

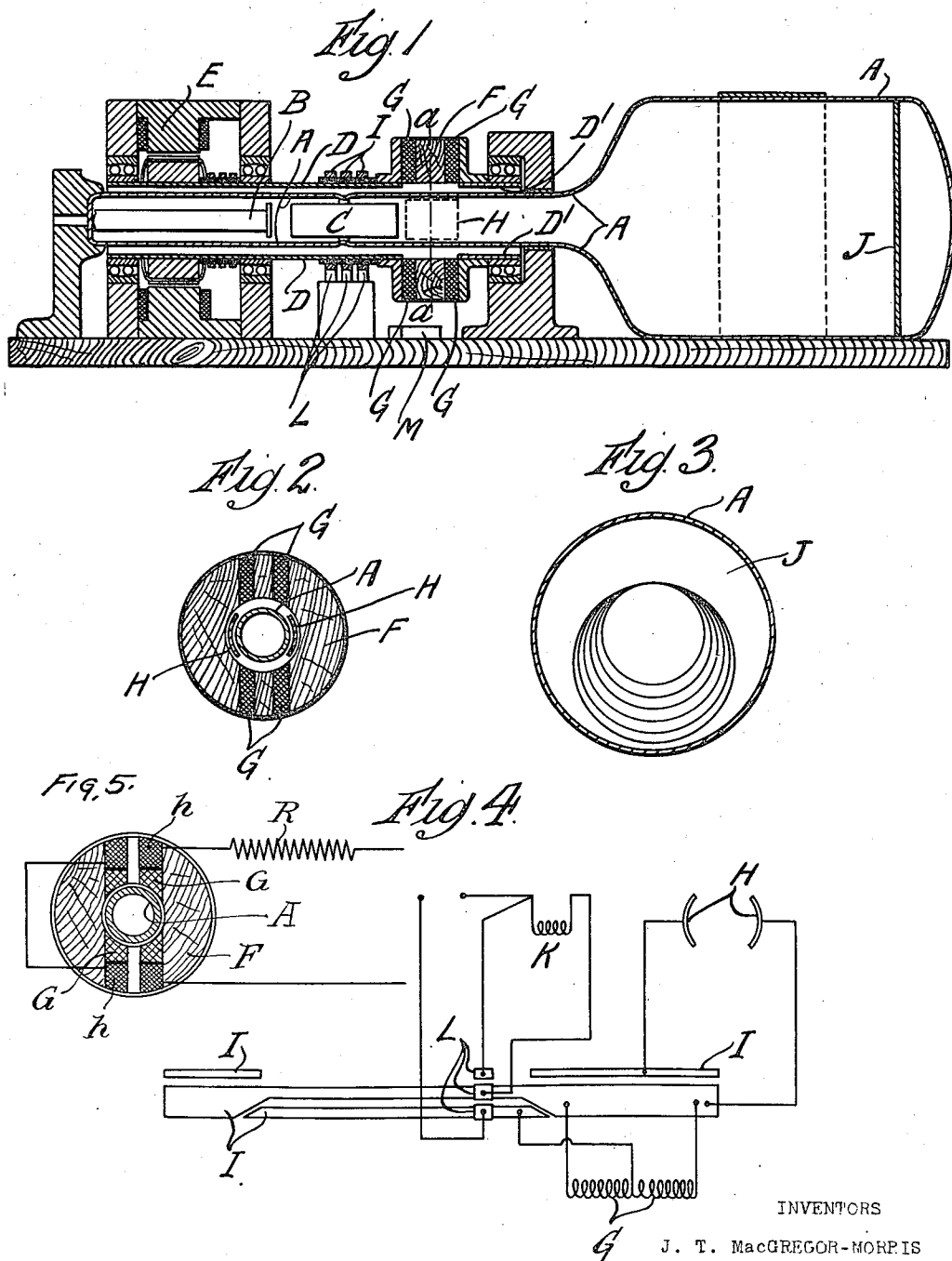
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MEANS FOR OBTAINING THE POLAR DIAGRAM OF AN ALTERNATING CURRENT WAVE

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UNITED STATES PATENT OFFICE.

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MEANS FOR OBTAINING THE POLAR DIAGRAM OF AN ALTERNATING-CURRENT WAVE.

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To all whom it may concern:

Be it known that we, JOHN TURNER MACGREGOR-MORRIS, a subject of the King of Great Britain, residing at 3, Lyndhurst Road, Hampstead, London, England, and FRANK RAYMOND FABER RAMSAY, a subject of the King of Great Britain, residing at East London College, Mile End Road, London, England, have invented new and useful Improved Means for Obtaining the Polar Diagram of an Alternating-Current Wave, of which the following is a specification.

The object of this invention is to provide simpler and less costly apparatus than has hitherto been known for producing the polar diagram of an alternating current wave.

It is known that if the cathode ray in a cathode tube be subjected to the action of an electromagnet or an electrostatic field it is deflected and that if the rays be allowed to fall upon a fluorescent screen in the tube the portion of the screen upon which they fall becomes luminous, so that if the field is due to an alternating current the trace on the screen is a straight line.

