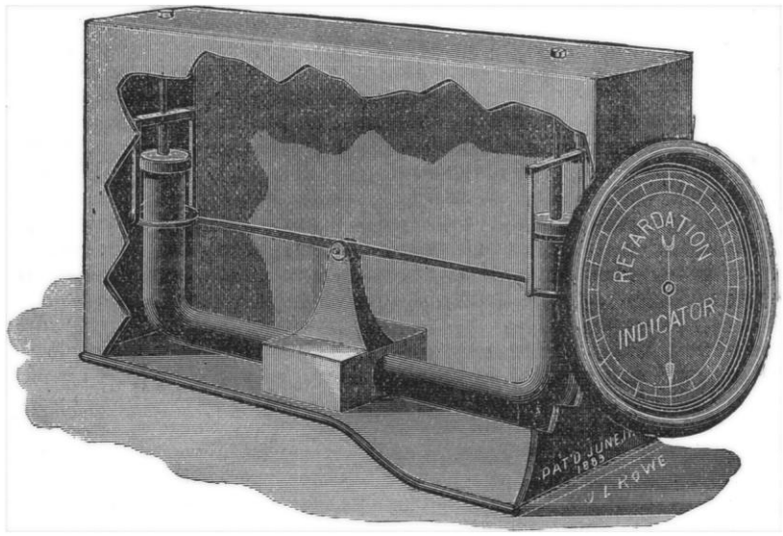
ARNOLD'S RETARDATION INDICATOR.

THE retardation indicator shown in the accompanying engraving is an apparatus intended to be placed in the cab of a locomotive, for indicating the relative measure of resistance exerted by the air-brakes when arresting the momentum of the train. By its use the person operating the brakes may be enabled to so regulate the steam or air pressure applied to the brakes as to prevent a too rapid stoppage of the train, and the consequent discomfort to the passengers.

The indicator consists of a tube, with upturned ends, arranged horizontally in the cab or car, the axis of the tube being parallel with the direction in which the train is to move. This tube contains mercury, which, as the train starts or stops, shows a difference of level in the upturned ends of the tube, governed by the rapidity of the starting or stopping, the change of momentum being proportional to the impulse producing it. Each end of the tube is provided with a freely moving piston, which rests upon the surface of the mercury. These pistons are attached to an arm which is pivoted in the centre, the pistons exactly balancing each other. Attached to an extension of this arm is a bevel-geared sector, which meshes into a pinion connected with the pointer on the dial-plate. When the train is at rest, or moving at uniform speed, the pointer remains at zero on the dial; but, when starting up or slowing down, the pointer moves around the dial, to the right or the left, a distance proportional to the rapidity of the starting or the stopping.



ARNOLD'S RETARDATION INDICATOR.

Among the advantages claimed for it are the following: it shows the engineer at any instant the effect of the brakes upon the wheels, and enables him to retard the train uniformly, regardless of the condition of the track or of the air-pressure; it economizes the air, and prevents an undue shock or strain on the brake-rigging or the car-body; and it enables the engineer to apply the brakes gradually, and with increasing effect, until the train is brought to rest. The indicator is manufactured by J. H. Reynolds of Troy, N.Y.

ELECTRICAL NEWS.

Incandescent Electric Lamp Filaments.

IN a recent communication to the Academy of Natural Sciences of Philadelphia, on the use of bamboo in incandescent electric lighting, Professor William P. Wilson states, that, for want of a homogeneous structure, the ordinary exogenous woods are not adapted to the construction of lamp-filaments. Such woods are made up of wood-cells of varying lengths and shapes in combination with a variety of ducts and vessels.

The walls of the wood-cells may be more or less thickened, the vessels and ducts may be larger or smaller, numerous or infrequent, according to the kind of wood examined. There are always enough of these vessels and ducts combined with the wood-cells in any stem to render the structure exceedingly heterogeneous. Most of these cells and vessels have their longer diameter parallel with the general direction of the stem. Groups of thin-walled, prismatic cells pass radially from the central portion of the stem to the circumference. These groups of cells are called medullary rays. It is impossible to cut a filament from any of these woods so that the medullary rays will not cross it many times at right angles to the ducts and long cells. The character of the cells forming these rays is so very different from the others in the filament, as to shape, direction, and thickness of the walls, that at the crossing points resistance is greatly increased, thus causing rapid burning and destruction at such points.

Such woods as hickory and rock-elm furnish the very best of our timbers. They are the toughest and most durable of our woods, but they do not make good filaments. The medullary rays are very numerous, and the walls of the cells composing them are greatly thickened. The long, pointed, thick-walled wood-cells do not follow a parallel course, but interlace with each other. This interlacing of the cells gives to these woods their toughness. It is the main characteristic, also, which renders them worthless when made into electric filaments. Upon carbonization of such filaments, the tension of the interlacing cells is relieved, and the tissues composing it become friable, and easily fall apart.

In the adult stem of the bamboo a combination of anatomical characters has brought about a result which makes it the most fitting material, so far as now known, for the electric filament. The nearly parallel fibro-vascular bundles grow more numerous as they approach the circumference of the stem, and, as is usual in similar stems, lose most, or sometimes all, of the woody elements, thus becoming pure bast. The parenchymatic tissue, which toward the centre of the stem may be composed of a layer of five or six cells between the bundles, decreases in amount near the circumference until but one layer of cells remains. The walls of the cells in this single layer often become so thickened, and at the same time compressed by the growth of the bast, that these bundles appear to make a solid zone of bast around the circumference of the stem. The bast-cells also continue to thicken their walls until they become, in the best specimens for the filament, completely filled and solid. It is from this zone of bast at the circumference of the stem that the filament is always taken. It is perhaps the nearest approach, in its continuity of structure and uniform character, to a metallic conductor, of any tissue which can be found in the vegetable kingdom.

Photographs of Lightning.

At a meeting of the Physical Society of London held June 22, and reported in *Nature*, Mr. A. W. Clayden presented a note on some photographs of lightning, and of "black" electric sparks. The lightning photographs, three in number, were obtained dur-