D. C. DAVIS.

ARC SUPPRESSING DEVICE.

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1,224,150. Patented May 1, 1917.

Fig. 1.

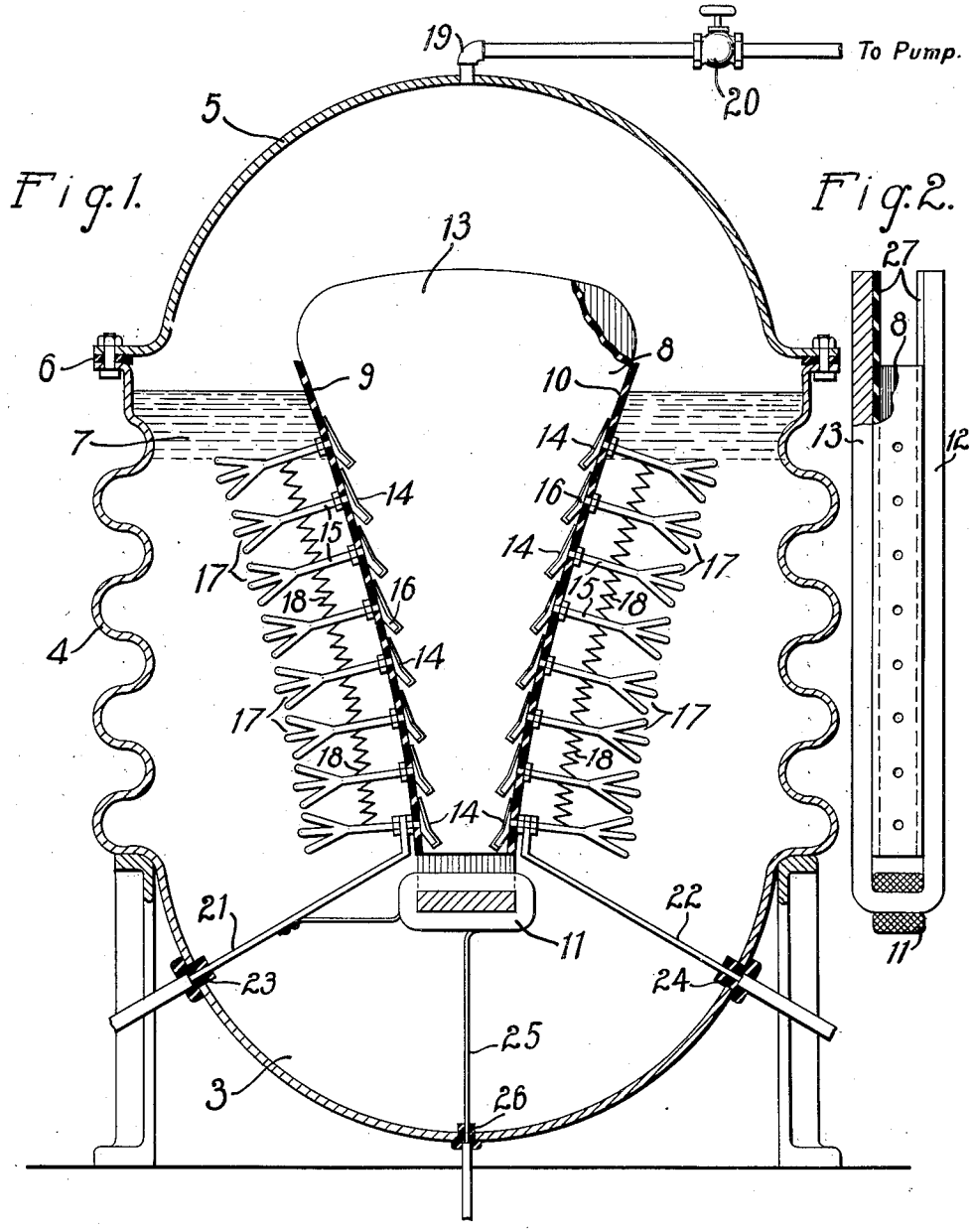


Fig. 2.

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DAVID C. DAVIS, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ARC-SUPPRESSING DEVICE.

1,224,150. Specification of Letters Patent. Patented May 1, 1917.

Application filed June 9, 1914. Serial No. 844,090.

To all whom it may concern:

Be it known that I, DAVID C. DAVIS, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Arc-Suppressing Devices, of which the following is a specification.

My invention relates to current-rectifying apparatus of the magnetic blow-out type and it has for its object to provide a device of the character specified that will be quiet in operation and in which means are provided for effectually dissipating the heat of the arc.

In the accompanying drawing, Figure 1 is a view, partially in section and partially in elevation, of an arc-suppressing device embodying my invention; and Fig. 2 is a side view, partially in section and partially in elevation, of the arc-suppressing device shown in Fig. 1.