According to this invention we pass the current wave whose polar diagram it is desired to obtain through a device by means of which the cathode rays will be deflected and we cause this device to rotate uniformly around the axis of the tube at such a speed that it will complete one revolution in each cycle of the current, with the result that the diagram due to the negative portion of each cycle will be superimposed upon the diagram due to the positive portion, and thus a stable or persistent diagram will be visible upon the screen. This diagram may be viewed directly or may be photographed if a permanent record is required.

Our invention is illustrated by the accompanying drawing, Figure 1 of which is a vertical longitudinal section while Figure 2 is a cross section on the line *a-a*, Figure 1. Figure 3 shows the fluorescent screen and Figure 4 is a diagram of the connections. Figure 5 shows a modification.

A is a cathode ray tube having in it a cathode B and a tubular anode C. Surrounding the stem of the tube is a sleeve D on which is mounted the armature of an electric motor E and also a cylinder F of insulating material. In this cylinder are two coils G, G, arranged opposite to one another and also two plates H, H, also ar-

ranged opposite to one another and at right angles to the coils G, G. The plates and coils are connected to slip rings I. Beyond the cylinder F is a sleeve D', the two sleeves being mounted in ball bearings so that the armature, the sleeves and the cylinder F, may be readily rotatable.

When it is desired to obtain the current diagram of an alternating current wave the current wave is led through the brushes L to the slip rings I so that the current passes through the coils G, the motor E being driven from the same source of alternating current supply.

The motor is so constructed that the sleeves D and D' and with them the coils G rotate around the tube at such a speed that they complete one revolution in each cycle of the current.

If the current have a pure sine form the cathode ray will form on the fluorescent screen J a circle, and in order that it may be easily ascertained if the current is of pure sine form we preferably mark upon the screen as shown in Figure 3 a number of circles, all having one common point in their circumferences, by comparison with which the circular form of the diagram may be ascertained.

It is necessary that there be some provision for focussing the rays such that they only strike a very small portion of the screen at any one instant.

Preferably we provide means such as a permanent magnet M for imparting to the cathode rays an initial deflection, so that the diagram on the screen may be brought to the desired position.

If it is desired to obtain the voltage diagram of the alternating current wave, the current wave is led to the slip rings I so that the potential will be applied to the two plates H instead of the current being led through the coils G.

Should it be desired to obtain simultaneously a diagram of the current and of the voltage, the slip rings and connections may be arranged as shown in Figure 4. On an examination of this figure it will be seen that during half a revolution the current will pass via the brushes L and slip rings I through the coils G and through the load represented by K in series with the coils G but that for the other half of the revolution the potential will be applied to the

plates H, H, which are connected in parallel with the load. Thus one half cycle of the alternating current will give a current curve while the other half cycle will give a voltage curve, and as these two curves succeed one another in rapid succession both curves will appear to be visible together on the screen.

In place of the plates H, H, two fine wire coils h, h , (see Figure 5) in series with a high non-inductive resistance R may be used if desired and these coils may be wound on the same core as the coils G, G.

The motor E may be employed to generate the voltage necessary for the production of the cathode ray.

What we claim is:—

1. The combination with a cathode ray tube having a fluorescent screen of a device adapted to deflect the cathode rays, means for applying an alternating current wave to that device and means for rotating the device in synchronism with the wave.

2. The combination with a cathode ray tube having a fluorescent screen, of two coils arranged one on each side of the stem of the tube, means for applying an alternating current wave to the coils and means for rotating the coils around said stem in synchronism with the wave.

3. The combination with a cathode ray tube having a fluorescent screen, of an electric motor the armature of which can rotate about the axis of the stem of the tube and a device fast with the armature and adapted to deflect the cathode rays.

4. The combination with a cathode ray tube having a fluorescent screen, of an electric motor the armature of which can rotate about the axis of the stem of the tube and two coils arranged one on each side of the stem of the tube and fast with said armature.

5. The combination with a cathode ray tube having a fluorescent screen, of means

for producing around the path of the cathode rays an electromagnetic field due to an alternating current wave and means for rotating said field producing means around said path once for each cycle of the wave.

6. The combination with a cathode ray tube having a fluorescent screen, of means for producing around the path of the cathode rays either an electromagnetic or an electrostatic field due to an alternating current wave and means for rotating said field producing means around said path once for each cycle of the wave.

7. The combination with a cathode ray tube having a fluorescent screen, of two coils arranged one on each side of the stem of the tube, two plates also arranged one on each side of the stem of the tube, means for applying an alternating current wave to the coils, and to the plates, and means for rotating the coils and plates around said stem in synchronism with the wave.

8. The combination with a cathode ray tube having a fluorescent screen, of an electric motor the armature of which can rotate about the axis of the stem of the tube, two coils arranged one on each side of the stem of the tube, and two plates also arranged one on each side of the stem of the tube, the coils and plates being fast with said armature.

9. The combination of a cathode ray tube comprising a stem having in it a cathode and a tubular anode, a fluorescent screen within the tube, an electric motor the armature of which is hollow and surrounds said stem, two coils arranged one on each side of said stem and fast with said armature and means for passing an alternating current through the motor and the coils.

In testimony that we claim the foregoing as our invention we have signed our names this nineteenth day of January, 1923.

JOHN TURNER MacGREGOR-MORRIS.
FRANK RAYMOND FABER RAMSAY.