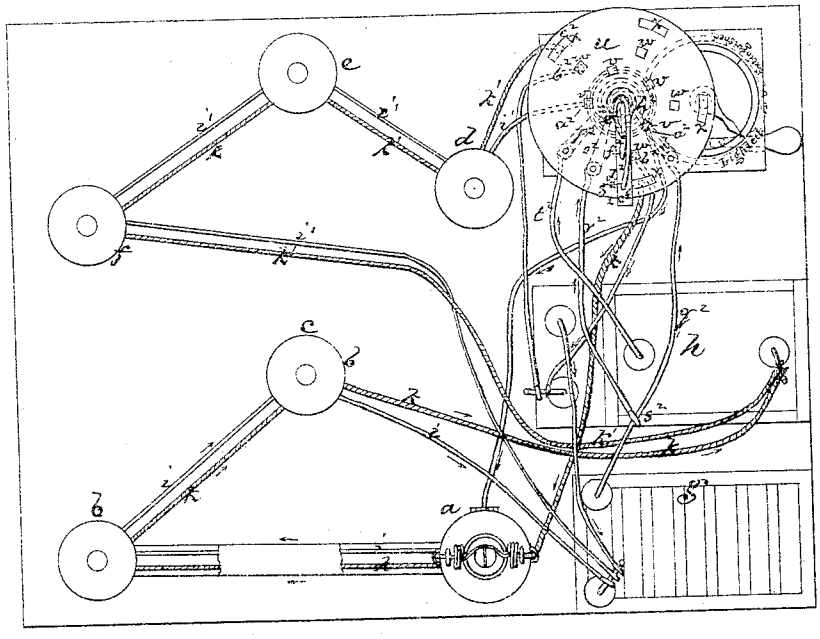
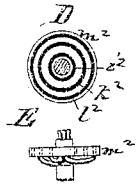
JOHN VANSANT.

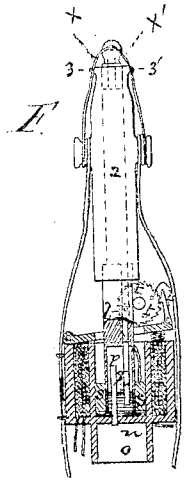
Improvement in Apparatus for Lighting and Extinguishing Gas by Electricity.

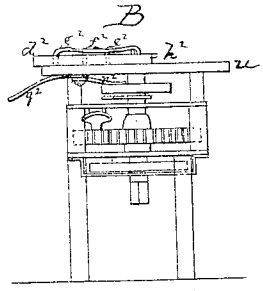
No. 124,773. Patented March 19, 1872.

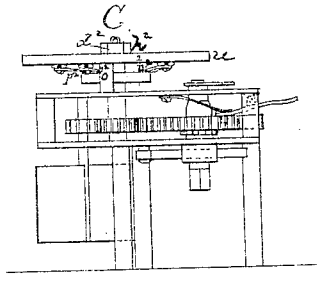
A.

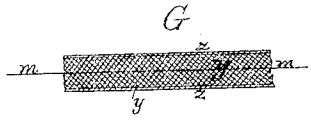


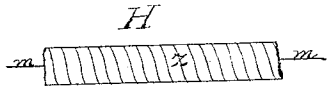












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AM. PHOTO-LITHOGRAPHIC CO. N.Y. OSBORNE'S PROCESS.

UNITED STATES PATENT OFFICE.

JOHN VANSANT, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.

Specification forming part of Letters Patent No. 124,773, dated March 19, 1872.

To all whom it may concern:

Be it known that I, JOHN VANSANT, of San Francisco, in the county of San Francisco and State of California, have invented certain Improvements in Lighting and Extinguishing Gas by Electricity; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

United States Letters Patent Nos. 113,370 and 120,469 have been granted to me for improvements in lighting and extinguishing street and other gas lamps by electric currents. My present invention relates to apparatus embodying to a greater or less extent the construction shown in said patents, to the arrangement of the batteries and main and spark-producing circuit-wires, and to the construction of the spark-producing line or circuit.