In a copending application of Ray P. Jackson, Serial No. 819,822, filed February 19, 1914, and assigned to Westinghouse Electric & Manufacturing Company, is disclosed and claimed a method of current rectification wherein a horn gap is placed in a unidirectional magnetic field and alternating current is passed between the horns thereof. Waves of one polarity will be retained at the position of minimum arc length while waves of the opposite polarity will be blown out on the horns and will be greatly decreased in quantity or wholly extinguished. While the device disclosed by Mr. Jackson gives extremely good results in the quality and amount of rectified current, it has two serious drawbacks, namely the highly objectionable noise caused by the rapid extinguishment of heavy-current arcs and the great amount of heat generated. It is the object of this invention to greatly minimize both these defects.

Referring to Fig. 1, 3 is a container, of any suitable gas tight material, preferably copper, approximately cylindrical in form, and having its walls circumferentially corrugated, as shown at 4. A dome shaped cover member 5 is clamped to the container 3 by any suitable gas-tight joint shown at 6. Within the container 3 is a pool of cooling fluid 7, preferably insulating in quality, such, for example, as a non-volatile oil. A vessel 8 having divergent walls 9 and 10 projects into the body of fluid 7 to a considerable depth. The vessel 8 is constructed of any suitable refractory, fluid-resisting insulating material, such, for example, as quartz or micarta.

An electromagnet comprising a winding 11 and pole pieces 12 and 13 embraces the vessel 8 on the two parallel sides thereof. The pole pieces 12 and 13 are shielded from arcs by refractory insulating plates 27. A plurality of conducting members 14 are supported on the divergent walls 9 and 10 of the vessel 8 and attached thereto are conducting stems 15, 15 projecting through the wall of the vessel 8 and into the fluid 7. The conducting members 14 are, preferably, constructed of a massive body 16 of good heat conductivity, such as copper, faced with a layer of highly refractory material, such, for example, as tungsten. The stems 15 are also preferably massive in construction and formed of good heat-conducting material, such as copper, and carry at their terminals heat-radiating fins or fingers 17. Resistance elements 18 of any suitable character are connected between adjacent stems 15 and submerged in the fluid 7. Projecting through the cover 5 is a tube 19 connected to any suitable exhausting pump (not shown) and controlled by a valve 20. Current is supplied to the two lower conducting members 14 by means of conductors 21 and 22 projecting through the wall of the container 3 and insulated therefrom by any suitable means, such as bushings 23 and 24. Current is supplied to the winding 11 by means of the conductor 21 and a separate conductor 25 projecting through the wall of the container 3 and insulated therefrom as shown at 26.

Having thus described the structure of my device, the operation is as follows: Upon the flow of alternating current through the wires 21 and 22 and between the lower conducting members 14 and upon the energization of the winding 11 by direct current, alternating waves of one polarity will be maintained of minimum length and allowed to flow between the lower members 14. Waves of the other polarity, however, will be expelled by the well known magnetic blow-out action and will rise to higher and higher members 14 and will be drawn out in length and forced to traverse more and more of the resistance elements 18. The arc will finally be blown into the space above the pole pieces

12 and 13 and will there break. The space above the fluid 7, however, having been evacuated through the tube 19, the breakage of the arc will cause very little noise, since the sound-transmitting medium has been removed. It is not essential that the degree of evacuation be any where near that of the ordinary vapor arc rectifier, but a few moments of operation of an ordinary piston pump will be found amply sufficient. The above described action will take place with great rapidity, and a considerable amount of heat will be generated at the electrodes 15 and in the resistance elements 18. The greater share of this heat will be conducted away through the copper stems 15 and radiated by the fins 17 into the bath 7 from whence it is radiated to the surrounding atmosphere through the corrugated wall 18.

Obviously, my invention may be modified in many of its particulars without departing from the spirit thereof and, accordingly, I do not desire to be restricted to the specific form disclosed but desire only such limitations to be imposed as are set forth in the appended claims. My invention is not necessarily restricted in its use to magnetic blow-out rectifiers, but may be employed wherever it is necessary to extinguish either direct or alternating current arcs with great frequency, where quietness of operation and good heat dissipating means are desired.

I claim as my invention:

1. An arc-disrupting horn comprising a supporting member of insulating material, a plurality of conducting members carried by said supporting member, a conducting stem attached to each of said conducting members, resistance elements connected between adjacent stems, and heat-dissipating means attached to each of the stems.

2. An arc-disrupting horn comprising a wall of insulating material, a plurality of conducting members supported on one face of said wall, a conducting stem attached to each conducting member and projecting through the wall, resistance elements connected between adjacent stems, and heat-dissipating means attached to each of the stems.

3. An arc-disrupting horn comprising a wall of insulating material, a plurality of conducting members supported adjacent one face of said wall, a conducting stem attached to each conducting member and projecting through the wall, a body of cooling fluid on the other side of the wall, resistance elements connected between adjacent stems, and heat-radiating devices attached to each of the stems and submerged in the cooling fluid.

