(No Model.)

2 Sheets—Sheet 1.

S. S. WHEELER.

ELECTRIC FIRE ENGINE SYSTEM.

No. 312,939. Patented Feb. 24, 1885.

Fig. 1.

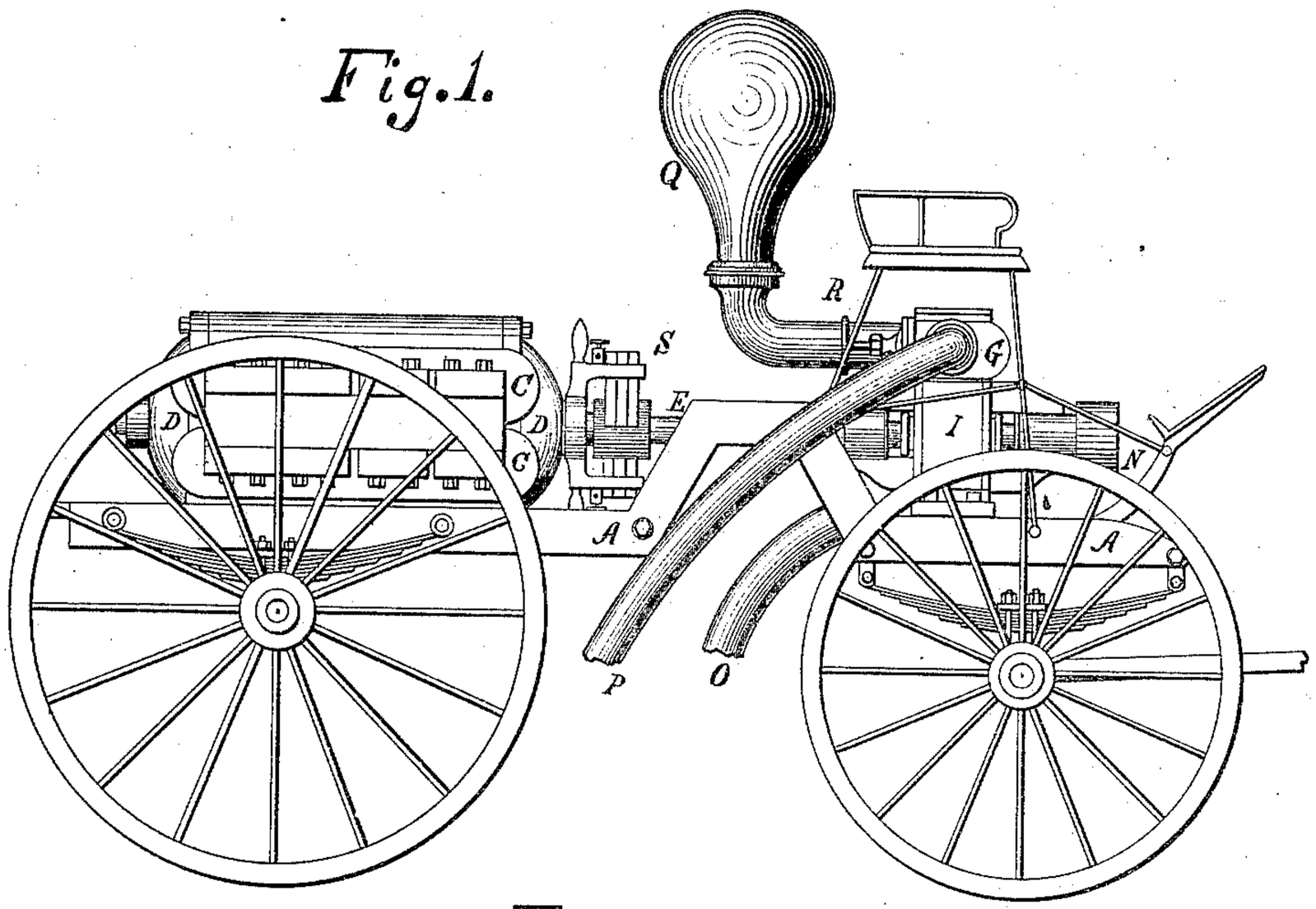

Fig. 2.

