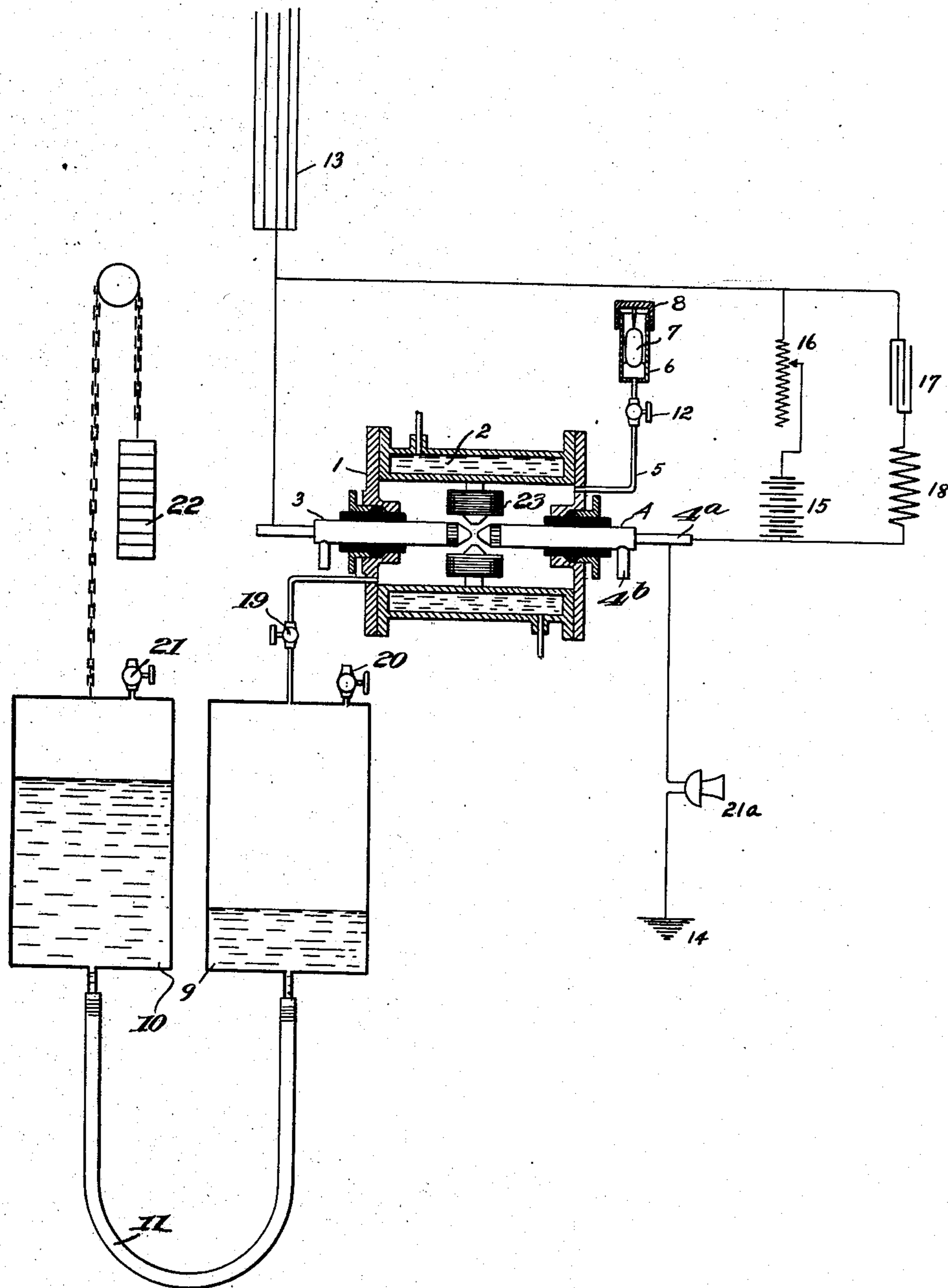


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WIRELESS TELEGRAPHY.
APPLICATION FILED JAN. 9, 1907.

923,963.

Patented June 8, 1909.



WITNESSES:

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WIRELESS TELEGRAPHY.

No. 923,963.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Wireless Telegraphy, of which the following is a specification.

My invention relates generally to the art of generating high frequency electrical oscillations, such as used in signaling by electromagnetic waves; and more particularly to producing such oscillations by use of discharges in gases or vapors. Its primary objects are to increase the efficiency of the generating means, as by keeping the potential and frequency constant, and otherwise.

I have illustrated the invention in the accompanying drawing which shows diagrammatically and in partial section, an apparatus embodying the invention.

