and forth, straining the insulation to the utmost.

The insulation may be compared to an elastic substance acting as the containing medium of a fluid. As the electrostatic charge accumulates at one place on the line, the insulation is endangered, just as would be the case in a rubber tube containing water if the latter should accumulate in one end; the rubber walls would stretch more and more as the water accumulated; the elastic limit would finally be reached, the rubber would burst and the water spill out. Likewise, with an induced charge in a conductor, as the induced charge assumes a greater and greater value under the influence of the inducing charge, the insulating medium separating the two is strained more and more till the limit is finally reached, when it breaks down and an electric discharge occurs. The insulating medium does not stretch mechanically, as does the elastic wall, but its insulating power is strained until it breaks down, if the accumulation of the charge be sufficient.

Electrical conductivity is only a relative term; there is no perfect conductor of electricity, neither is there a perfect insulator. The resistance of heavy copper bars in many cases is so small as to be negligible, while under ordinary conditions the conductivity of insulators used on high-voltage transmission lines is too small to be considered, and yet it is possible for the electric charge to break down the insulation and pass to earth.

ELECTRIC SURGES.

The long transmission lines now in such general use accumulate charges at different points, due to the inductive action of the electrical charges of the atmosphere. When the latter vary and the transmission system is long, electrical surges will take place in the line which are of considerable magnitude and extremely difficult to control, because subjected to so many varying influences. All of this can happen without the line being struck by lightning, simply by electrostatic induction, as already explained.

These surges are also frequently caused by internal disturbances in the transmission system, due to switching, short-circuits or grounds. For example, an arc from a transmission line over a defective insulator to ground results in a heavy rush of current and produces a series of traveling waves or recurrent surges. These phenomena, caused by abnormal internal conditions of the system, are commonly referred to as "internal lightning."

Chicago Electric Club.

At the meeting of the Chicago Electric Club, directly after luncheon on April 7, Perry Boole, of the house committee, reported on the efforts to get permanent quarters for the club. The prospects in this connection not being particularly favorable, the committee recommended that the subject be temporarily dropped. The programme for the meeting provided for a discussion of electric heating devices, the principal address being made by E. L. Callahan, of the General Electric Company.

Mr. Callahan devoted the principal part of his address to a forceful demonstration of the desirability of all interests connected with the electrical industry boosting the sale and use of electrical heating appliances. He stated that these devices, whether for household or industrial uses, have passed the experimental stage and have been developed into reliable utensils that are here to stay. While economy is still not one of the strong points of the direct electric method of doing all the cooking in the home, the recent development of the electric fireless cooker has resulted in a most promising and efficient combination. The speaker compared the trade in electric flatirons of more than ten years ago with what it is today.

F. J. Holmes, of the Vulcan Electric Heating Company, opened the general discussion by stating that electric heating in many of its applications, particularly industrial, is the cheapest as well as the best means of producing heat. To illustrate this, he cited a case where the use of electric soldering irons had been found decidedly cheaper and more satisfactory in every way than the old irons heated by gasolene torches. Harold Almert, lately of Wichita, Kan., explained why central stations had formerly sometimes found it inadvisable to push the use of electric-heating appliances and how their introduction should be effected in order to produce results satisfactory to all concerned. Leonard Kebler, president of the Ward Leonard Electric Company, emphasized the fact that most electric-heating devices are now as dependable as rheostats. G. B. Johnson, of the Commonwealth Edison Company, spoke briefly of how this company in four months put out 10,000 electric flatirons on approval. H. F. Holland, of the Pacific Electric Heating Company, closed the discussion by referring to some of the good points that make the electric flatiron so popular.

Special Railroad Rates for Machinery Manufacturers' Conventions.

It is announced that for the joint convention of the Southern Supply and Machinery Dealers' Association, and the American Supply and Machinery Manufacturers' Association, to be held in Chattanooga, Tenn., May 5, 6, 7, the Southeastern Passenger Association has granted a rate of one-and-one-half fares, plus fifty cents, for round trip under the certificate plan, and the Trunk Line Association has granted a rate of one-and-three-fifths fares, plus twenty-five cents, for round trip under the certificate plan.

Also, for the joint convention of the National Supply and Machinery Dealers' Association, and the American Supply and Machinery Manufacturers' Association, to be held in Pittsburg, Pa., May 12, 13, 14, the New England Passenger Association has granted a rate of one-and-three-fifths fares, plus twenty-five cents, on the certificate plan, for points in Trunk Line territory outside of Pennsylvania, and two cents per mile in each direction on round-trip tickets from points in Pennsylvania east of Pittsburg.

Purchases by the United States Navy Department.

The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on April 20 next for the following electrical supplies. Bidders interested therein should fill out the enclosed application card, giving the schedule numbers desired, and forward same to the bureau without delay.

Article.	Quantity.	Delivery at Navy Yard.	Schedule.
Batteries, storage.	1,100	Works	1112
Boards, panel and cabinet distribution	2	New Orleans, La.	1110
Cable, electric, etc.	Miscellaneous.	New Orleans, La.	1110
Conductor, rubber-covered	10,000 feet	Annapolis, Md.	1113
Supplies	Miscellaneous.	New Orleans, La.	1110

Railroad Electrification.

The Northern Pacific Railway Company is conducting a preliminary investigation, and is negotiating with the Madison River Power Company for electric power to operate trains over the Montana division.

The St. Paul road has already decided to electrify the division of the road, and is awaiting the development of the power project at Great Falls by John A. Ryan and associates.