4. An arc-disrupting horn comprising a wall of insulating material, a plurality of conducting members supported on one face of said wall, a conducting stem attached to each conducting member and projecting through the wall, a body of cooling fluid on the other side of the wall, resistance elements connected between adjacent conducting stems and submerged in said cooling fluid, and heat-radiating devices attached to each of the conducting stems and also submerged in the cooling fluid.

5. An arc-disrupting horn comprising a wall of insulating material, a plurality of conducting members supported adjacent one face of said wall, each of said conducting members comprising a highly refractory face member and a backing member therefor of high heat conductivity, a conducting stem attached to each conducting member and projecting through the wall, resistance elements connected between adjacent stems, and heat-dissipating means attached to each of the stems.

6. An arc-disrupting horn gap comprising a vessel having two diverging walls, a plurality of conducting members supported adjacent the inner face of each of said walls, a conducting stem attached to each of said conducting members and projecting through the adjacent wall, resistance elements connected between adjacent stems, and heat-dissipating means attached to each of the stems.

7. An arc-disrupting horn gap comprising a vessel having two diverging walls, a plurality of conducting members supported adjacent the inner face of each of said walls, a conducting stem attached to each of said conducting members and projecting through the adjacent wall, resistance elements connected between adjacent stems, a bath of cooling fluid surrounding said vessel, and heat-dissipating means attached to each of said stems and submerged in said bath.

8. An arc-disrupting horn gap comprising a vessel having two diverging walls, a plurality of conducting members supported adjacent the inner face of each of said walls, a conducting stem attached to each of said conducting members and projecting through the adjacent wall, a bath of cooling fluid surrounding said vessel, resistance elements connected between adjacent stems and submerged in said bath, and heat-dissipating means attached to each of said stems and also submerged in said bath.

9. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, and resistance elements connected between said conducting sections.

10. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, resistance elements connected between said conducting sections, and means for forc-

ing an arc formed between said electrodes out to the most widely separated portions thereof.

11. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, resistance elements connected between said conducting sections, and magnetic means for forcing an arc formed between said electrodes out to the most widely separated portions thereof.

12. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, resistance elements connected between said conducting sections, and a magnet having its pole pieces embracing the electrodes and the field therebetween.

13. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, heat-dissipating means attached to said conducting sections, and resistance elements connected between said conducting sections.

14. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, heat radiating means attached to said conducting sections, a bath of cooling fluid adjacent said electrode and submerging said heat-radiating means, and resistance elements connected between said conducting sections.

15. The combination with an evacuated container, of a pair of divergent discharge electrodes therein, one of said electrodes comprising a plurality of conducting sections, heat radiating means attached to said conducting sections, resistance elements connected between said conducting sections, and a bath of cooling fluid adjacent said electrode and submerging said resistance elements and said heat-radiating means.

16. The combination with an evacuated receptacle, of a bath of cooling fluid partially filling the same, a vessel having two divergent walls projecting into said bath, and electrodes adjacent said walls, one of said electrodes comprising a plurality of conducting sections connected by resistance elements.

17. The combination with an evacuated receptacle, of a bath of cooling fluid partially filling the same, a vessel having two divergent walls and projecting into said bath, and electrodes adjacent said walls, one of said electrodes comprising a plurality of conducting sections connected by resistance elements which are submerged in said bath of cooling fluid.

18. The combination with an evacuated receptacle, of a bath of cooling fluid partially filling the same, a vessel having two divergent walls and projecting into said bath, electrodes located adjacent to said walls and comprising a plurality of conducting sections connected by resistance elements, and heat-radiating means attached to said conducting sections and projecting through said walls into said bath of cooling fluid.

19. The combination with an evacuated receptacle, of a bath of cooling fluid partially filling the same, a vessel having two divergent walls and projecting into said bath, electrodes located adjacent to said walls and comprising a plurality of conducting sections connected by resistance elements, heat-radiating means attached to said conducting sections and projecting through said walls into said bath of cooling fluid, and means for forming a unidirectional magnetic field in the space between the electrodes.

20. The combination with an evacuated receptacle, of a bath of cooling fluid partially filling the same, a vessel having two divergent walls projecting into said bath, electrodes located adjacent to said walls and comprising a plurality of conducting sections connected by resistance elements, heat-radiating means attached to said conducting sections and projecting through said walls into said bath of cooling fluid, and a magnet embracing said vessel between its pole pieces.

21. The combination with an evacuated container, of a bath of cooling fluid in the lower portion thereof, a vessel projecting into said bath, a horn gap within the vessel, and means for transmitting the heat generated by a discharge across said horn gap through the wall of said vessel and into said bath of cooling fluid.

22. The combination with an evacuated container, of a bath of cooling fluid in the lower portion thereof, a vessel projecting into said bath, a horn gap within the vessel, means for transmitting the heat generated by a discharge across said horn gap through the wall of said vessel and into said bath of cooling fluid, and means for causing a unidirectional magnetic field between said electrodes.

In testimony whereof, I have hereunto subscribed my name this 26th day of May, 1914.

DAVID C. DAVIS.

Witnesses:
GEO. W. HANSEN,
B. B. HINES.