In my present invention I employ, in connection with each lamp-post, a chamber containing mercury or other suitable liquid, into which chamber the inlet gas-pipe enters, while from it leads the tube extending to the lamp or burner. The inlet and outlet tubes or passages and the vessel or chamber into and from which they extend are stationary, and the upper surface of the mercury in its normal position is above the mouth of one of the tubes, so that communication between the inlet and outlet through the chamber is cut off by the mercurial or liquid valve.

In the chamber or a compartment thereof is a piston or weight over the mercury, said piston or weight being connected with the ratchet-wheel, the rotative movement of which in one direction, effected by the movement of the armature of the electric coil at the post, lifts the piston or weight, and permits the whole surface of the mercury to assume one level, thereby bringing the mercury below the mouth of the tube closed by it. Free communication is then and thus established between the gas inlet and outlet, and the gas can pass freely to the burner. When the piston or weight falls, its pressure upon the mercurial surface beneath it presses up the mercury in the compartment into which the mercury-controlled tube enters, bringing the mercury into contact with the mouth of the tube, and shutting off communication between the gas inlet and outlet.

The mechanism for directly operating the ratchet-wheel and producing the rise and fall of the gas-controlling devices is, or may be, like that shown in either of the above-mentioned patents, the feature constituting one part of my present invention being the stationary gas tubes or passages controlled by the movable column of mercury, and the construction of the mechanism for effecting the movement of the mercury, or the rise of one part of the mercury by pressure upon the other part, and the consequent opening and closing of communication between the gas inlet and outlet.

In connection with a series of lamps brought into one electric circuit, or with several series brought into as many circuits, I use one battery and one Ruhmkorff or induction coil, the opposite poles of the battery forming a circuit with the single series of lamps, or with each of the several series, (for operating the gas-controlling passages,) and also into connection with a circuit embracing the coarse helix of the Ruhmkorff or induction coil. The several circuits are formed through one battery and one induction-coil by using what I term a commutator or switch mechanism, having a rotary insulated arm provided with a series of metallic connections, from each of which one end of an insulated wire extends, the opposite ends of all the wires extending through the tubular hub of the arm, and thence outward and into contact each with some one of a corresponding series of concentric metal rings in the surface of a rotary wheel having a fixed connection with the arm. With each of these rings one end of a metallic spring is in contact, the other end of said spring being in connection with one of the wires of one of the circuits. The rotating arm swings over a stationary insulated disk containing a series of metal pins or plates corresponding to the pins or plates in the rotating arm, each pin or plate being at a distance from the center of the disk corresponding to the distance of one of the plates or pins of the arm; and the several pins or plates of the disk are so arranged that as the arm swings upon the disk the inner plate of the arm first comes into contact with the inner plate of the disk and closes the main or valve-operating circuit, (each disk-plate extending through the disk, and connecting with one of the wires of one of the circuits,) and then passes from said disk-plate and breaks said circuit, the arm next (but not until after the

main circuit is broken) bringing its next pin or plate into contact with the third or outer plate of the disk, and thereby closes the circuit extending through the fine helix of the Ruhmkorff coil. The arm then passes on and makes a connection between its center pin or plate and the corresponding plate of the disk for the purpose of closing the circuit through the coarse helix of the induction-coil, making and breaking such connection, while the last-named circuit remains closed to prevent the generation of the spark in the commutator. Through the outer plate of the arm and the outer plate of the disk and the circuit-wires connected thereby the circuit is closed which embraces the line extending to each burner from the poles of the fine wire of the induction-coil, the wires of the line coming nearly into contact at the jet-orifice of each burner, so that the electric spark generated by the induction-coil shall ignite the liberated gas. By thus making and breaking the several circuits, one battery and one induction-coil answers for all the lamps of the series.

