April 15, 1924. 1,490,836

E. C. LIPPS

SCLEROSCOPE

Filed Jan. 20, 1919 2 Sheets-Sheet 1

Fig. 1.

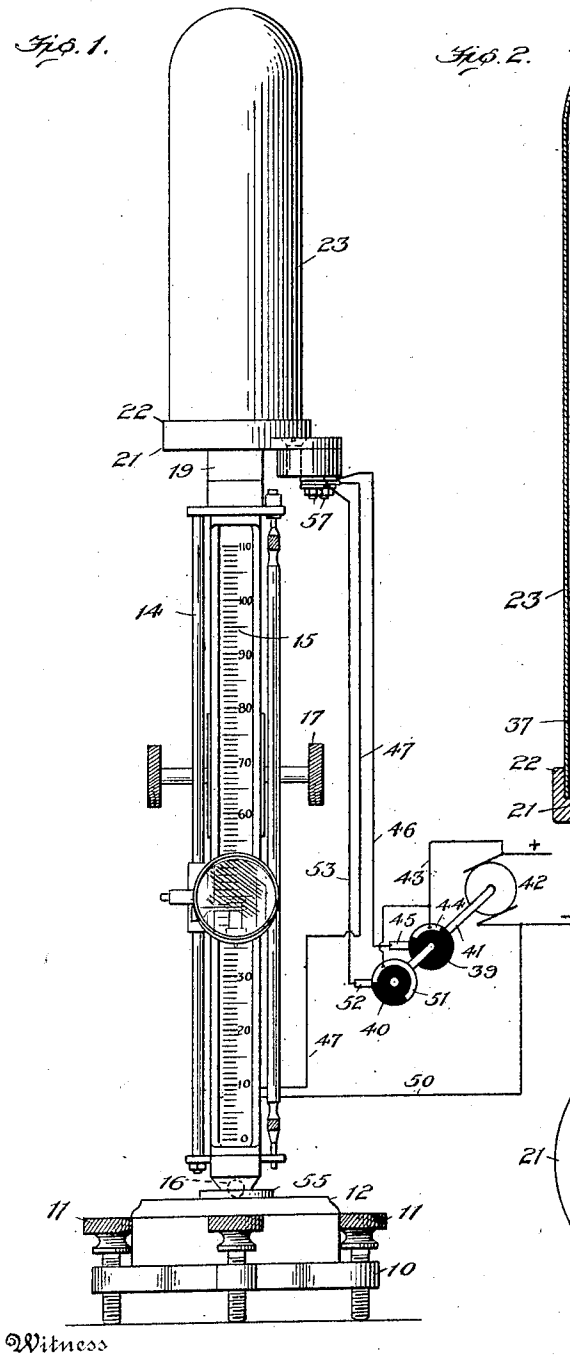


Fig. 2.

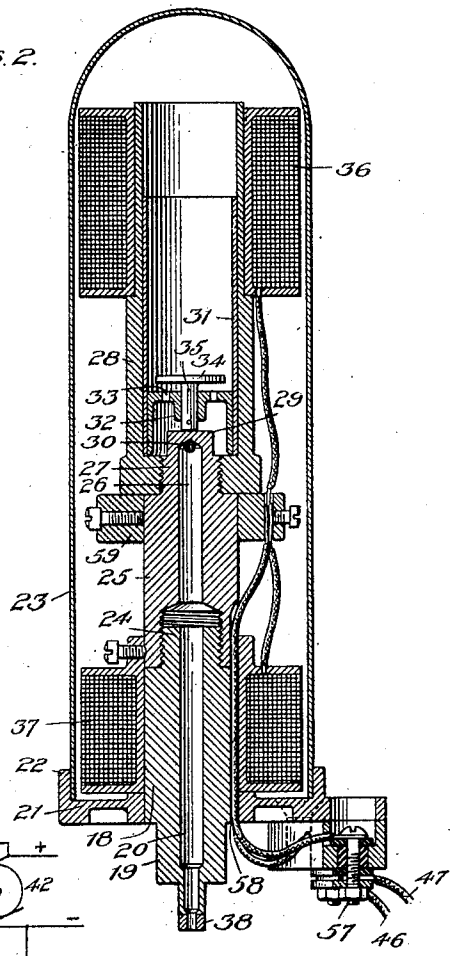
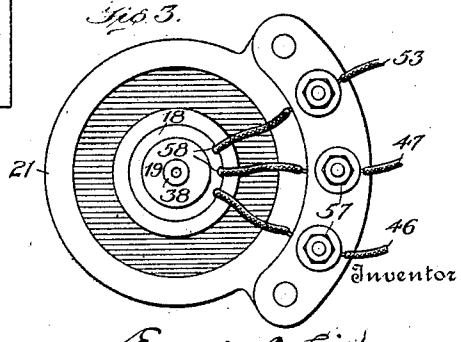


