

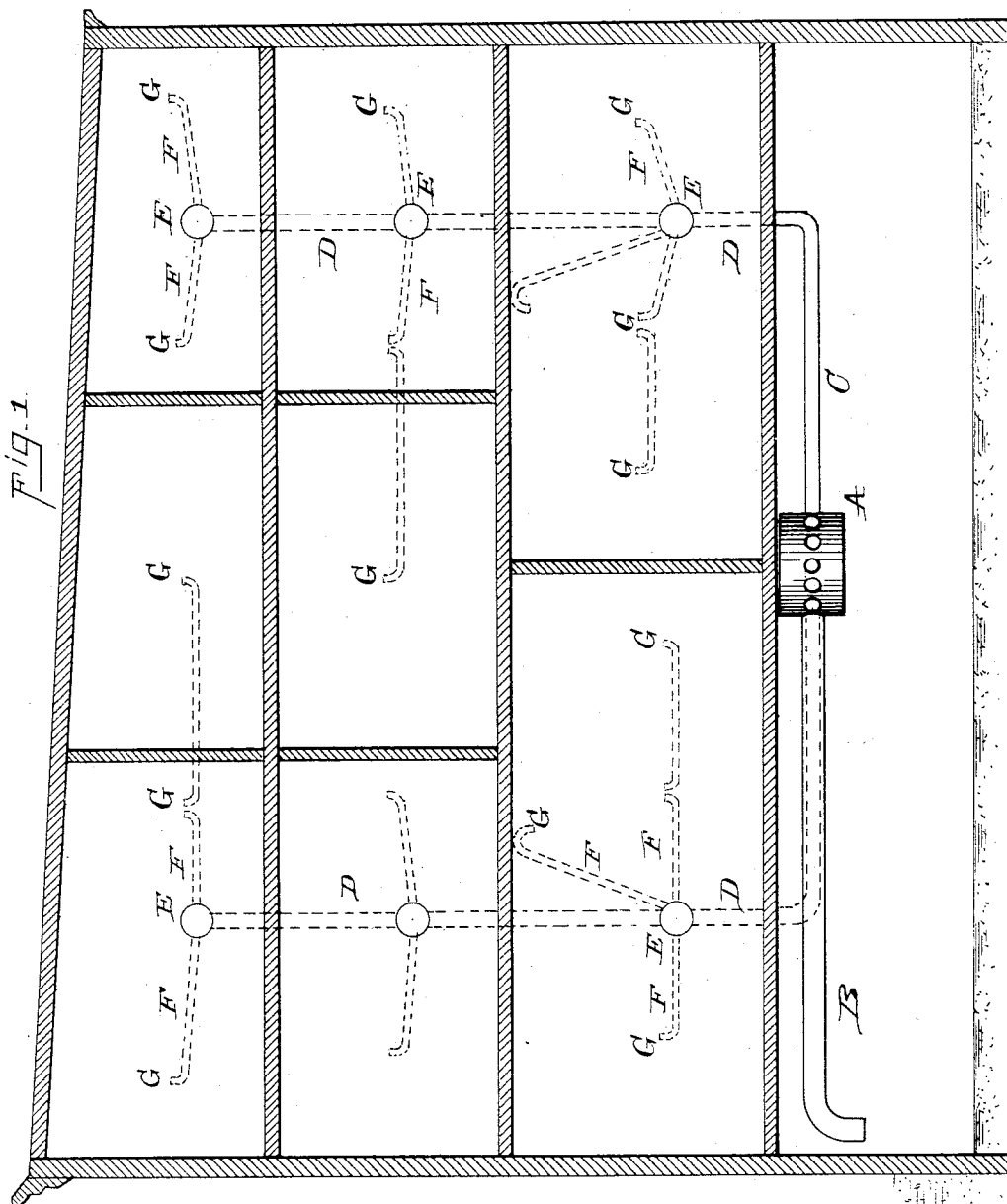
(No Model.)

4 Sheets—Sheet 1.

E. H. JOHNSON & E. T. GREENFIELD.
WIRING STRUCTURES FOR ELECTRIC LIGHTING.

No. 401,498.

Patented Apr. 16, 1889.



