(No Model.) 2 Sheets—Sheet 1.

E. T. STARR & W. J. PEYTON.

ELECTRIC LIGHTING.

No. 260,624. Patented July 4, 1882.

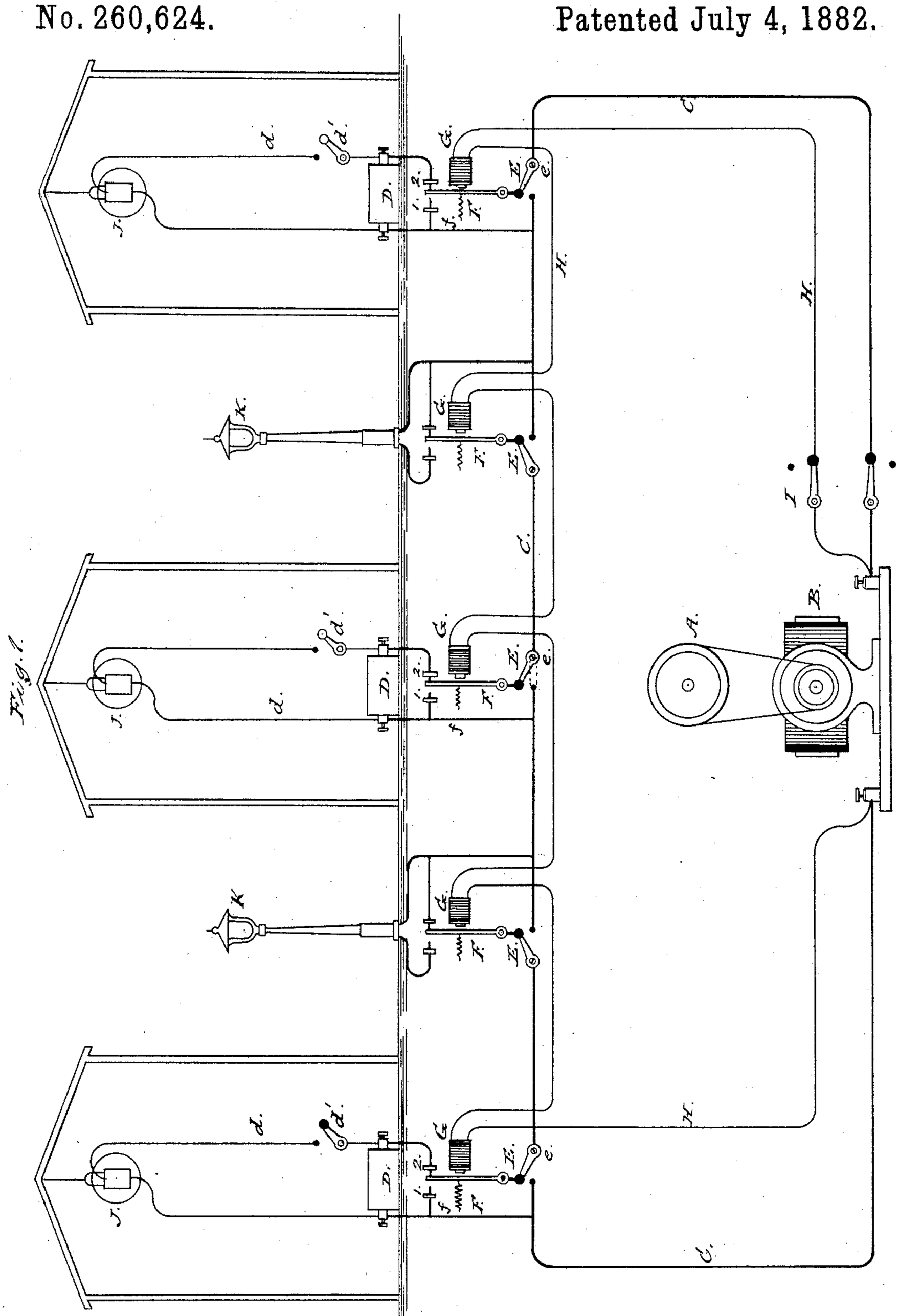

Fig. 1.

Attest;
F. H. Howard
James Young.

Inventors:
Eli T. Starr,
William J. Peyton,
by their Atty Wm J. Peyton.