Fig. 3.



Witness

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Fig. 5.

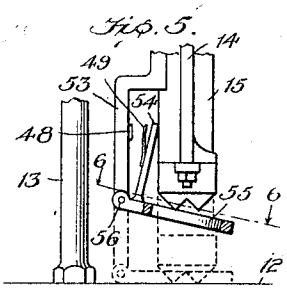


Fig. 6.

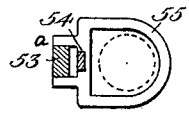


Fig. 4.

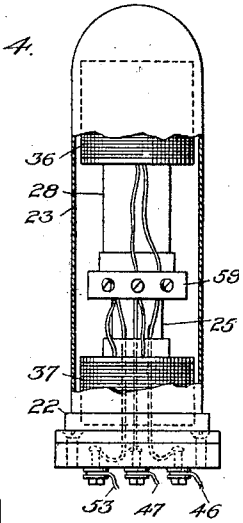


Fig. 7.

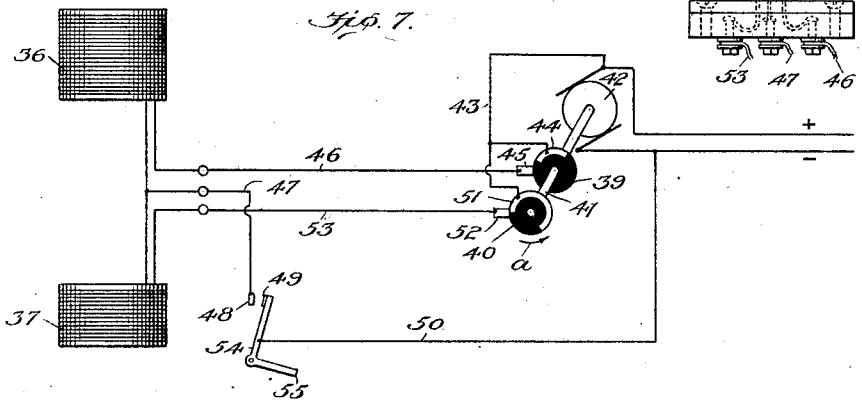
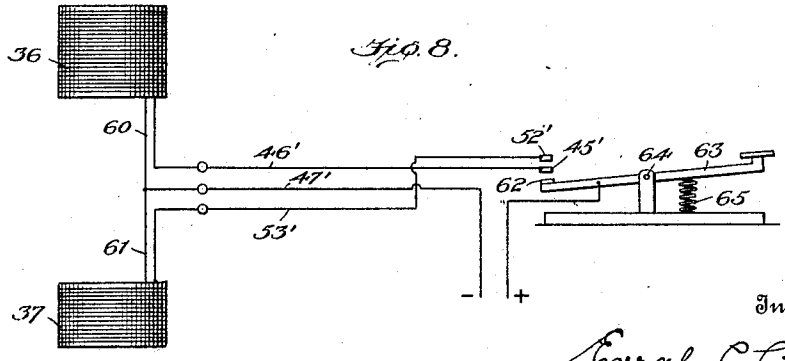


Fig. 8.



Witness

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Patented Apr. 15, 1924. 1,490,836

UNITED STATES PATENT OFFICE.

EVRAH C. LIPPS, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

SCLEROSCOPE.

Application filed January 20, 1919. Serial No. 272,080.

To all whom it may concern:

Be it known that I, EVRAH C. LIPPS, a citizen of the United States, and residing at Detroit, Wayne County, State of Michigan, have invented certain new and useful Improvements in Scleroscopes, of which the following is a specification.