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

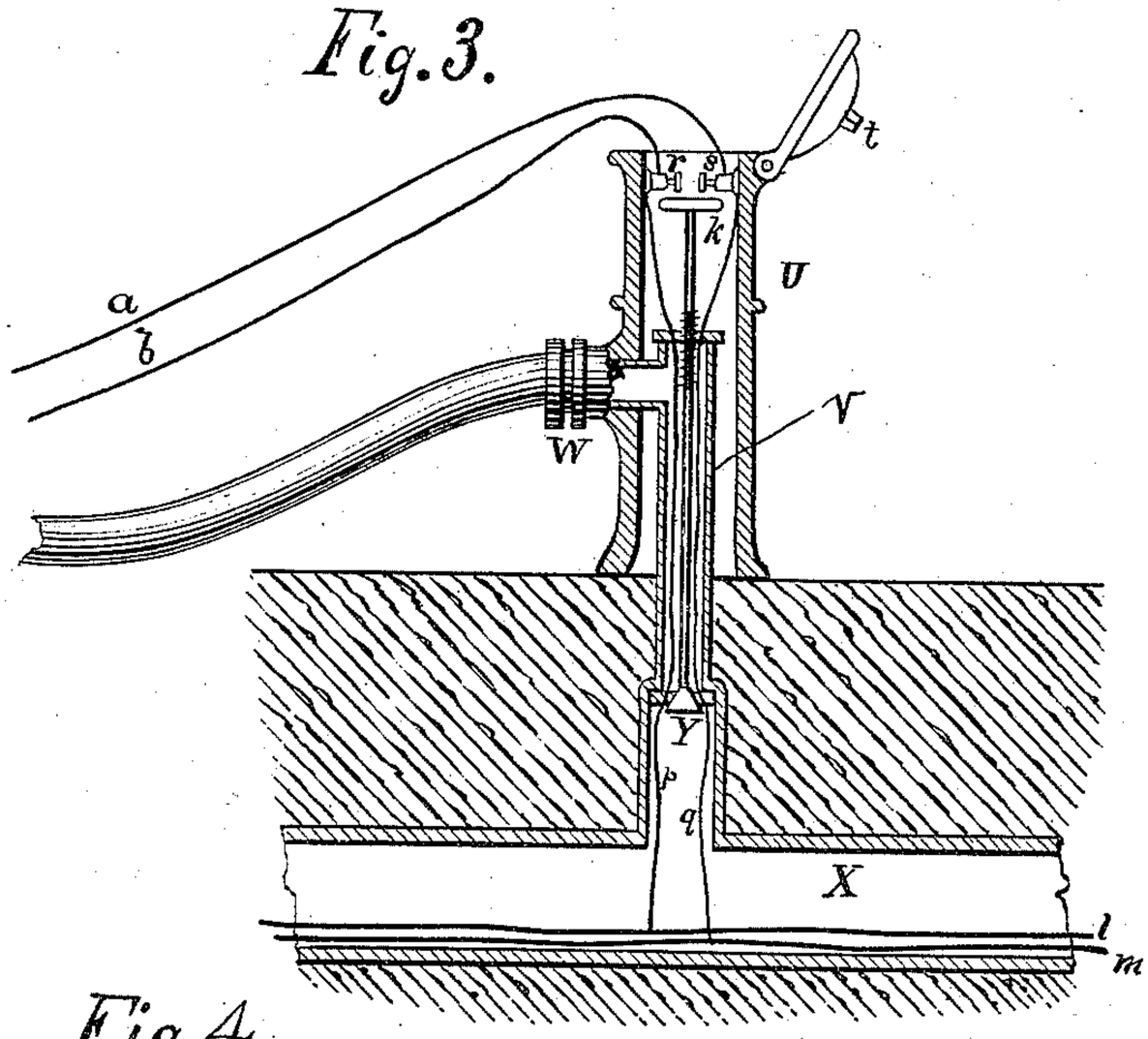
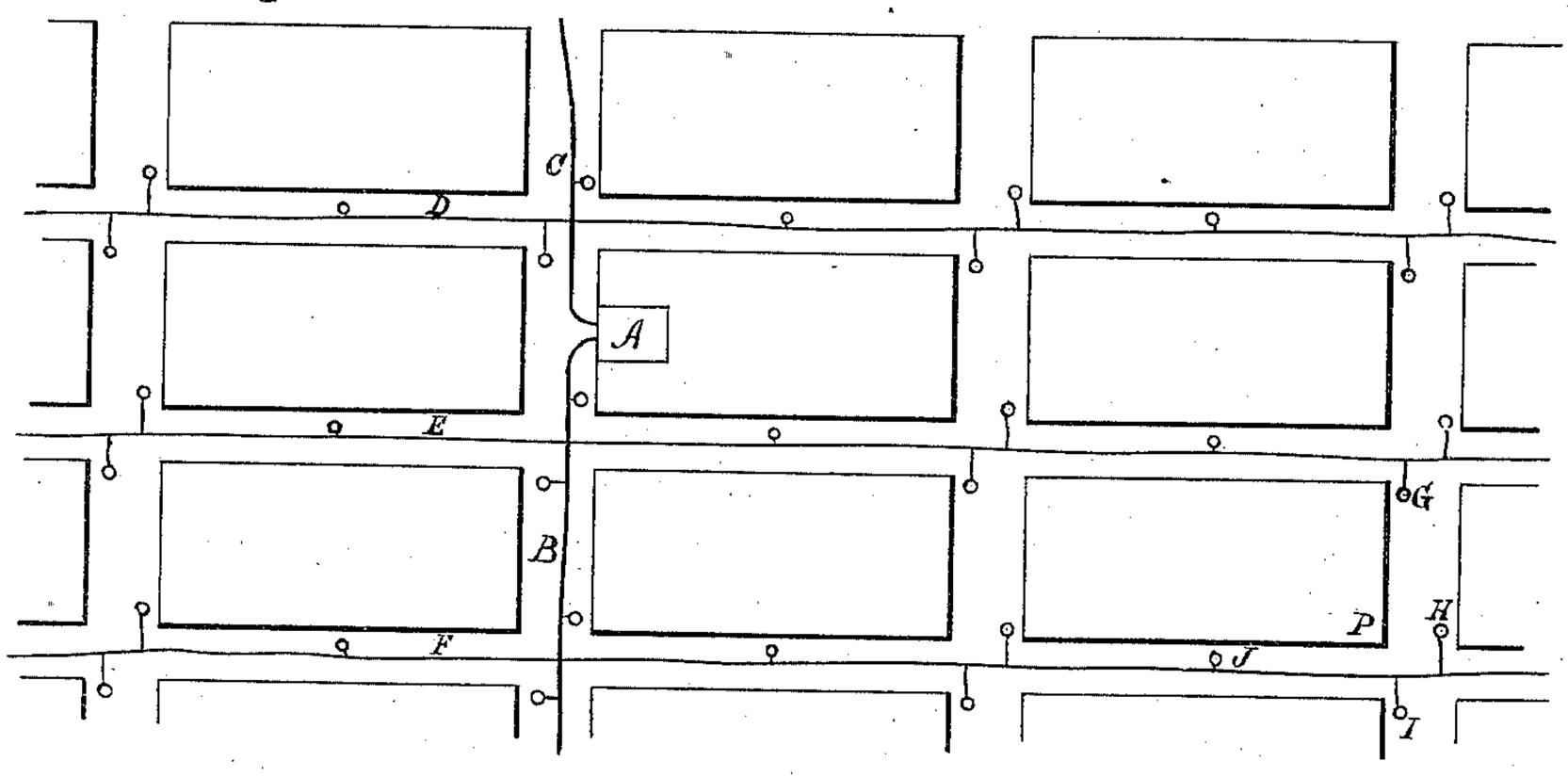