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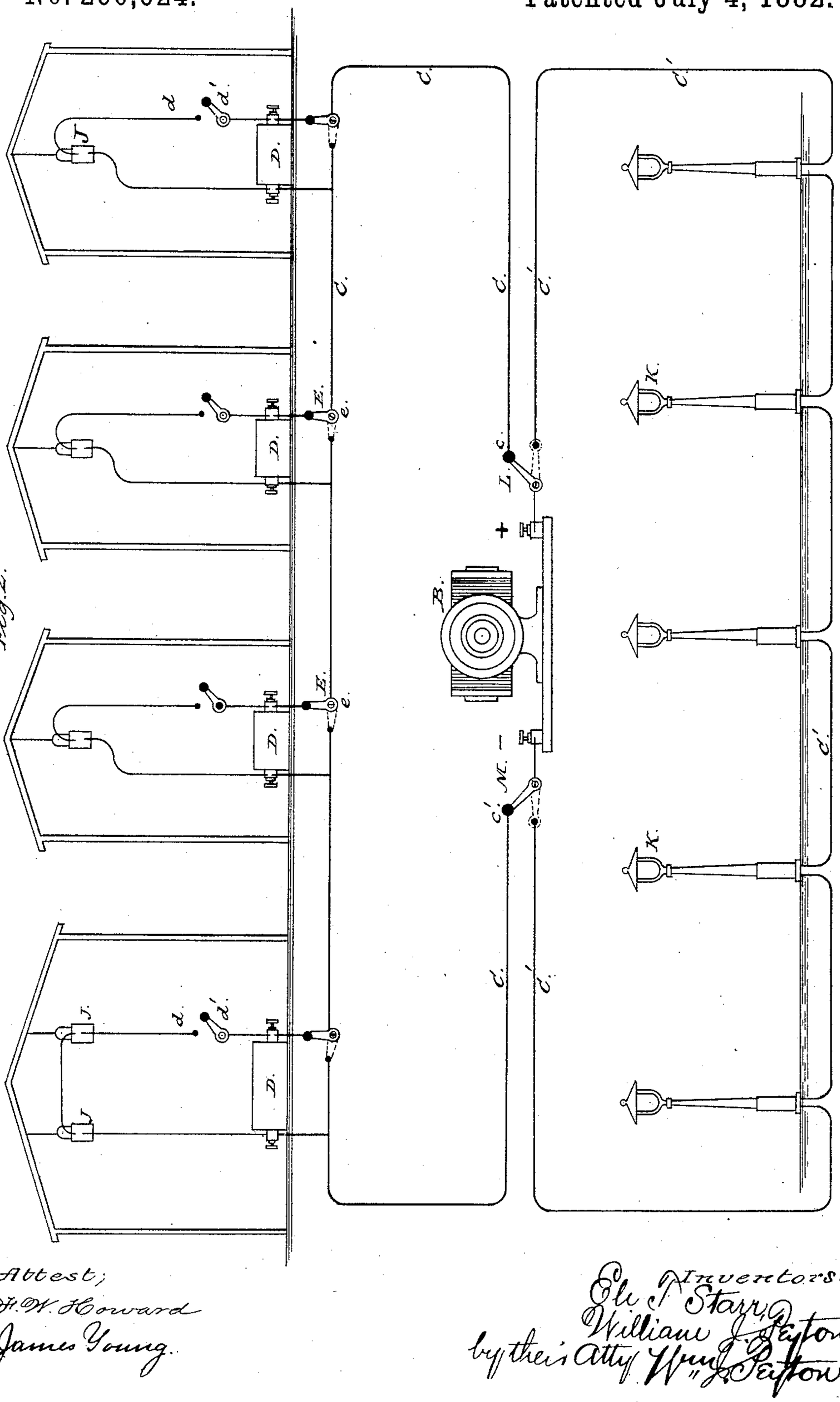

Fig. 2.

Attest;
H. W. Howard
James Young.

Inventors:
Edw. T. Starr,
William J. Peyton,
by their Atty Wm. J. Peyton.

UNITED STATES PATENT OFFICE.

ELI T. STARR, OF PHILADELPHIA, PENNSYLVANIA, AND WILLIAM J. PEYTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 260,624, dated July 4, 1882.

Application filed May 10, 1882. (No model.)