The present invention relates to scleroscopes or instruments for testing the relative hardness of materials and more particularly to the type of instrument having a hammer or striker adapted to be raised and thereafter dropped, the height of the rebound of the hammer being a measure of the hardness of the object tested.

The principal features of the invention consist in the provision of an improved means to raise the hammer; the provision of improved means to hold the hammer raised and thereafter release the same; the provision of automatically acting means to raise and thereafter release the hammer; the provision of means to intermittently raise and let fall the hammer; the provision of means to automatically place the tube in communication with the atmosphere after the hammer has been raised so that it may fall freely; and generally, to improve the construction and operation of this type of instrument. Other features and objects of novelty will be apparent from the description taken in connection with the drawings in which:—

Figure 1 is a front elevation of an instrument constructed in accordance with the present invention, the wiring and means for controlling the operation of the magnets being shown diagrammatically;

Figure 2 is a sectional elevation through the apparatus located at the top of the tube of the instrument;

Figure 3 is a bottom plan view of the part of the instrument shown in Figure 2;

Figure 4 is a side elevation of the parts shown in Figure 2, certain parts being broken away to illustrate the arrangement of the wires, this figure being on a reduced scale;

Figure 5 is a side elevation illustrating the switch mechanism disposed at the lower end of the tube;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 5;

Figure 7 is a diagrammatic view illustrating the electric circuits and means for controlling the same; and

Figure 8 is a similar diagrammatic view showing a modified means for controlling the circuits.

Referring to the drawings the numeral 10 indicates a plate supported by the three adjusting screws 11 and carrying an anvil 12. A post 13 projects vertically from the anvil and adjustably supports a frame 14 carrying a glass tube or guide 15 within which is slidingly fitted a hammer or striker 16. As shown, this hammer is in the form of a ball although other types of strikers may be employed. The frame 14 is adapted to be adjusted vertically by means of the thumb screw 17 which operates any suitable mechanism for this purpose. The parts described above may be constructed and arranged as disclosed by the patent to Shore, 962,790, June 28, 1910.

In the operation of the instrument the hammer 16 is raised and then allowed to fall onto the material being tested, the extent of the rebound indicating the degree of hardness of the material. According to the present invention novel means are provided for raising the hammer and thereafter releasing it. This means is illustrated in vertical section in Figure 2 and is adapted to be disposed at the upper end of the tube 15. For this purpose a sleeve 18 is formed with a nipple 19 which fits into the upper end of the tube and the bore 20 of this sleeve communicates with the interior of the tube. The sleeve also has a radially extending flange 21 formed with a peripheral lip 22 which engages and holds the lower end of a casing 23 enclosing the apparatus. The sleeve 18 at its upper end is formed with a threaded nipple 24 which is screwed into the lower end of a sleeve 25 formed with a bore 26 which constitutes an extension of the bore 20. The upper end of the sleeve 25 has a threaded nipple 27 which carries a cylinder 28. The nipple 27 has a portion 39 which is unthreaded and projects into the cylinder, communication between the bore 26 and the cylinder being had through radial ports 30 formed in this extension 29. It will be seen, therefore, that the cylinder 28 has communication with the interior of

the tube 15 through the bores of the sleeves. For the purpose of reducing the air pressure above the hammer 16 and thereby raising the same, a plunger or piston 31 is slidingly fitted in the cylinder 28. When this plunger is raised, it is obvious that the air pressure below the same and in the tube 15 is reduced thus raising the hammer. As shown, the plunger 31 is in the form of a sleeve having a head 32 set in at one end of the sleeve. This head is formed with a plurality of passages 33 adapted to be closed by a valve 34 having a stem 35 which projects below the head 32. When the plunger moves upwardly the valve 34 is held against the head 32 by gravity and thus closes the openings 33. When the plunger 31 falls, near the end of its stroke, the stem 35 strikes the extension 29, thereby raising the valve 34 and opening the passages 33. In this manner communication is afforded between the interior of the tube 15 and the atmosphere, in consequence of which the hammer may fall freely.

