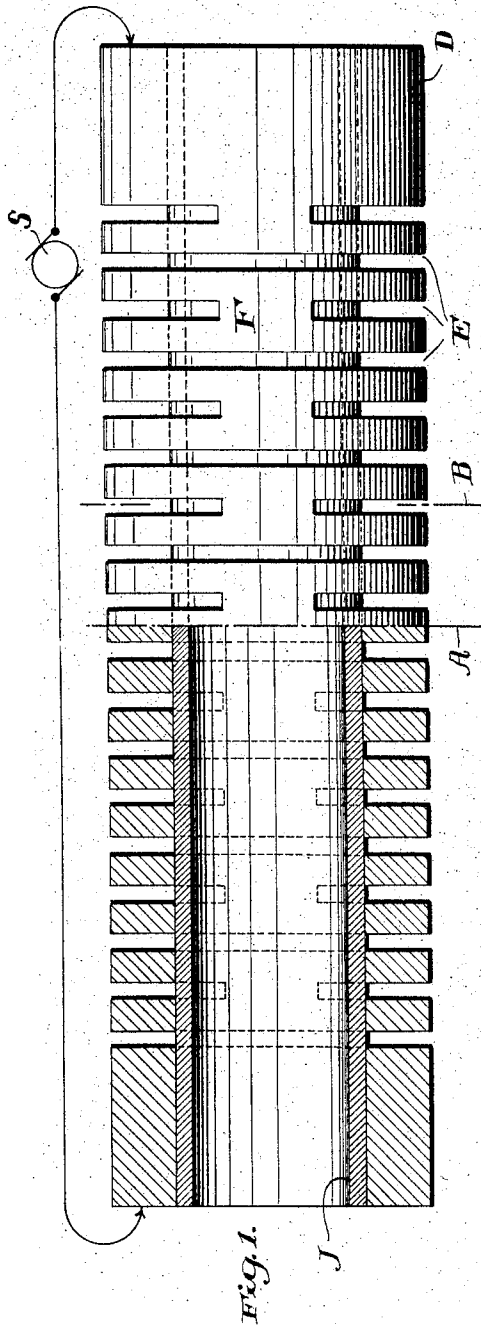
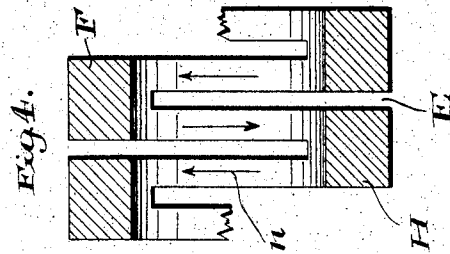
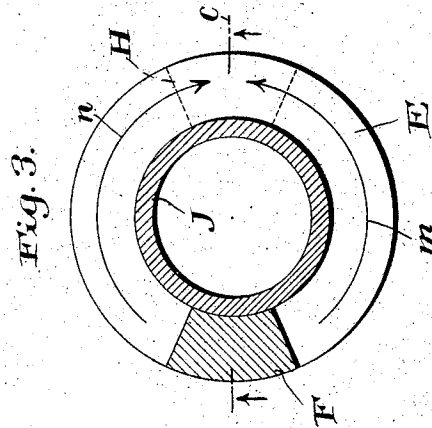
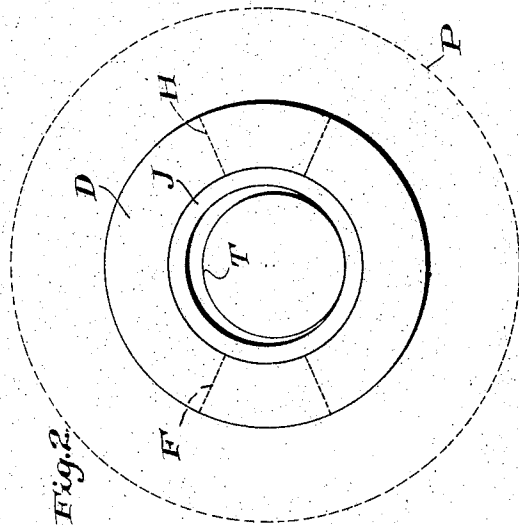


J. THOMSON.
TUBULAR ZIGZAG CARBON ELECTRIC RESISTER.
APPLICATION FILED OCT. 7, 1918.

1,318,031.

Patented Oct. 7, 1919.



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Specification of Letters Patent.

Patented Oct. 7, 1919.

Application filed October 7, 1918. Serial No. 257,218.

To all whom it may concern:

Be it known that I, JOHN THOMSON, a citizen of the United States, and a resident of the borough of Manhattan, city of New York, county and State of New York, have invented certain new and useful Improvements in Tubular Zigzag Carbon Electric Resisters, of which the following is a specification.