To all whom it may concern:

Be it known that we, ELI T. STARR, of Philadelphia, in the State of Pennsylvania, and WILLIAM J. PEYTON, of Washington, in the District of Columbia, have jointly invented certain new and useful Improvements in Electric Lighting, of which the following is a specification.

Our invention relates to certain improvements in lighting dwelling-houses, buildings, street-lamps, &c., by electricity; and its objects are to provide a safe, economical, and reliable system or method of and means for electric lighting, in order to displace to a great extent the use of gas and similar artificial illuminators.

The objections to the use of gas for illuminating purposes in dwellings, buildings, street-lamps, &c., are well known. Gas is dangerous. It poisons the atmosphere in closed rooms, and does not give a steady, pure, and brilliant light. The electric light, on the contrary, does not vitiate the air, while its purity and brilliancy meet the requirements of artificial illumination.

The systems of electric lighting heretofore introduced are objectionable principally on account of the liability of highly-heated conductors or apparatus to set fire to buildings or inflammable substances in their vicinity, and on account of the cost of producing and maintaining the lights.

We are not aware that heretofore a practical and successful system of electric lighting has been invented or devised so as to supersede the use of gas for domestic lighting.

One of the principal objects of our invention is to substitute the electric light in place of gas for domestic purposes in a safe, desirable, and economical manner.

The subject-matter claimed by us as of our invention is first fully described, and then particularly pointed out at the close of the specification.

The accompanying drawings show our improved apparatus as organized in the best way now known to us. It is to be understood, however, that some of our improvements may be organized in ways differing from that shown, and that some of our said improvements may be used without the others.

Figure 1 is a diagram of one way of organizing our improvements, the view showing a main conducting-wire, through which a current of electricity to charge a series of secondary or storage batteries and to supply current to a series of street-lamps passes, there being also shown another circuit by which the storage-batteries may be thrown into or out of the main circuit, so that they may be charged and then cut out, and the current of the charging-line made to flow through the street-lamps to work them direct while the storage-batteries are working the lamps of the houses, halls, or other places in which they may be placed; and Fig. 2 is a diagram showing our improvements as organized in a way somewhat different from the organization exhibited in Fig. 1.

One or more steam-engines or other form of motor, A, (not necessary to be particularly described or shown,) are used to drive one or more dynamo-electric machines or generators of electricity, B, the form or construction of which is immaterial, so long as it is suitable for generating electricity of the requisite tension or strength to charge secondary or storage batteries, so as to convert said batteries into independent sources of electrical supply. The electric current generated by the generator is conducted over a main circuit-wire, C, which is preferably laid underground, running lengthwise of the street upon which the houses to be lighted face, in the manner of an ordinary gas-pipe main. The main circuit-wire C, or a branch thereof, is preferably run underground from the street into the lower room, hall, passage, cellar, yard, outhouse, or back building of each house to be lighted, in order to charge a storage-battery or series of batteries, D, in such cellar or other place, as clearly shown in the drawings. The line C or branch thereof over which the charging-current passes is provided near each battery with a switch, E, which may be organized as shown in the figures, whereby any one or more of said batteries D may be put in the circuit of the main line, or of its branch, to be charged without affecting the others.

It will thus be understood that we have a main line over which the charging-current passes, a series of independent storage-batteries to be charged, and a series of switches where-

by any one or more of said batteries may be charged without affecting the others, or whereby all of said batteries may be charged simultaneously by being thrown into the circuit of the main line. One or more of the batteries may thus be cut out for an indefinite period without affecting the capacity of the charging-line to charge the others.

The switches E, which control the connection of their respective batteries with the main or charging line, may be located in the respective houses and protected by a locked box or casing accessible only to the proper person or officer in charge of the batteries; or they may be outside—for example, in an opening in the sidewalk—under cover, in a manner somewhat similar to the organization of the cocks or valves by which gas is cut off from or turned on to houses from the outside.

The simple form of switch E shown in the drawings consists of a conducting-lever pivoted at *e*, and electrically connected at the butt-end with the wire C, and making contact at its opposite end with the wire leading to the battery, so that the switch forms part of the circuit over which the charging-current passes. The switches, when in the position shown in full lines in the figures, close the circuit of the main line or its branches through the batteries D, the current, after its passage through one of said batteries, returning to the street and passing to the next battery or series of batteries, and so on, the arrangement on circuit being sufficiently illustrated in the drawings. When one or more of said switches E are in the position shown in dotted lines in Figs. 1 and 2 the respective battery or batteries D of the house or houses to which said switches belong are cut out and no current flows thereto, inasmuch as the circuit through the battery will be broken.