For the purpose of operating the plunger 31 an electromagnet 36 is disposed around the upper portion of the cylinder 28. When this magnet is energized the plunger 31 moves upwardly thereby reducing the air pressure in the tube 15 and raising the hammer. For the purpose of holding the hammer in raised position until the plunger 31 may fall, an electro-magnet 37 is disposed around the sleeve 18. When this magnet is energized and the hammer is in raised position, it will hold the hammer against the lower tip end 38 of the sleeve, this end being preferably of brass in order to eliminate any effects of residual magnetism.

Preferably, the magnets are controlled so that the hammer is intermittently raised and released. To this end a pair of rotary switches 39 and 40 (Figure 7) are provided. As shown these switches consist of disks or commutators mounted on a shaft 41 rotated in any suitable manner, as by means of a motor 42. Current is taken from a main and by means of wire 43 conducted to the segment 44 of switch 39. This segment is an electrical conductor and is insulated from the rest of the disk. A brush or other conductor 45 is positioned to engage the segment 44 as it rotates and is connected to the magnet 36 through conductor 46. From the magnet the current may flow through a return wire 47 to a terminal 48 of a switch presently to be described. From the other terminal 49 of this switch the current flows through a wire 50 to the other supply main. In this manner the switch 39 controls the operation of the electro-magnet 36.

The switch 40 in a similar manner controls the operation of the electro-magnet 37. Thus the current may be taken from the wire 43 to the segment 51 which is an electrical conductor and insulated from the remainder of the rotary switch. A brush 52 is disposed to contact with the segment as it rotates and is electrically connected to the magnet 37 by means of conductor 53. The circuit continues through the common return 47 to the switch terminal 48.

Preferably, the timing of the energizing of the two magnets is such that the magnet 37 is first supplied with current, and immediately thereafter the magnet 36 is energized which, through the operation of the plunger 31, raises the hammer. The magnet 37 being energized, the hammer is held against the tip 38. The magnet 36 is now de-energized thus permitting the plunger 31 to fall and open the valve 34 thereby placing the passages above the hammer in communication with the atmosphere so that the hammer may fall freely. The magnet 37 may now be de-energized thus permitting the hammer to fall. This cycle of operations is then repeated with the result that the ball is raised and allowed to fall at regular intervals so that the operator may obtain an accurate reading of the rebound of the hammer. Referring to Figure 7 it will be observed that the segments 44 and 51 are disposed and are of such extent that if the switches are rotating in the direction indicated by the arrow *a*, the magnet 37 will first be energized, then magnet 36. But as as segment 44 is less than one-half the length of segment 51, magnet 36 will soon thereafter be demagnetized and later magnet 37 will also be rendered inoperative. To illustrate, if the shaft 41 makes one revolution every three seconds the extent of segment 51 might be such as to maintain the magnet 37 energized for about two seconds while the segment 44 maintains the magnet 36 energized for three-fourths of a second and such energization takes place about one-fourth of a second after the energizing of magnet 37.

From the foregoing it will be seen that automatic means are provided for intermittently raising and allowing the hammer to fall. For the purpose of further controlling this automatic means the switch having the contacts 48 and 49 is provided and preferably this switch is disposed so that it is closed when the tube 15 is lowered onto the test piece. Referring now to Figures 5 and 6 it will be seen that at the lower end of the tube 15 the frame 14 is formed with an offset 53^a which carries the contact 48. The contact 49 is mounted on an arm 54 carried by a lever 55 disposed at the lower end of the tube 15 and pivotally mounted as at 56 on the offset 53^a. It will be seen that the arrangement of these parts is such that when the tube 15 is lowered the lever 55, which is in the form of a closed figure

surrounding the tube 15, will strike the test piece and move the contact 49 into engagement with the contact 48. Preferably, the contact 49 is yieldingly mounted so that the circuit through the switch will be properly maintained.

Referring now to Figures 2 and 4 it will be seen that the wires 46, 47 and 53 previously mentioned are brought to binding posts 57 on the flange 21. Thence they extend upward, being disposed in the slots 58 formed in the sleeve 18. Just above the magnet 37 these wires are carried to the collar 59 secured to the sleeve 25 and from this collar extend to their respective magnets.