This is an invention in tubular, zig-zag, carbon, electric resisters, particularly adapted to heat articles placed in the interior thereof.

In the drawing,

Figure 1 is a composite front elevation and longitudinal center section of the resister from the right and left-hand sides of the vertical center line A.

Fig. 2 is an end elevation either from the right or the left hand end of the resister.

Fig. 3 is typical of a transverse section along any of the zig-zag slits, as the section on the line B; and

Fig. 4 is a fragmental longitudinal center section, revolved 90 degrees from that of Fig. 1 or Fig. 3, Fig. 4 being a section taken as on the center line C of Fig. 3 looking in the direction of the arrows.

The resister D is formed of carbon, either graphitized or amorphous, and it is primarily molded as a cylindrical tube or a solid round rod, but in the latter case it is bored to produce a cylinder.

The next constructive step is to mill a series of transverse slots E from opposite sides, leaving connecting sections, as F and H, each of which is diametrically disposed from the other. In this wise, a "zig-zag" electric circuit, of restricted area, is formed but with two notable differences from previous practice, namely:

The current passes in a circular path right and left, in parallel, as indicated by arrows *m, n* Fig. 3, from one connecting section to another, and as the lineal length of the inner circumference of the resister is manifestly less than that of its outer circumference the current density will be proportionately increased along the inner surface of the bore.

As a consequence of transmitting the current in parallel, the cross-sectional area of each connector-section should be equal to that of the combined cross-sectional areas of both of its connecting circular limbs. It is to be observed that, owing to the circular

traverse of the current as it passes from one pair of zig-zag limbs to another, an extensive lineal length of circuit may be obtained in a comparatively short resister part.

The thermal effect, due to the increase of current density along the interior surface of this tubular resister, may be illustrated by assuming that the lineal length of its outer circumference is, say 20 inches, while that of the bore is 10 inches; consequently, both the development and emissivity of heat would be one hundred per centum greater along the interior than at the periphery. Hence, if the bore is utilized for heating an article and the outside is insulated to minimize the escape of heat therefrom the conditions are unique for yielding efficient results. But, to utilize this tubular resister, the carbon must be made immune to the destructive effect of oxygen. This is accomplished in the following manner:

The carbon element having been formed, as in the manner already described, a supplemental and relatively thin-walled tube, as J, is placed in the bore of the resister, fitting snugly therein. The tube is preferably formed of fused aluminum oxid or crystalline silicon carbid, either of which is sufficiently non-conductive of electricity not to short-circuit the carbon zigzags; is highly refractory; is an effective conductor of heat, and is non-reactive. Thereafter, the exterior of the resister is surrounded by an airtight sheathing, of material such as fire-clay, the outer limits of which are denoted as by the broken line P.

When the resister is suitably set to be electrically incited from a suitable source of electrical supply, such as is herein symbolically indicated by S, the resister then becomes a highly efficient means for heating articles placed within its inner tube, especially so in the instance of relatively long metal articles of relatively small cross-section as compared to the length, for example, of billets or rods, as T, Fig. 2.

While this tubular zig-zag resister is peculiarly effective when used in the foregoing manner it may yet be employed to heat gases flowing through its inner tube; or the latter may be dispensed with if or when it is desirable to radiate energy outwardly.

What I claim is:

1. A tubular, zig-zag, carbon, electric resister having circular limbs which pass to

and from their correlative connecting sections, whereby the transmission of electric current is in parallel from one to the other of any pair of said sections.

5 2. A tubular, zig-zag, carbon, electric resistor having limbs arranged in pairs which pass to and from their correlative connecting sections, whereby the transmission of electric current is in parallel from one to the other
10 of any pair of said sections.

3. A tubular, zig-zag, carbon, electric resistor having circular limbs which pass to and from their correlative connecting sections, whereby in the electric transmission
15 of energy from one to the other of any pair of said sections the current density is the greater along the inner surface of the bore of the resistor.

4. A tubular, zig-zag, carbon, electric resistor having a supplemental inner tube 20 formed of material immune to oxidization.

5. A tubular, zig-zag, carbon, electric resistor whose exterior is heat-insulated and whose interior bore contains a supplemental tube immune to oxidization. 25

6. A tubular, zig-zag, carbon, electric resistor whose exterior is heat-insulated, whose inner bore contains a tube immune to oxidization and which also serves as a receptacle for articles to be heated. 30

This specification signed and witnessed this 10th day of September, A. D. 1918.

JOHN THOMSON.

Signed in the presence of—

JOSEPH KASTNER, JR.,

RALPH M. THOMSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."