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

SCHUYLER S. WHEELER, OF NEW YORK, N. Y., ASSIGNOR TO CHARLES A. CHEEVER, TRUSTEE, OF SAME PLACE.

ELECTRIC FIRE-ENGINE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 312,939, dated February 24, 1885.

Application filed May 29, 1882. (No model.)

To all whom it may concern:

Be it known that I, SCHUYLER S. WHEELER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Electric Fire-Engine System, of which the following is a specification.

The object of this invention is to supersede the cumbrous and expensive portable steam-pumps, commonly called "fire-engines," which have heretofore been used for extinguishing fires by a lighter and more efficient apparatus constructed to be actuated by an electric current instead of by steam-power, and designed to be used in connection with a system of distributing-conductors for conveying the electric current from fixed stations at which the current is generated by means of steam or other power to the street-hydrants at which the supply of water is obtained, and which may readily be put in electrical connection with the fire-engine, both the water and the motive power required for pumping being thus derived from the same hydrant.

To this end my invention comprises two general parts: first, an electric fire-engine, which consists, mainly, of a frame mounted upon wheels carrying an electric motor and a suitable pump mechanically connected, so as to be worked by the motor; and, second, apparatus for supplying the fire-engines with the required electric current, which consists of a central generating-station furnished with stationary dynamo-electric machines and with motive power for producing the electric current, and electrical conductors for transmitting the current to the engines, which branch out in all directions from the generating-station, and extend to the various street-hydrants at which the supply of water is obtained. These conductors are of sufficient capacity to convey the quantity of energy in the form of an electric current required to operate a number of engines at once, and are laid along in the vicinity of and connected to each hydrant by a branch circuit, so that all the engines supplied with motive current from the same main conductor are operated in "multiple-circuit," by which method each engineer is enabled to regulate the amount of current supplied to his engine without materially affecting the others by throwing into or out of the branch circuit electrical resistance, and thus to control the power of his engine.

Heretofore the important objection to the large steam fire-engines has been that they could not be made powerful enough to throw a compact stream of water to the tops of high city buildings without being too heavy to be drawn by two horses. The great advantages to be derived from the use of an electric current instead of steam-power for working the pump of a fire-engine are, that an engine of greater power can be made much lighter by the substitution of a light electric motor for the heavy boiler and engine of a steam fire-engine; that such a fire-engine would be much less expensive and less liable to get out of order; that there would be no smoke, no noise, nor sparks to set fire to awnings, &c.; that each engine would not require a skilled engineer, and sometimes a fireman, to operate it, since there would be nothing to do but to turn a switch; that no time would be lost in getting up steam, as the generating-station would always be kept in readiness to supply electric current immediately, either by having steam up constantly in one or more of the boilers, or else by means of electrical storage batteries or accumulators in which energy may be stored and afterward given out in the form of an electric current. These batteries may be filled or charged at regular intervals during the day or week, or during a fire, and whenever a fire breaks out they may serve to supply the necessary electric current until the steam-engines can be got working. I will not here give a detailed description of the necessary apparatus for the application of such storage-batteries to this purpose, as I propose making it, together with other minor devices and improvements, the subject of another patent.

Another feature of my invention is that the electric currents employed for electric lighting and power purposes may be utilized in an emergency for actuating the engines in places where it is not desired to erect a separate plant expressly for the purpose.

In the accompanying drawings, Figure 1 is a side elevation of an electric fire-engine con-

structed according to my invention. Fig. 2 is a plan view of the same. Fig. 3 represents a vertical section of a hydrant, showing the electrical arrangements combined with the usual hydraulic apparatus, according to my invention. Fig. 4 is a plan representing a city-district in which my invention is in operation, the arrangement of the main and branch conductors for conveying the electric current to the hydrants being shown.

In Fig. 1, A A represent the iron frame of a fire-engine, supported in the usual manner, upon wheels, as represented. Upon this frame is fixed the electric motor B, which may be of any well-known form sufficiently light to be adapted to the purpose. C C are the field-magnets of the motor, upon the sides of which are bolted the two metallic heads D D, which form the bearings for the shaft E of the armature of the electric motor B, this armature not being shown, but being inclosed within the field-magnets and the pieces D D. The shaft E of the armature is prolonged and connected by a suitable mechanical coupling directly to the main shaft F of the rotary pump G, which pump is also rigidly fixed to the main frame A of the engine, and which may be of any suitable form of construction. I have here shown one similar to those employed in the well-known Silsby fire-engine, which would be very well adapted to this purpose; and as such rotary pumps are common, it is sufficient to say that it consists of two intersecting cylinders, H and I, in which work two rotating interlocking pistons the shafts of which F and K are geared together within the casings M and N. The water from the street-hydrant enters this pump at the bottom through the feed-pipe O, and is forced by the rotation of the pistons, which are caused to revolve by the electric motor B, into the water-chest G and through the fire-hose P, uniformity of pressure being maintained, as usual, by the air-chamber Q, and the quantity of water discharged being regulated by the valve R.