In the operation of the instrument the tube 15 being raised the test piece is placed on the anvil 12 and the tube lowered into contact with the same. The lever 55 is thereby turned on its pivot to bring the contact 49 into engagement with the contact 48 and set in operation the motor 42. This energizes magnet 37 and immediately thereafter magnet 36 which raises the hammer and holds it until the magnet 37 is demagnetized. During this holding period the upper end of the tube has been placed in communication with the atmosphere so that the hammer may fall freely. This cycle of operations will be repeated as long as the switch at the lower end of the tube is kept closed or until the test piece is withdrawn from the instrument.

If desired, the instrument may be equipped to be controlled manually. The wiring for such control is illustrated diagrammatically in Figure 8. Thus the magnet 36 has a conductor 46′ which extends to a spring contact 45′. It is also connected with a common return 47′ by conductor 60. The magnet 37 is connected by means of a conductor 53′ with a contact 52′ disposed at one side of the contact 45′. This magnet is also connected to the common return 47′ by a wire 61. A contact 62 is disposed on the opposite side of contact 45′ with respect to 52′. As shown, the contact 62 is carried at one end of a lever or key 63 pivotally mounted at 64, a spring 65 being provided to hold the contact 62 out of engagement with the other contacts. When the lever 63 is depressed it carries the contact 62 into engagement with contact 45′, thereby energizing the lower magnet 37. Thereafter the contacts 45 and 62 remaining in engagement are carried as a unit against the contact 52 thereby energizing the magnet 36. Thus the magnet 37 is first magnetized and immediately thereafter magnet 36. The circuits are broken in the reverse order so that the magnet 36 is demagnetized first.

Although an embodiment of the invention has been described in detail it is to be understood that the invention is not thus limited but includes modifications and changes which come within the scope of the appended claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:—

1. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a vertical cylinder above the tube and in communication therewith, a plunger in the cylinder, an electro-magnet surrounding the cylinder at one end thereof operable to raise the plunger, said plunger having a valve controlled passage therethrough adapted, when open, to place the tube in communication with the atmopshere, a second electro-magnet disposed below said cylinder adapted when energized to hold the hammer raised, and means to open said valve when the plunger falls.

2. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a cylinder at the top of the tube in communication with the tube, a plunger in said cylinder having a passage affording communication between the tube and atmosphere, a valve controlling said passage having a stem projecting at one end of the plunger, means to move said plunger in one direction to reduce the air pressure in the tube, and means engaging said stem to open the valve when the plunger moves in the opposite direction.

3. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a vertically disposed cylinder at the top of the tube in communication therewith, a plunger in said cylinder, having a valve controlled axial passage therethrough, means to raise said plunger to reduce the air pressure in the tube, and means to open said valve after the plunger has completed its upward movement to place the tube in communication with the atmosphere.

4. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a single acting pump at the top of the tube in communication therewith, comprising a cylinder, and a plunger in said cylinder, means to actuate said plunger to reduce the air pressure in the tube, and means operated by the return movement of the plunger to place the tube in communication with the atmosphere.

5. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a cylinder at the top of the tube in communication therewith. a plunger in said cylinder, and an electro-magnet to move said plunger in the direction to reduce the air pressure in the tube.

6. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, electro-magnetic means to raise the hammer, electro-magnetic means

to releasably hold the hammer raised, a rotary switch in circuit with each of said means, and means to rotate said switches.

7. A scleroscope comprising in combination, a guide, a hammer slidably associated therewith, electro-magnetic means to raise the hammer, electro-magnetic means to releasably hold the hammer raised, a switch in circuit with each of said means, and means to intermittently open and close said switches.

8. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, electro-magnetically operated pneumatic means to raise the hammer, a switch in circuit with said means, and means independent of said hammer to intermittently open and close said switch.

9. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, pneumatic means to raise the hammer and thereafter drop it, and controlling means independent of said hammer to repeatedly effect the operation of the first mentioned means.

10. A scleroscope comprising in combination, a guide mounted for vertical adjustment to place the test piece under its lower end, a hammer slidably associated with said guide, electric means to raise the hammer, hold it raised and thereafter release it, means to control the operation of said electric means including a switch in circuit therewith adapted to be closed by the adjustment of the guide toward the test piece.

11. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, electric means to raise the hammer, electric means to hold the hammer raised and thereafter release it, means to control the operation of said electric means including a switch in circuit therewith adapted to be opened by withdrawing the test piece from the instrument.

12. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, electric means to raise the hammer, electric means to hold the hammer raised and thereafter release it, a switch to control the raising means, a switch to control the holding means, and means to close said switches in the sequence recited.

13. A scleroscope comprising in combination, a guide, a hammer slidably associated therewith, electric means to raise the hammer, electric means to hold the hammer raised and thereafter release it, and control means to render said electric means operative in the sequence recited.

14. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, means to raise the hammer, means to hold the hammer raised and thereafter release it, and control means to render said raising and holding means operative in the sequence recited.

15. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, means to adjustably support the guide so that the test piece may be inserted under the lower end thereof, means to raise the hammer, and means to hold it raised, said raising and holding means being rendered operative by lowering the guide onto the test piece.

16. A scleroscope comprising in combination, a tube, a hammer slidably fitted therein, means to reduce the air pressure in the tube above the hammer to raise the hammer, means to hold the hammer raised, and means to thereafter put the tube above the raised hammer in communication with the atmosphere and release the holding means.

17. A scleroscope comprising in combination, a vertical guide, a hammer slidably associated therewith, means to raise the hammer, means to hold it raised, and automatic means controlling the operation of said raising and holding means.

18. A scleroscope comprising a combination, a tube, a hammer slidable therein, means to reduce the air pressure in the tube to raise the hammer and automatically operating electro-magnetic means to hold the hammer raised and thereafter release the same.

19. A scleroscope comprising in combination, a tube, a hammer slidable therein, means to reduce the air pressure in the tube to raise the hammer, and automatically operating means to hold the hammer raised and thereafter release the same.

20. A scleroscope comprising in combination, a tube, a hammer slidable therein, means to reduce the air pressure in the tube to raise the hammer, and electro-magnetic means to hold the hammer raised.

21. A scleroscope comprising in combination, a vertical guide, a hammer of less length than the guide associated therewith, electro-magnetic means to raise said hammer to the top of the guide, and electro-magnetic means to hold the hammer raised.

22. A scleroscope comprising in combination, a vertical guide, a hammer of less length than said guide associated therewith, means to raise the hammer to the top of the guide, and electro-magnetic means to hold the hammer raised.

23. A scleroscope comprising in combination, a vertical guide, a hammer of less length than said guide associated therewith, electro-magnetic means to raise said hammer to the top of the guide, means to hold the hammer raised, and means to release said holding means to permit the hammer to fall.

24. A scleroscope comprising in combination, a vertically adjustable guide, a hammer

slidably associated therewith, electric means to raise the hammer, means to control the operation of said electric means including a switch in circuit therewith adapted to be closed by the adjustment of said guide.

25. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a cylinder at the top of the tube in communication therewith, a plunger yieldingly held at one end of said cylinder, an electro-magnet to move the plunger away from said end to reduce the air pressure in the tube below atmospheric and thereby raise the hammer, said plunger having a valve controlled passage therethrough, adapted when open to place the tube in communication with the atmosphere, a second electro-magnet adapted when energized to hold the hammer raised and means to open said valve when the plunger moves toward the said end of the cylinder.

26. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a cylinder at the top of the tube in communication therewith, a plunger yieldingly held at one end of the cylinder, an electro-magnet adapted to move the plunger away from said end to reduce the air pressure in the tube below atmospheric and thereby raise the hammer, a valve controlled passage adapted to place the tube in communication with the atmosphere, said valve being open when the plunger is at said end of the cylinder and closed at other times, releasable means to hold the hammer raised and means to open said valve when the plunger moves toward said end.

27. In a scleroscope the combination with the tube and hammer slidably fitted therein; of a cylinder at the top of the tube in communication therewith, a plunger yieldingly held at one end of said cylinder having a valve controlled passage therethrough, means to move said plunger away from said end to reduce the air pressure in the tube and means to open said valve after the plunger has completed said movement, to thereby place the tube in comunication with the atmosphere.

In testimony whereof I affix my signature.

EVRAH C. LIPPS.