In Fig. 2 the connection of the secondary batteries with the charging-line C depends wholly upon the switches E, each of which may be operated by hand to determine whether its respective battery or batteries shall be charged to form an independent source of electricity, or whether it shall be cut out without affecting the others. In Fig. 1, however, while we provide the switches E in order that we may cut out any particular battery for an indefinite period without affecting the others, we have shown an organization of switches, F, whereby the storage-batteries may be simultaneously thrown into or out of circuit from the station at which the generator is located, or from any other point desired, so that they may be charged when desired, and then cut out. Each of said switches F may consist of an armature pivoted at one end and electrically connected to the wire leading into the battery, and acted upon by a spring, *f*, to normally close the circuit of the main line through the armature, the contact-point 1, and wire returning from the battery, so as to cut out the battery and prevent the current passing thereto. The circuit to the storage battery or batteries of each house therefore is kept open until the time for charging the batteries arrives, when the circuit is completed and the current conducted through the batteries to charge them.

In order to close and open the circuit to the storage-batteries, we employ electro-magnets G, placed so as to act, when excited by a current of electricity traversing their coils, upon the switches or armatures F, to attract them and close the circuit to the batteries through said armatures, the contact-points 2, and the wires leading to and from the batteries. The controlling-magnets G are excited by the current of an electric generator passing over an independent circuit, H, in which the electro-magnets G are included. A switch or key, I, is included in the circuit H, by which said circuit may be made and broken at will in order to throw the batteries in or cut them out of the main charging-circuit C. The switch I of any particular charging station or district into which a town or city may be divided for convenience is preferably located at the office of the station, so as to be under the immediate control of the engineer or electrician in charge.

It will be evident that as soon as the circuit of the line H is broken the armature-switches will be returned by their springs to their normal position in contact with the contact-points 1, and thus cut out the secondary batteries, which are now to be used as independent sources of supply at night for the purpose of running the lamps with which the houses or buildings may be supplied,

The generator to furnish current to operate the armature-switches F may be a galvanic battery or a charged storage-battery; or, if preferred, a portion of the current of the generator B may be utilized to excite the electro-magnets G.

From each storage-battery (or series of batteries) D circuit-wires *d* are run throughout the house to all points requiring lamps, the lamp or lamps J being suspended or mounted and connected in circuit in well-known ways, so as to receive the current of the battery, or a portion thereof, to produce the lights. The lamps may be either arc or incandescent lamps of well-known or any approved construction, and the number which may be run by the storage battery or batteries D of any one house or building is determined by the capacity of said battery or batteries.

It will be understood that the circuit of the battery is completed through the lamp or lamps J only when light is desired, and this is accomplished by switches or buttons which may be organized so as to be operated somewhat like the thumb-piece or button of the ordinary gas-bracket, by which the flow of gas is turned on or shut off. In the drawings we have shown a simple switch, *d'*, to complete the circuit of the storage-battery through the lamp or lamps.

In Fig. 2 one of the houses in the row of

four illustrated is shown as provided with circuit-connections *d*, leading from the storage battery or batteries D to two lamps J J.

We contemplate in our system to charge storage or secondary batteries of a large number of dwellings or buildings during the day from stations at which the generators will be situated, and then cut out said batteries so that they will be independent sources of electric supply to run the lamps during the succeeding night. The generator or generators B may then be employed at night to run a series of lamps direct—such as street-lamps—whereby it will be understood that by our system of lighting we store during the day secondary batteries to be independent sources of light at night, and run a system of lamps at night directly by the current evolved by the generator or generators.

In Fig. 1 we show the lamps that are to be run directly by the current of the generator that charges the storage-batteries as consisting of street-lamps K, which, like the storage-batteries D, are preferably each provided with a switch, E, to cut them out indefinitely, if desired, and also with armature-switches F, the action of which is the reverse of that of the corresponding switches for the storage-batteries—that is to say, said armature-switches, when attracted by the excited electro-magnets G, will break the circuit to the lamps and cut them out, while the armature-switches of the storage-batteries E will complete the circuit to the storage-batteries, as hereinbefore stated, so that said batteries will be charged. When the circuit H is broken, however, the armature-switches will be no longer attracted and the storage-batteries will be cut out, as before described, while the circuit through the lamps K will be established, so that said lamps will be run directly by the current of the generator.

