctuating currents.

The means for eliminating the restrictive effects of the "permalloy" inserts 6 and 7 consists of metallic bars 20 and 21 normally placed, respectively, across but below the split parts of the pole-pieces 2 and 3. These bars are held together with strips 22 and 23 and held in their proper place by means of a U-shaped member 25 straddling the magnet 1 and secured to the strips 22 and 23. This member 25 normally holds the bars 20 and 21 in the position shown in Fig. 1 below the pole-pieces 2 and 3 through the agency of the spring 26 coiled around the hook 27 and resting at one end against the inner upper surface of the housing 28 and at the other end against the central portion of the U-shaped member 25. The housing 28 is provided for enclosing this magnetic structure and the mouthpiece 30 is arranged therein as shown for the purpose of utilizing the electromagnetic elements as a receiver.

Referring now to the function of the device, when it is used as a receiver, it is evident that when the receiver is hung up on the usual receiver hook 31 by hook 27, the weight of the receiver will be sufficient to cause the spring 26 to become compressed and thus permit the U-shaped member 25 to move the bars 20 and 21 upwardly across the split parts of the pole-pieces 2 and 3 so that they will completely shunt the "permalloy" inserts 6 and 7, respectively. The position of the bars under these circumstances is indicated in dotted lines in Figs. 1 and 2. On the other hand, when the receiver is removed from the hook the spring 26 will return the bars to their normal position below the pole-pieces 2 and 3 as shown in Fig. 1. Consequently, if fluctuating currents, such as strong howler currents produced in telephone circuits to give loud call signals through a receiver when it is on the hook, energize coils 19, corresponding violent agitations of the diaphragm are produced. This is due to the fact that the resulting magnetic flux through the armature pole-pieces 2 and 3, and bars 20 and 21 will not be impeded or in any way restricted by the "permalloy" inserts 6 and 7. Hence when the receiver is on the hook this device may be used for the reception of calling signals and the desired loud acoustic effects produced

whereas if the receiver is off the hook and the bars 20 and 21 are removed from the path of the variable flux component this flux will be limited to a certain maximum depending upon the saturation characteristics of the "permalloy" inserts. This limiting effect is produced in accordance with the above mentioned patent of E. L. Norton.

The present invention when applied to a receiver construction of the type described above may therefore serve the purpose of transmitting loud call signals when the receiver is placed on the hook and preventing such signals as well as any violent electrical disturbances from being transmitted when the receiver is off the hook.

What is claimed is:

1. An electromagnetic device comprising a flux path, a coil for variably energizing said flux path, means in said path traversed by the variable flux therein for limiting the maximum flux therethrough, and means for rendering ineffective the limiting property of said last mentioned means.

2. An electromagnetic device comprising a flux path, a magnetic element in said path, means for setting up flux through said element to cause said device to operate, said element being designed to saturate to prevent false operation by limiting the flux in said path when subjected to a force somewhat greater than the operating force, and means associated with said element for changing the operating conditions for permitting the passage of a greater flux through said path than said element can carry.

3. An electromagnetic device comprising a field magnet, an armature, a coil for variably energizing said device, means in the path traversed by the variable flux component for limiting the maximum flux through said path, and means for rendering ineffective the limiting property of said last mentioned means.

4. An electromagnetic device comprising a field magnet, an armature, a coil around said armature for energizing said device, means for limiting the response of said armature to produce a substantially uniform operation of the armature to energizing currents above a certain limit, and means for rendering ineffective the limiting property of said last mentioned means.

5. An electromagnetic device comprising a field magnet, an armature, a magnetizing system for said device, means for limiting the response of the armature to said magnetizing system to a substantially uniform displacement from magnetizing effects above a certain limit, and means for diminishing the effect of said response limiting means under certain operating conditions.

6. An electromagnetic device comprising a permanent magnet, an armature, a magnetizing system for said device, means associated

with the magnet for restricting the displacement effects of said armature due to said magnetizing system to a certain maximum, and means associated with said magnet for neutralizing the effect of said displacement restricting means under certain operating conditions.

7. A telephone receiver comprising a flux path, a coil for variably energizing said path, means in said path for limiting the flux therein to an amount somewhat above the normal operating value, movable means for rendering ineffective the limiting property of said last mentioned means, and means controlling said movable means rendered operative by placing said receiver in its position of rest.

8. An electromagnetic device comprising a field magnet, an armature between the poles of said magnet, a winding for producing variable magnetic flux through said armature and poles of said magnet, means for limiting the magnetic flux to a predetermined amount substantially irrespective of the changes in amplitude of the energizing force in said winding tending to produce magnetic flux above said amount, and means for counteracting said limiting means to permit normal production of magnetic flux corresponding to variously changing energizing forces.

9. A receiver comprising a field magnet having split pole-pieces, an armature, coils for energizing said armature, a vibrating member actuated by the movement of said armature, "permalloy" inserts interconnecting adjacent split pole-pieces to limit the flux in the path of said magnet, and metallic members normally outside the path and movable within the path to eliminate the effect of said "permalloy" inserts on the actuation characteristics of said vibrating member.

In witness whereof, I hereunto subscribe my name this 28th day of October, A. D. 1926.

RALPH V. L. HARTLEY.