The electric current employed to actuate the motor B is derived from the hydrant (shown in Fig. 3) and conveyed by proper electrical conductors *a* and *b* to the binding-posts *c* and *d*, respectively. From the binding-post *c* the current flows through one of the field-magnet coils C; thence by the wire *e* and commutator S through the armature of the motor; thence through the wire *f* and the other field-magnet coil C to the switch T, by turning which switch, so as to connect with the different points *p p p p*, &c., more or less resistance *r r r r* may be introduced into the circuit at pleasure and the velocity of the motor thereby controlled. From this switch the current flows through the wire *g* to the binding-post *d*, and thence back to the hydrant through the return-conductor *b*. The velocity of the motor may also be regulated by turning the brushes of the commutator S around the shaft of the armature, this method now being commonly employed for regulating the power of electric motors.

I do not confine myself to any particular style of pump G, as any well-known form of mechanism for pumping may be employed instead of the rotary pressure-pump I have here shown.

The arrangement of the circuits within the hydrant or fire-plug in relation to the hydraulic apparatus is represented in Fig. 3, in which U is the cast-iron box containing the vertical pipe V, which connects the nozzle W with the water-main X, the flow of water through it being controlled by the valve Y, operated by the handle *k* in the usual manner. I prefer to convey the electric current for operating the engines through two conductors, *l* and *m*, laid within the water-main X, one or both of which may be insulated. The two wires *l* and *m* constitute the direct and return conductors of one of the main supply circuits, and are connected, respectively, by branch wires *p* and *q* to the binding-posts *r* and *s*, placed within the hydrant, so as to be always protected by the cover *t*, except when in use during a fire. It is obvious that when an engine arrives at one of these hydrants it is only necessary to take the ends of the conducting-wires *a* and *b*, carried by and permanently connected by the binding-posts *c* and *d* of the engine and insert them into the binding-posts *r* and *s* of the hydrant.

Fig. 4 illustrates the general arrangement of distributing-circuits, showing the streets, location of the hydrants, and the central generating-station. A represents the generating-station, which is furnished with powerful steam-engines and dynamo-electric machines capable of developing sufficient power in the form of an electric current (about four hundred or five hundred horse-power, perhaps) to actuate the maximum number of engines in operation at any one time during a fire. This station is identical with the fire head-quarters, at which all the fire-alarms are received, so that whenever a fire occurs the engineer in charge of the generating-station is immediately informed of its location, whereupon he starts up some of the engines and dynamo-machines connected therewith, and makes connections with the particular main conductor which supplies those hydrants that are in the neighborhood of the fire. Suppose, for example, that a fire breaks out at the point P. This fact is at once known at fire head-quarters, and communicated to the station A. The engineer in charge starts up the usual number of dynamo-machines to supply power to the fire-engines required in the case of an ordinary fire, and by means of a suitable switch connects in the main electrical conductor B, by which the electric current is conveyed to the cross-conductors E and F and by them to the street-hydrants G H I J, near the fire. If the fire becomes more serious, the engineer in charge of the generating-station is signaled to supply more power,

whereupon he starts up more engines and dynamo-machines. The main conductors B C D E F, &c., (shown in Fig. 4,) are in fact single cables composed of the two conducting-wires *l* and *m*, (shown in Fig. 3,) one being the direct and the other the return conductor, which must of course be insulated and be sufficiently large to transmit the maximum current ever required. In Fig. 3 I have shown these main conductors *l* and *m* laid within the water-main X, for the purpose of protecting them from injury and of avoiding the necessity of laying a special conduit; but it is clear that they may be laid in such conduits, if desired, or may be conveyed above ground on poles.

Instead of making the electrical connection with the underground main conductors through the water-hydrants, as we have shown, separate boxes connected with the main conductors and containing connecting devices for making connection to the engines may be erected in the vicinity of the hydrant.