In generating oscillations by continuous currents, and using a normally insulating discharge gap, applicant has discovered that the character of the normally insulating medium, especially when taken together with the pressure under which it is used, is of great importance, and that gases or vapors belonging to the group of elements which include argon, helium, krypton, neon and others are particularly efficient for the purpose in view. I have also found that these gases work best when used in connection with electrodes formed of very thin conductors which are kept cool. The manner in which each gas should be used depends upon the character of the gas, its cost, the amount of energy which it is desired to radiate and other circumstances, and these include the adaptability of particular pressures to use with particular gases. For example helium has been found to work best when under compression, when fairly large amounts of power are to be transmitted, while in transmitting smaller amounts of power the ordinary atmospheric pressure is sufficient. Where still a smaller amount of power is to be transmitted, a gas such as argon for example may efficiently be used in a partial vacuum chamber. And the condition is further improved by the use of water cooled aluminum discharge gap terminals, or terminals consisting of slightly oxidized sodium or sodium amalgam. Thus in the figure illustrating the invention I have shown a relatively small chamber 1 surrounded by

a water jacket 2, and inclosing the ends of electrodes 3 and 4, which are adjustable in position and have means for keeping them cool. In a chamber 6 is placed a capsule 7 containing a gas to be used, which capsule may be ruptured at the proper time by securing down the cap 8 of the chamber 6, when the gas will pass by way of the pipe 5 through the cock 12 into the chamber 1 containing the electrodes. The terminals 3, 4 are hollow and their inner ends are composed of very thin metal as before described. These are preferably rounded in form as shown in the drawing, and may be kept cool by circulating water through the pipes 4^a, 4^b.

For regulating the pressure of the gas in chamber 1 I provide a liquid containing vessel 9 which may be attached to an air pump if desired, or may be used with the other tank 10, the two connected by flexible pipe 11, to form by themselves an air pump. Thus when the cocks 19 and 20 are opened and the tank 10 is raised the air will be driven out of tank 9; whereupon by closing cock 20 and opening cock 21 and lowering tank 10, the air will be drawn out of the chamber 1 preliminary to introducing gas therein from the chamber 6. The pressure of the gas will depend upon the position of tank 10 which is counterbalanced by weight 22. This regulator may of course also be used to withdraw the gas itself if it should become necessary to open the chamber 1.

Connected to the terminals 3 and 4, is an antenna 13 grounded at 14, and also connected through the terminals is a circuit containing a source of continuous voltage 15, which may be a small number of dry cells in case only a small power is required, and also 16 a high resistance or inductance or both. A condenser 17 and inductance 18 may also be used in circuit as shown. A magnet 23 may be used if desired to blow out the arc of the discharge gap. The ends of the terminals 3, 4 should be of thin metal and may be composed of silver or iridium or other alloys to good effect in some cases.

By the above arrangement great regularity and uniformity of intensity and frequency can be obtained, and the distance apart of the electrodes 3, 4, as well as the pressure of the particular gas used may be regulated empirically to get the best results.

Having thus described my invention and

illustrated its use, and what I claim as new and desire to secure by Letters Patent, is the following:

1. In apparatus for generating high frequency electric oscillations; a discharge gap normally insulated by a medium consisting of the gases of the argon and helium group.
2. In apparatus for generating high frequency electric oscillations, a spark gap inclosed in a vapor or gas of the argon and helium group of elements, and means to regulate the pressure of such inclosing medium.
3. Means for generating high frequency oscillations comprising a circuit containing a source of voltage, a capacity, an inductance, and a spark gap enveloped by a gas of the argon and helium group of elements.
4. A discharge gap comprising terminals having means to keep them cool and a surrounding normally insulating medium of gases of the helium and argon group of elements.
5. In means for generating electro-magnetic waves, a discharge gap comprising

water cooled terminals having thin metal walls, and an inclosing normally insulating medium of gas under an appropriate critical pressure, and means for regulating said pressure.

6. In means for generating electro-magnetic waves, a discharge gap, a chamber inclosing the gap and filled with an inert gas of the helium group of metals, and means for maintaining said gas at a critical pressure, substantially as described.

7. Means for generating electromagnetic waves, comprising a spark gap with thin metal walls and means for cooling said walls, and an inclosing chamber containing an insulating medium of gas at a critical pressure appropriate to the power being used, substantially as described.

Signed at Brant Rock, in the county of Plymouth and State of Massachusetts this 7th day of January A. D. 1907.

REGINALD A. FESSENDEN.

Witnesses:

JESSIE E. BENT,

ADELEINE WÖLENER.