Witnesses,
W. H. Lowland
William Ryer

Inventors
Edward H. Johnson
Edwin T. Greenfield
By their Attorneys
John R. [Signature]

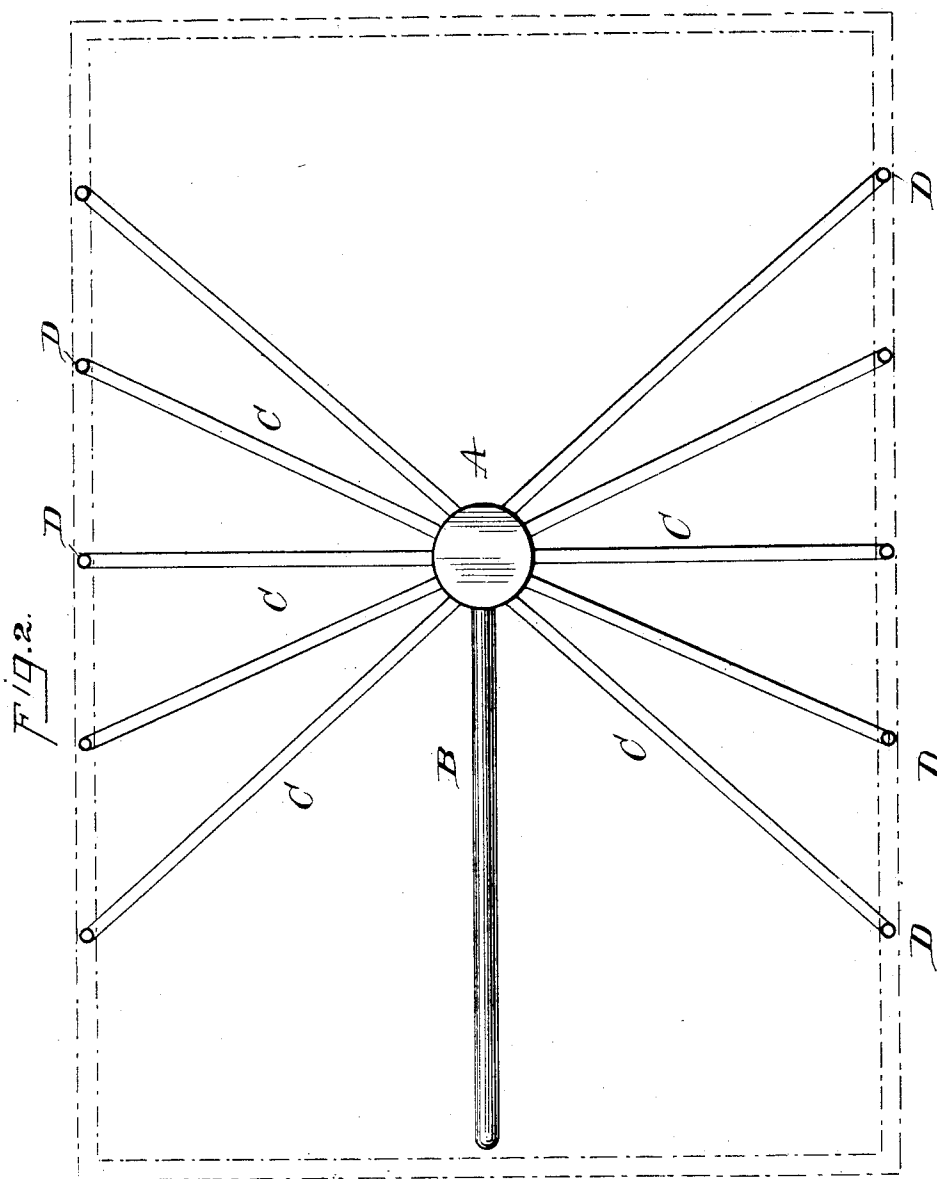
(No Model.)

4 Sheets—Sheet 2.

E. H. JOHNSON & E. T. GREENFIELD.
WIRING STRUCTURES FOR ELECTRIC LIGHTING.

No. 401,498.

Patented Apr. 16, 1889.



