

instance, in packing houses, wire with a better insulation than underwriters, standard must be used. The moisture which covers insulators and wire would cause considerable leakage, and, besides, would corrode the wire. The use of wood cleats or iron staples instead of porcelain insulators should not be permitted in any case, as they are liable to cause grounds and, in fact, have been the source of mischief in a good many cases in years gone by.

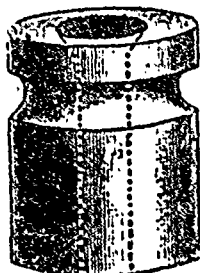


FIG. 11.

INCANDESCENT CIRCUITS INSIDE OF HOUSES.—In the low tension systems, wooden cleats or wooden molding are permitted for fastening the wires to the walls and ceilings if there is absolute safety from moisture. Underwriters' wire may be used also under the same conditions. If there is any possibility of moisture getting to the wires, the latter should be first-class water-proof insulation. If any "fishing" has to be done, where wires are to be concealed under floors, above ceilings, or between walls or laths, only water-proof wire can be used. Incandescent wiring inside of houses requires a good deal of skill and experience, and should only be entrusted to reliable and responsible concerns. Unfortunately, any man who ever fastened a piece of wire for a bell-pull, thinks himself an expert also for incandescent wiring; a good many even important jobs have been done by such men, with the result that, after a great expenditure of money by the owner of the house, the whole system had to be condemned, as not an inch of the wire had been put in properly and could be used.

The joints or connections in water-proof wire should be made water-proof also. This is done in the following way: After

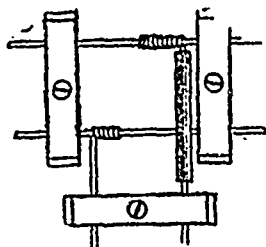


FIG. 13.

having spliced, soldered and cleaned the wires properly, cover the joint with hot Chatterton's compound by molding it between the fingers to almost the total thickness of the insulated wire. Then cover it with kerite tape and give it a second thin coating with hot compound, or hot asphaltum, and then give it a second coat of kerite tape. Hot liquid asphaltum should be used in lieu of compound where there is danger from sewer or illuminating gas that is prevalent in the soil and basements of houses in large cities.

Figs. 12, 13, 14, 15 and 16 show the use of cleats. Fig. 12 shows a familiar form of cleat. Where the positive wire crosses the negative, an extra protection of rubber tube is required to prevent any danger from short circuits, Fig. 13.

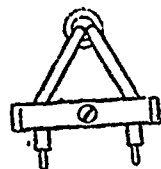


FIG. 15.



FIG. 16.

In passing through a wall, each wire should be inserted in a separate hole, lined with a hard rubber tube, Fig. 14, or each wire should be covered with soft rubber tubing and both may be drawn through one hole, Fig. 15, lined with a pipe of non-conducting water-proof material.

Fig. 16 is a cross-section of wood molding. The lower part is fastened to the wall or ceiling, the wires put in—positives in one

groove and negatives in the other—and the cover screwed on. Care must be taken that nails or screws do not touch the wires.

The safety plugs are put in the circuit according to the rules of the fire underwriters. They must be of such size that they will fuse before the wire they have to protect can get dangerously warm.

SIZE OF WIRES FOR INCANDESCENT LAMP INSTALLATIONS.—The wire for each main or branch must be of such size that it can carry the current to the lamps which are connected to it, without getting very warm. The number of amperes a wire can thus safely carry is called its carrying capacity. The larger the wire the less the loss; the smaller the wire the higher the loss. In house wiring not more than 5 per cent. loss should be allowed from the dynamo to the lamp.

For those who want to give this matter more study the following formulas are given. Any one who understands arithmetic will be able to calculate the size of wire for any loss and for any lamp:

n = number of lamps.

d = distance = $\frac{1}{2}$ length of circuit.

$\%$ = energy lost in the conductors, expressed in decimal fractions of 100 as 5% = .05.

r = resistance in ohms.

$$1. \quad r \text{ of wire} = \frac{r \text{ of lamp hot} \times \%}{n}$$

$$2. \quad \text{Length of wire : } 1000 = r \text{ of wire : } r \text{ per } 1000 \text{ feet.}$$

$$3. \quad r \text{ per } 1000 \text{ feet of wire} = \frac{r \text{ of lamp hot} \times \% \times 1000}{n \times 2 \times d}$$

$$4. \quad r \text{ per } 1000 \text{ feet of wire} = \frac{\text{constant}}{n \times d}$$

$$5. \quad \text{Constant} = 500 \times \% \times r \text{ of lamp hot.}$$

EXAMPLE: Find size of wire necessary to carry 40 sixteen candle power lamps ($r=167$ ohms hot), 500 feet, 10% loss.

$$\text{Formula 5: Constant} = 500 \times .10 \times 167 = 8350.$$

$$\text{Formula 4: } r \text{ per } 1000 \text{ feet} = \frac{8350}{40 \times 500} = .417 \text{ ohms.}$$

This is the resistance per 1000 feet of the wire necessary to use. If the resistance hot of the lamp should not be known it can be calculated from Ohm's law. $C = \frac{E}{R}$ or $R = \frac{E}{C}$. Suppos-

ing the e. m. f. = 100 volts and the current = $\frac{5}{10}$ amperes, R would equal $\frac{100 \times 10}{5}$, or $R=200$.

TESTING.—The circuit should be tested every day for grounds by means of the detector galvanometer or a magneto bell. If a ground is indicated it should be speedily located by disconnecting the circuit in different places and taking each section separately, until the ground is located.

TRADE NOTES.

The contract for lighting the town of Lunenburg, N.S., has been awarded to the Edison General Electric Co. Plant to be installed is 750 incandescent lamps.

The contract for lighting D. W. Alexander's tannery has been awarded to the Edison General Electric Co. Plant to be installed consists of 180 incandescent lamps.

The contract for electric light plant at Merrickville, Ont., has been awarded to the Edison General Electric Co. Plant to be installed will consist of 500 incandescent lamps.

The contract for electric lighting at Niagara Falls, Ont., was awarded to the Edison Co. on Jan. 22nd. Eight different companies were competing. The contract was awarded to the Edison Company on its merits, as their price is said to have been nearly the highest of any of the tenders. The plant to be installed consists of 60 arc lights and 750 incandescent.

The Windsor Electric Light and Power Co., of Windsor, N. S., started up their Edison plant on Nov. 15th. 1,000 lights are installed and in operation, and giving such satisfaction that it has been found necessary to increase the plant, and an additional order for two Edison dynamos has been given to the Edison General Electric Co., which will give the plant a capacity of 1,600 sixteen c. p. incandescent lamps.

We had thought that the talented and versatile newspaper reporter had invented about all the possible causes of boiler explosions, but a new one comes from St. John, N. B., where a boiler exploded with great violence (as they nearly always do), killing six men and wrecking build-ings. The despatch says: "From what can be learned, the boilers were low, the water was turned on, and the person in charge neglected to turn it off, with the result that the boilers overflowed and exploded." From this it will be seen that it is very dangerous to allow boilers to overflow.—*American Machinist.*