In the system of distributing-conductors which I have represented in Fig. 4, each hydrant G H I J, &c., is placed on a branch circuit from the main conductors E and F, which are branches of the conductor B, so that all the fire-engines which are supplied from this conductor are operated in "multiple circuit," the result being that the current at each junction of the different hydrant-connections with the main conductors splits, part flowing through the engine supplied at that junction, and the rest passing on to the next hydrant, where it again splits, and so on through all the engines connected in multiple circuit. Since the entire current under this arrangement does not have to pass through each engine, each engine being on a branch circuit, and since the whole current is divided among the engines in the inverse ratio of their electrical resistances, the power of any one engine can be regulated without producing any very material effect upon the others by altering its resistance in the way already explained; but in order to compensate for the small changes which would occur in the strength of current flowing through the other engines when the power of any one was changed, an automatic current-regulating device, of which there are many well-known forms, may be placed at the generating-station, and arranged to throw more or less current through the main conductor, according as the combined resistance of the various engines is diminished or increased. All the other hydrants are connected with the main conductors, and the engines, whenever required in any locality, are operated in precisely the same manner.

In a small city a single generating-station and system of conductors would probably suffice, while very large cities should be divided into districts furnished with independent generating-stations and systems of distributing-conductors.

As the function of the distributing-conductors is simply to convey the electric current or currents to the fire-engines, it is immaterial, so far as my invention is concerned, on what general plan or method these conductors are arranged and connected, provided they serve to supply the necessary current to the engines.

By means of my invention both the water and the power for pumping the same can be instantly obtained from a stationary source, from which they are conveyed to the fire and supplied to the movable fire-engines through stationary permanent conductors, by which means the weight of the engine is very greatly reduced, and the power can be almost indefinitely increased by the use of electric currents of high electro-motive force, no time is lost in getting up steam, and other important advantages already enumerated are obtained.

I am aware that an electric fire-engine—that is, a pump and an electric motor mechanically connected and mounted upon wheels—is described in Letters Patent to L. G. Wooley, No. 207,377, of August 27, 1878, and therefore I do not broadly claim such a construction. The said patent also shows a rotary electric motor and a rotary pump mounted upon the same shaft, placed side by side over the rear axle with the shaft extending across the frame; but this construction is very objectionable. In practice it will be necessary to employ a positive-pressure pump with interlocking pistons, such as I have shown and described, in order to obtain the necessary pressure, and such a pump, being entirely different in shape from that shown in Wooley's patent, and also being very light compared with the electric motor, is unadapted to be placed side by side with it. Besides this, the form of electric motor desirable to use for this purpose is a different shape from that shown by Wooley, requiring, like the pump, more space in the direction of its shaft, and for this reason having the motor connected direct with the pump upon the same shaft, which is very desirable, would necessitate, as Wooley has constructed his engine, making the engine very wide and cumbrous, and much heavier on the motor side than on the other. By my construction I am enabled to employ a very narrow carriage, and to place an electric motor of the desired form between the rear wheels and as close to the rear axle as possible, thus lowering the center of gravity and equalizing the weight on both sides, and at the same time enabling a suitable pump of comparatively little weight to be arranged in front with one of its pistons connected direct or mounted upon an extension of the shaft carrying the armature of the motor, which is a very desirable arrangement where a small rotary pump is used.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the frame A, mounted upon four wheels, the electric motor B, sup-

ported upon the said frame over the rear axle and fixed thereto, with its armature shaft extending lengthwise, and the rotary pump I, fixed to the front part of the frame, and having one of its revolving pistons mounted upon an extension of the armature-shaft, substantially as described, whereby the weight of the electric motor is supported by and equally distributed between the rear wheels, and a suitable electric motor is enabled to be used and connected direct with one of the pump-pistons without requiring a wide carriage.

2. The herein-described electric fire-engine system, comprising electric fire-engines, substantially such as described, a system of stationary electric conductors for conveying motive power in the form of electric current from a stationary generator to the said fire-engines, and provided with suitable means for forming electrical connections with the fire-engines at fixed points accessible from the streets, and a system of water-supply pipes constructed with suitable hydrants or fire-plugs, to supply water to the said fire-engines, the said means for making electrical connection with the system of conductors being arranged within or in close proximity to the said hydrants, so that both the water and the electric current required for pumping may be immediately obtained at the same point, substantially as described.

3. The combination, with a hydrant or fire-plug, of electrical conductors electrically connected at one end to a system of current-supplying conductors connected with an electric generator, and terminating at the other end within the said hydrant, and being provided with suitable means within the hydrant for connecting and disconnecting at pleasure wires or other conductors, substantially as described.

May 25, 1882.

SCHUYLER S. WHEELER.

Witnesses:

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FRANCIS B. CROCKER.