Witnesses
E. Howland
William Ryer

Inventors
Edward H. Johnson
Edwin T. Greenfield
By their Attorneys
John Day

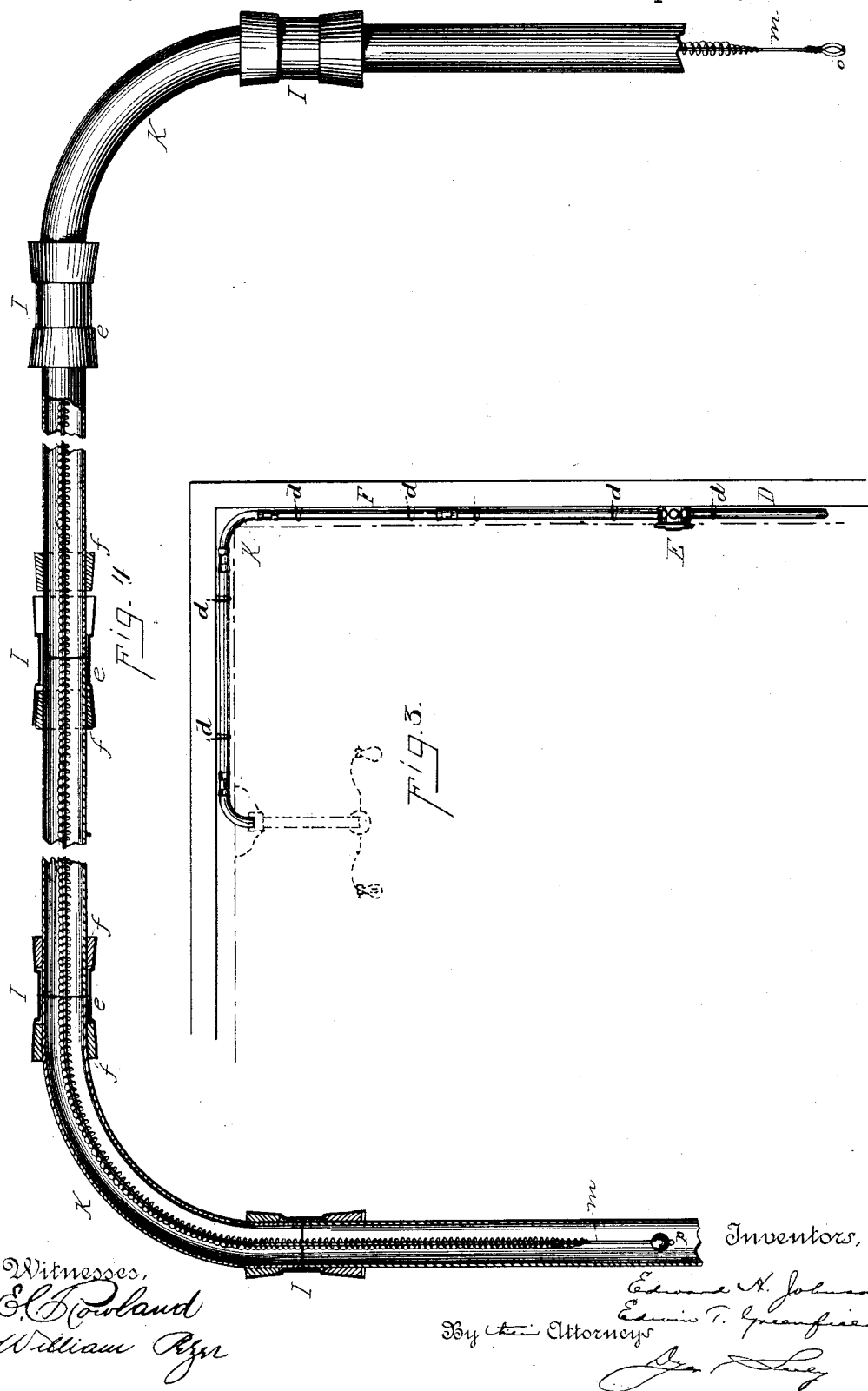
(No Model.)

4 Sheets—Sheet 3.

E. H. JOHNSON & E. T. GREENFIELD.
WIRING STRUCTURES FOR ELECTRIC LIGHTING.

No. 401,498.

Patented Apr. 16, 1889.



Witnesses,
E. J. Howland
William Ryn

Inventors,
Edward H. Johnson
Edwin T. Greenfield
By their Attorneys
Geo. L. Lacey

E. H. JOHNSON & E. T. GREENFIELD.
WIRING STRUCTURES FOR ELECTRIC LIGHTING.

No. 401,498.

Patented Apr. 16, 1889.

FIG. 5.