In Fig. 2 we have shown a second main line, C′, leading to the series of street-lamps K, which may be either arc or incandescent lamps, and the current of the generator at night is thrown upon said line without affecting or throwing current upon the main line C.

In order to readily switch the current of the generator B from one main line to the other, to do the work required, we have provided a switch arrangement, which we prefer to be organized as shown in Fig. 2. The terminals of the main lines C C′ are connected with contact-pieces. The positive pole of the generator B is electrically connected with a pivoted switch, L, capable of being turned to make contact with the positive terminal *c* of the main line C, while the negative pole of the generator is likewise connected with a switch, M, capable of being turned to make contact with the negative terminal *c′* of said main line C. The main line C thus constitutes a complete metallic surface.

When the generator is throwing current upon the line C, including the storage-batteries, the said batteries will be charged, while when the switches L M are connected with the terminals of the line C′, as shown in dotted lines, said line C will be cut out and the lamps in the line C′ only will be operated.

It will be understood, of course, that a switch or switches may be made part of the main line C at or near the generator B in Fig. 1, so as to break the circuit of said generator, if desired.

It will also be evident that it is not necessary to establish the current through the lamps K in Fig. 2 at the time of cutting out the charged secondary batteries, as the switches may rest at a point intermediate of the terminals of the main line C C′.

By the organization we have described we largely increase the capacity of a generator for giving light at the time light is required. For example, we will suppose the dynamo-electric machine or generator B to be of light-giving capacity equal to five hundred horse-power, and that it is capable of storing one thousand secondary or storage batteries of light-giving capacity equal to one horse-power each during, say, seven hours of daylight. The storage-batteries are then disconnected and constitute independent sources of light, while the generator may be employed to run direct during the period the light is required, say, five hundred lights equal to one horse-power each. We thus get, at the period the light is to be used, light equal to fifteen hundred horse-power from a five-hundred-horse-power generator.

We prefer to employ in our system storage-batteries or accumulators constructed according to the sole invention of Eli T. Starr, for which an application for Letters Patent is now pending. It will be understood, however, that any other form of secondary batteries or accumulators suitable for the purpose may be used, the particular form of battery used constituting no part of our invention.

From what has been said it will be seen that we have invented a system of electric lighting that is safe, desirable, and economical. Currents of electricity of high tension can pass into the houses no farther than the batteries D, which, as before stated, should be, for absolute safety, located in the cellar, lower portion of the house away from inflammable material, or in an outhouse. Each house with its source of light is independent, and each house, moreover, is not dependent for its light at night upon the action of a generator of large capacity, which is employed to run a large number of lights for other houses, as in the systems heretofore proposed. Consequently, should the action of the generator B be interrupted at night from any cause, it will affect the lamps only which are being supplied directly by it. The economy of the system has also been satisfactorily determined.

We disclaim all the patentable subject-matter described and shown in this case save the subject-matter recited in the two following

clauses of claim. This present application is a division of our prior application filed January 9, 1882, in favor of which we disclaim all the patentable subject-matter of our invention, save, as aforesaid, the two combinations or improvements hereinafter particularly recited as the subject-matter of the present case.

The said improvements claimed herein for which we desire to secure Letters Patent are—

1. The combination, substantially as herein-before set forth, of a dynamo-electric machine or generator, a secondary battery to be charged by said generator, an electric lamp to be run directly by the current of said generator, and switch mechanism for determining whether the current of said generator shall flow through the battery or through the lamp, whereby during the charging of said battery no light is given out at said lamp.

2. The combination, substantially as herein-before set forth, of a dynamo-electric machine or generator, a series of independent secondary batteries to be charged by said generator, a series of electric lamps to be run directly by the current of said generator, and switch mechanism for determining whether the current of said generator shall flow through said batteries or through said lamps, whereby during the charging of said batteries no light is given out at said lamps.

In testimony whereof we have hereunto subscribed our names this 6th day of May, A. D. 1882.

ELI T. STARR.
WM. J. PEYTON.

Witnesses:
JAMES YOUNG,
J. J. PEYTON.