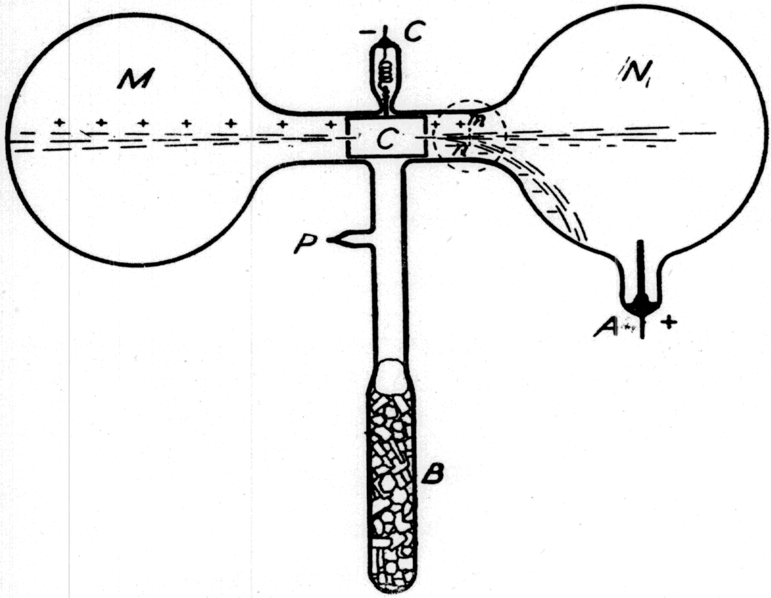
VISIBLE COLOR EFFECTS IN A POSITIVE RAY TUBE CONTAINING HELIUM

ABSTRACT

CHAS. T. KNIPP, UNIVERSITY OF ILLINOIS

In a recent number of Science[1] the writer described a positive ray tube, containing a hollow cathode, in which the distinguishing features are the color effects of the cathode and canal rays when the residual gas in the tube is either hydrogen, helium, argon or neon. For example, when the tube contains a trace of helium the cathode beam presents an apple green color, while in the same gas the canal ray beam is orange.



Recently the writer was able to show within the same tube by the visible color effect produced, the retrograde rays as well. The color of these rays borders on purple. By reference to the figure the relative position of the various beams is apparent. The cathode rays are bent out of the way by a magnetic field perpendicular to the plane of the paper and placed in the position of the dotted circle. This comparatively weak field has

1. Knipp, Science, 42, Dec. 31, 1915.

no deflecting effect on the heavy retrograde rays (ions negatively charged) streaming to the right in the bulb N, and of course none on the positively charged ions traveling to the left in M.

As pointed out, in the article referred to above, the positive rays have their origin at the edge of the Crookes dark space in front of the cathode, indicated by the broken line *mm*. To show the color of the retrograde rays to the best advantage the air must be all removed from the tube and the quantity of helium just right, also the bulbs should be of lead glass to avoid excessive fluorescence, and the cathode openings should not be too large.

These retrograde rays were overlooked for some time, though it was well known from their photographic effect that they were present in a tube of this construction. When the above conditions were complied with, we have the rather unusual spectacle of *three different colors,* all visible to the naked eye, in the region immediately in front of the cathode—a purple color due to retrograde rays; orange, due to positive rays; and apple green, due to cathode rays.