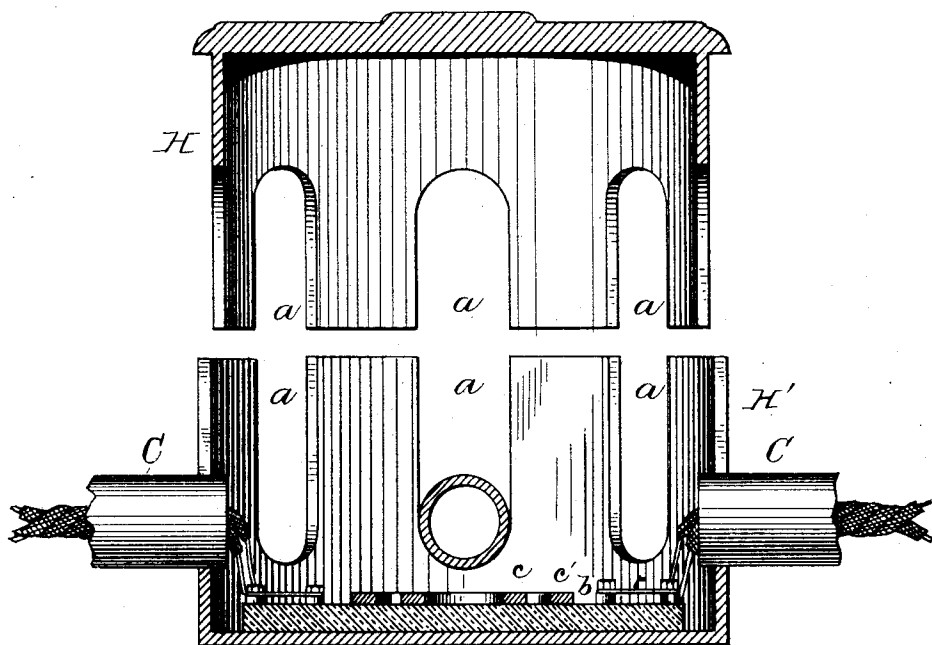
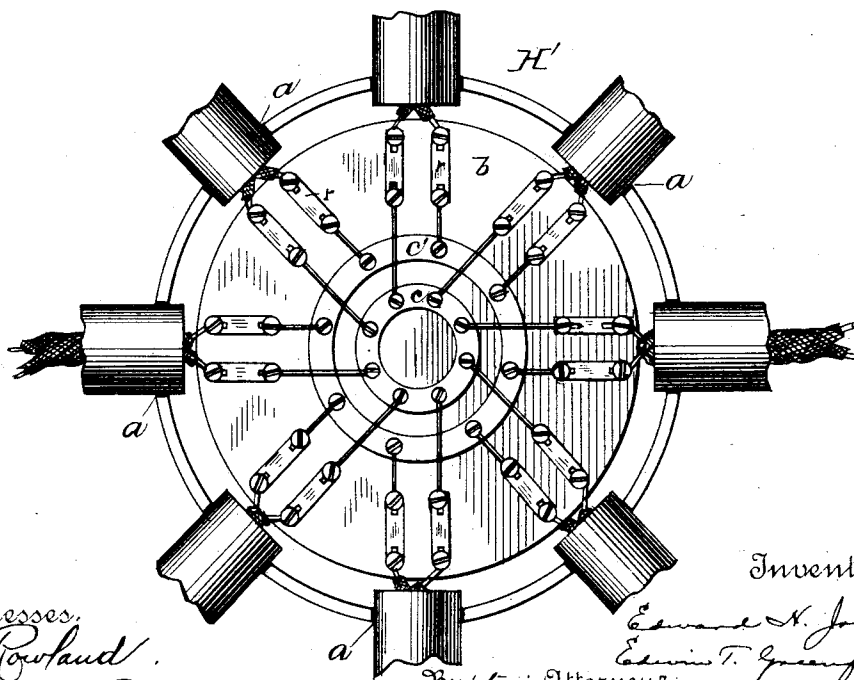


FIG. 6.



Witnesses,
E. Rowland,
William Rye

By their Attorneys

Inventors,

Edward H. Johnson
Edwin T. Greenfield
J. H. Day

UNITED STATES PATENT OFFICE.

EDWARD H. JOHNSON AND EDWIN T. GREENFIELD, OF NEW YORK, N. Y.

WIRING STRUCTURES FOR ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 401,498, dated April 16, 1889.

Application filed September 21, 1888. Serial No. 285,997. (No model.)

To all whom it may concern:

Be it known that we, EDWARD H. JOHNSON and EDWIN T. GREENFIELD, both of New York city, in the county and State of New York, have invented a certain new and useful Improvement in Wiring Structures for Electric Lights, of which the following is a specification.

The object of our invention is to enable houses and other structures to be readily provided with wires for electric lighting and to enable any wire in a building to be readily removed and replaced by another when necessary, and also to furnish protection from fire due to crosses or leakage on the wires.