To bring several series of lamps (each series having its own independent valve-actuating and spark-generating lines) into connection with the same battery and induction-coil, the circuit-closing and breaking disk is made with as many series of irregularly-arranged connector pins or plates as there are series of lamps, each series making and breaking connections through the same rotating arm and rotary wheel. The arm and wheel are preferably rotated by a weight or the stress of a spring, and the mechanism is preferably arranged to impart several rotations to the arm for each lighting operation—as, for instance, three rotations—the first effecting a partial rise of the gas-controlling device, and inducing a spark-producing current; the second effecting a further rise of the gas-controlling device, inducing a second electric current in the induction-coil and generating a spark, which will ignite the gas if it shall be sufficiently liberated for ignition; and the third effecting the complete opening of the connection between the inlet and outlet gas-passages at each lamp, and inducing a third current in the induction-coil, which current will generate a spark, which will ignite the gas at each burner if not lighted by the previous spark.

To extinguish the gas, the arm is again thrown around sufficiently far to close the main circuit, the movement of the armature of each magnet at each lamp effecting the liberation of the gas-controlling device, and cutting off communication between the gas inlet and outlet, which, of course, cuts off the supply of gas and extinguishes the flame.

The combination of one battery with all of the lamps of a series by a circuit that works the armature of the magnet at each lamp, and through it controls the flow of gas to the burner, with one induction-coil for all of the lamps, and with one spark-producing line for all of the lamps, constitute one of the features of this invention. Another feature consists in the specific organization of the circuit-closing and breaking mechanism for such system; and another feature consists in the assemblage of several series of lamps in such system, each series having its own independent main or valve-controlling circuit and spark-generating circuit, but all the series being operated by the single battery and its induction-coil.

In this connection, much information concerning the division and arrangement of the electric circuits may be found in the "Exposé des Applications de L'Electricité, par Du Moncel," second edition, Paris, 1857, 3d vol., between pages 240 and 253 and between pages 291 and 301; and I consider my invention as confined to the specified circuit divisions and mechanical arrangements described further on in the specification and summed up in the claiming clauses.

For conveying the electric current for igniting the gas I use a very fine metallic wire, made of any suitable metal, giving to such wire the requisite strength and body sufficient to enable it to be freely handled and laid by covering it with a body of gutta-percha or similar coating, which coating is preferably covered with cotton, and which may be varnished or coated with tar or other material to protect the line from the action of air. The gutta-percha or similar coating insulates the wire, but is applied in a body sufficient to protect and build up the fine wire, which, if simply covered by a thin coating, would have neither body sufficient to enable it to be readily laid and to keep it from kinking, nor strength sufficient to keep it from attenuating or breaking.

I have found that the very fine wire thus built up and protected is a reliable conduit for high-tension electricity to light a system of lamps relatively at great distances apart, whereas with a coarse wire, however protected, it is impracticable to attain this very desirable result—namely, that of positively insuring the lighting of all of the far-separated lamps of a system by an induced electric current—as the large sectional and superficial area of the wire dissipates the current. With the very fine wire the current remains intensified and preserves its power unimpaired. What is meant herein in this connection by the term "fine wire" is such wire as is used at the present time in the exterior helix of an ordinary induction-coil.

The drawing represents an apparatus and parts of an apparatus embodying my improvements.

A shows a plan of the same. B and C are side views of the switch mechanism. D is a plan and E an elevation of the rotary wheel of the switch mechanism. F shows the gas-valve-operating mechanism, and the location and arrangement of the spark-producing conductor. G and H show the construction of the wire or line for conveying the high-tension electricity to light the burners.