In carrying our invention into effect we place the conductors in pipes or conduits made of insulating material, through which pipes the wires extend to the points where they are to be connected with fixtures or electric lamps. Preferably the structure is provided with a complete system of such pipes or conduits extending continuously to every place where an outlet is required, the pipes being all joined together through suitable junction-boxes, which gives access to each pipe at its extremity. This enables us, when the building is to be wired, to very readily and conveniently run the wires by "fishing" them through each pipe from the junction-box to the outlet; and, further, it enables us, whenever a wire becomes damaged or its insulation deteriorated in any way, to readily disconnect such wire and withdraw it and put another in its place without disturbing any of the other wires or other details of the building.

We employ for our conductors within the pipes two wires placed in close proximity by twisting them together, the wires being insulated from each other and the two wires forming opposite sides of the circuit. At the junction-boxes and at all points where the wires branch we interpolate fusible links or safety-catches therein. One object of confining the wires in close proximity is to make certain the operation of the safety-catches. When a leak occurs between the two sides of a circuit, it is intended that the safety-catches shall give way at once; but in practice with the ordinary arrangements this often does not occur, for leaks sometimes occur which are of

too high resistance to cause such flow of current as will fuse the safety-catches, but are still sufficient to cause danger from fire; but by placing the wires close together any slight leak immediately increases in extent and causes a short circuit of low resistance, which at once causes the safety-catches to give way. In addition, no serious fire can occur in the confined space within the tubes, for any combustion will be smothered by the lack of air and draft. The wires being protected from mechanical injury and from contact with dust or other foreign materials, and the pipes being of insulating material, the chances of the occurrence of a leak are very slight, and if any leak does occur the circuit is at once broken by the safety-catches, whereby the most complete immunity from danger of fire is insured.

Our invention is illustrated in the accompanying drawings. Figure 1 is a longitudinal section of an ordinary house, illustrating the general arrangement of the pipes; Fig. 2, a plan view showing the pipes in the cellar or basement of the building. Fig. 3 illustrates the arrangement of a pipe within a room. Fig. 4 is an enlarged view, partly in elevation and partly in longitudinal section, of a line of pipe, illustrating the joints and elbows and the peculiar fishing-wire which we prefer to employ. Fig. 5 is a vertical section of a junction-box with its two halves separated, and Fig. 6 a top view of the lower half of the box.

A main junction-box, A, is placed at a convenient point, usually in the basement or cellar of the building. A pipe, B, extends from this box to the front of the house. From the openings in the junction-box A a number of pipes, C C, radiate to different parts of the building, and are joined to vertical pipes or risers D D, which extend up through the house, and have on each floor a junction-box, E, from which branch pipes F F extend to outlets G G.

The junction-boxes are all preferably of the construction illustrated in Figs. 5 and 6, each consisting of two cylindrical halves, H H', the upper half fitting into the lower half, and each half being provided with notches a, which form circular pipe-openings when the two halves are placed together. The

boxes are made of metal or other suitable material. A block, *b*, of wood or other suitable insulating material, is set in the bottom of the box, and on this block are fixed two
5 metal rings, *c c'*, or other contact-plates for making multiple-arc electrical connections within the box.

All the pipes B, C, D, and F are made as small and light as possible. We make them
10 of insulating material, and preferably of thick paper or pasteboard, which is impregnated with a suitable moisture-proof and non-inflammable paint or compound.

The pipes D and F we prefer to place under the plaster of the walls or partitions of the house, securing them to the studding or elsewhere by ordinary double-pointed staples,
15 *d*, Fig. 3. The junction-boxes E are also secured to the studding, and their upper halves or covers project outside of the line of the plaster, which is indicated by the dotted line in Fig. 3.

Where two lengths of pipe are to be joined, we prefer to employ coupling devices I I for
25 this purpose. These consist each of a spun-metal sleeve, *e*, made flaring at both ends, and beveled split bushings *ff*. The bushings *ff* being placed on the ends of the pipes to be joined, such ends are inserted in the sleeve *e*,
30 and the bushings, being then grasped by a suitable tool, are forced as tightly as possible into the sleeve, whereby the sleeve is wedged upon the pipes and the same are tightly secured together. This furnishes a secure joint,
35 and one which has no inwardly-extending edges or projections to catch the wire and obstruct its passage through the pipe.

For bringing the pipes around corners, we provide elbows K, preferably made of insulating material, which may be the same as
40 that of the pipes. We make these elbows with as wide a curve as possible to make the passage of the wires through them as easy as possible, and with straight extremities of sufficient length to enable them to be readily
45 coupled in line with the straight pipes.

The system of pipes will in new buildings be put in position before the plaster is put on. Where old buildings are to be wired, the
50 same methods are followed as in providing buildings with gas or other pipes.

In Fig. 3, D may represent a vertical riser, and E a junction-box in the uppermost story of the house, while F is a pipe extending up
55 the wall and across the ceiling to the middle of the room, where an elbow is placed, projecting below the plaster, whereby connection is to be made with an electrolier. (Represented in dotted lines.) From the remaining
60 openings of the junction-box pipes may be run to outlets for side lights or other lights, various arrangements being illustrated in Fig. 1. The house being thus provided with a complete system of pipes, each of which is
65 readily accessible at both ends, when wires are to be run, we employ, preferably, a fishing-wire such as is illustrated in Fig. 4. This

consists of a core, *m*, of steel wire wound spirally over its whole length with another wire. An eye, *o*, is formed at one end, and a weight,
70 *p*, may be placed at the other. Now, if it is desired to run a wire from the main box to a first-story junction-box, the latter is opened and the fishing-wire is inserted into the
75 vertical pipe D and passed through it into pipe C, and so on to the box A, the end having the eye *o* entering said box and the other end projecting at box E. The conducting-wire is then hooked to the eye *o*, and so is
80 drawn up through the pipes to box E. In a similar way the wires are run through the branch pipes F to the various outlets, the fishing-wire being first passed through the pipe in whatever direction is more convenient, and the conducting-wire then attached to it and
85 drawn through the pipe. The peculiar fishing-wire which we employ is stiff enough to be pushed readily through the pipes and flexible enough to pass around the elbows without difficulty.

For the conductors which are placed in the tube we prefer to use the ordinary flexible cord—that is, two flexible conductors twisted together and in a common braided retaining-covering, each wire forming one side of the
90 circuit. The wires twisted together are illustrated in Figs. 5 and 6 of the drawings.

The wires being placed in the pipes, the connections are made in the junction-boxes. This may be conveniently done, as shown in
100 Fig. 6, all the positive wires being joined to one of the rings *c c'* and all the negative wires to the other. Fusible safety-catches *rr* are interpolated, preferably, in each side of each circuit within the junction-box, and thus
105 safety-catches are provided for each outlet, which makes it unnecessary in most cases to provide safety-catches in the fixtures. The safety-catches in the junction-boxes are readily accessible and can easily be replaced
110 when destroyed.

If at any time any one conductor extending from a junction-box to an outlet becomes deteriorated or damaged, such wire can readily
115 be removed by disconnecting it at both ends and drawing it out of the pipe, and another wire can with great readiness be fished through and connected in its place.

What we claim is—

1. In house-wiring for electric light, the combination of a pipe of insulating material, a pair of wires insulated from each other and placed in close proximity to each other within
120 said pipe, and each forming one side of an electric-lighting circuit, and a safety-catch interpolated in said circuit, substantially as set forth.

2. In house-wiring for electric light, the combination, with the building or structure, of a system of insulating-pipes extending throughout the same, and comprising main and branch
130 pipes, a pair of wires in each pipe, insulated from each other and placed in close proximity to each other, and each forming one side of

an electric-lighting circuit, and safety-catches interpolated in the circuit, substantially as set forth.

5 3. In house-wiring for electric light, the combination of a pipe of insulating material, a pair of insulated wires twisted together within said pipe, each wire forming one side of an electric-lighting circuit, and a safety-catch interpolated in said circuit, substantially as set
10 forth.

15 4. In house-wiring for electric light, the combination, with the building or structure, of a system of pipes extending throughout the structure, comprising main pipes, branch pipes extending from said main pipes continuously to all points where outlets are required, junction-boxes connecting the branch pipes to the main pipes, a pair of wires placed loosely in

each pipe, such wires being placed in close proximity to each other and insulated from each other, and each forming one side of the electric-lighting circuit, and safety-catches in the junction-boxes connecting the wires of main and branch circuits, substantially as set forth.

25 5. The fishing-wire having, in combination, a core of wire and a flexible wire coiled spirally on said core, substantially as set forth.

This specification signed and witnessed this 14th day of September, 1888.

EDWD. H. JOHNSON.

EDWIN T. GREENFIELD.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.