a b c denote a series of lamps to be lighted,

which series may be composed of any number of lamps. *d e f* denote a second series, (embracing any number of lamps,) the line or circuit of which is independent of the first series, except in that they are embraced and operated by the same battery. The system may embrace any number of such series. *g* denotes the battery; *h* the induction-coil connected therewith. *i* denotes the main or valve-operating line, and *k* the spark-line of the first series of lamps; i^1, the main, and k^1 the spark-line of the second series of lamps. Each lamp is provided with a magnetic coil, and with an armature hinged by iron to the electro-magnet and raised by a spring, and drawn down by the electro-magnet when the main circuit is closed; this armature having jointed to it a drag-pawl, which engages with a ratchet-wheel, each movement of the armature imparting rotative movement to the wheel, and said wheel having projecting from one of its faces a series of lifter-pins, one of which is at all times in position to lift a hook at the upper end of a rod. Such mechanism is or may be not unlike that shown in either of my patents above mentioned; but in this mechanism the liquid-valve is different. The gas-tube connects with the lamp at *o*, and from the tube or chamber *n* a stationary inlet-tube, *p*, extends up into a chamber, *q*. From the lower part of this chamber another tube, *r*, leads to the burner. In this chamber, or in a compartment thereof, or a surrounding chamber, is a weight or piston, *s*, to which is attached the rod, having at its top the hook s^1 that is lifted by the ratchet-wheel pins *p*. In the chamber is a quantity of mercury or other suitable liquid, the upper surface of which, when the piston or weight is raised, is below the level of the burner-tube *r*, so that gas entering the chamber through tube *p* can escape therefrom to the burner through tube *r*. But when the weight or piston is down it displaces the mercury beneath it and raises the level of the part thereof surrounding the tube *r*, carrying it above the bottom of the tube *r*, and closing the tube *r* to the passage of gas. This is the normal position of the parts. When the circuit is closed the pawl actuates the ratchet, raising the hook *l* and lifting the piston, and when, by the first, second, or third movement of the armature the movement of the piston is such that the gas can escape to the burner, the spark simultaneously generated will inflame the gas, the mechanism being so arranged that the next time the circuit is closed the hook *l* is freed from the pin *t*, releasing the weight, which then falls, displacing the mercury and shutting the mouth of the tube *r*; this last closing of the circuit being effected for the purpose of extinguishing the gas.

x x^1 denote the conductors for the current producing the spark that ignites the escaping gas. These conductors are supported on projections from the insulating porcelain tube 2, and have their ends held in position, just at the base of the slot in the burner, by the projections 3 $3'$, against which they firmly press. This location of the spark-points of the electric conductors at the bottom of the slot, and not over the top of it, in the usual place, is highly important, since it is at the bottom that the issuing gas first mingles with the surrounding air, forming thus a compound capable of being ignited by an electric spark, though the latter may be of exceeding shortness; while if the points were as nearly approximated over the slot the spark would strike continuously through the pure carbo-hydrogen gas without inflaming it. Shortening the spark increases the number of lamps that can be lighted by an apparatus of a given size. If it be desirable, one of the conductors, as *x*, may be attached directly to the gas-tip, which in this case should be of metal, and the other conductor have its end placed, as before, very near to the bottom of the slot, the spark then striking into the burner, but through the explosive mixture of air and gas.

In the work by Du Moncel, entitled Exposé Des Applications, De L'Electricité, 2d vol., page 208 of the 1st edition, published in Paris in 1854, may be found a description of a mode of lighting from a distance the night-lantern of the Observatory of Paris. In this mode two insulated platinum-wires were placed just above a gas-burner tip with the ends of the wires a little distance apart, and said wires were in communication with gutta-percha covered wires, which extended to a Ruhmkorff coil placed at considerable distance from the burner. When the gas was turned on it was lighted whenever the spark was produced, at will. But my invention may be said to be an improvement upon Du Moncel's description in the matter of the location of the spark-producing points, and in the reduction of the size of the conducting-wires insulated and strengthened.

The wire that conducts the electric-spark current is shown at G and H, the wire *m* being a very fine wire, covered by the gutta-percha *y*, which gives body to the line, and with the wound covering *z* imparts tensile strength, the rigidity imparted by the covering enabling the line to be freely handled in laying without attenuating, kinking, or breaking the wire. The fine wire keeps the current condensed or intensified in a small sectional area, and thus insures its passage through the wire without tendency to dissipation of the electric fluid.

The various circuits are intermittently or successively completed and broken through the switch mechanism. In this mechanism *u* denotes the stationary disk, insulated, but made with the series of connectors *v w x*, one set for each circuit or series of lamps. Each connection extends through the disk, and with the under surface of each some one of the circuit-wires connects. With each inner plate the end of one of the main circuit-wires *i* or i^1 connects, as seen at a^2; with the next the wire connects that extends to one pole of the Ruhmkorff coil, as seen at b^2; and with the outer one the wire of the spark-line, as seen at c^2. d^2 denotes the movable arm of the switch, this

arm being made with three insulated wires, e^2 f^2 g^2, the inner ends of all of which extend through the tubular hub k^2, and through it make connection—one with the inner metal ring i^2, one with the center metal ring k^2, and one with the outer metal ring l^2, of three insulated rings in a wheel, m^2, which is connected to and rotates with the arm d^2. Three stationary springs, n^2 o^2 p^2, are fixed to the under side of the disk u, their flexible ends making contact, each with one of the rings i^2 k^2 l^2, and their opposite ends each with some one of the circuit-wires. One ring is connected by its spring n^2 with the wire q^2, leading to one pole of the battery; another ring, by its spring o^2, with a wire, r^2, connecting s^2 with the wire q^2, leading to the same pole of the battery; and the other ring, by its spring p^2, with the wire t^2 leading to one pole of the Ruhmkorff coil; so that as the arm is rotated the several connections to close the several circuits are successively made as before described, the continued rotation of the arm completing the circuits, operating the valves, and lighting the lamps of all of the series successively—all the circuits for each series of lamps, and all the circuits for the several series in succession being thus operated by the single battery.

Any suitable mechanism may be employed for automatically imparting the requisite number of rotative movements to the arm d^2, and for making the movements of the arm regular and without fluctuations.

The courses of the respective electric currents are indicated by the dotted lines.

I claim—

1. In combination with each burner of a connected system or series of gas-lamps, a mercury or liquid containing chamber and gas inlet or outlet connected therewith, in such manner that by displacement, or rise and fall of the mercury in the chamber, or one part or compartment thereof, connection with the burner-passage is cut off or established.

2. Also, the stationary mercury-chamber, the stationary inlet and outlet, and the piston or weight for displacing the mercury, the whole being arranged, and the piston or weight operated, substantially as shown and described.

3. Also, the use of a fine metallic wire insulated and strengthened, substantially as described, for connecting together the burners of street-lamps and conveying to them induced or frictional electricity, for the purpose of igniting the gas by a spark, the said fine wire being in size substantially such as is used in the exterior helix of an ordinary induction-coil, and may be considered an extension or continuation thereof.

3. Also, the combination of the single battery, the main circuit embracing the lamps of a single series, and working the armatures of the magnets of the respective lamps to control the supply of gas to the burner, the single induction-coil, and the circuit connecting it with the battery, and the high tension or igniting electric-line or circuit, the main circuit and the inducing circuit being both worked by the single battery.

5. Also, in combination with the single battery and single induction-coil, a system of lamps composed of several series, each of which series has its own independent main and ignition circuit lines connecting with the single battery and induction-coil.

6. Also, the movable arm d^2, plate-connecting wires e^2 f^2 g^2, wheel n, and rings i^2 k^2 l^2, in combination with the disk or plate u, and its plates v w x, connecting with the respective circuits, and alternately with the plates or pins of the arm, to successively establish or close and break the respective circuits, substantially as described.

7. Also, in combination with the circuit closing and breaking disk u^2, arm d^2, and wheel n^2, the duplicate series of connecting plates v w x for the several circuits of a system embracing independent series of lamps, substantially as described.

8. Also, two conductors for induced or frictional electricity with their spark-points near together, and located at the base of the slot in a gas-burner, where the air mingles with the gas escaping, thereby forming an explosive compound, said arrangement being for the purpose of shortening the spark, locating it in an explosive compound, and rendering the ignition more certain.

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Witnesses:

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