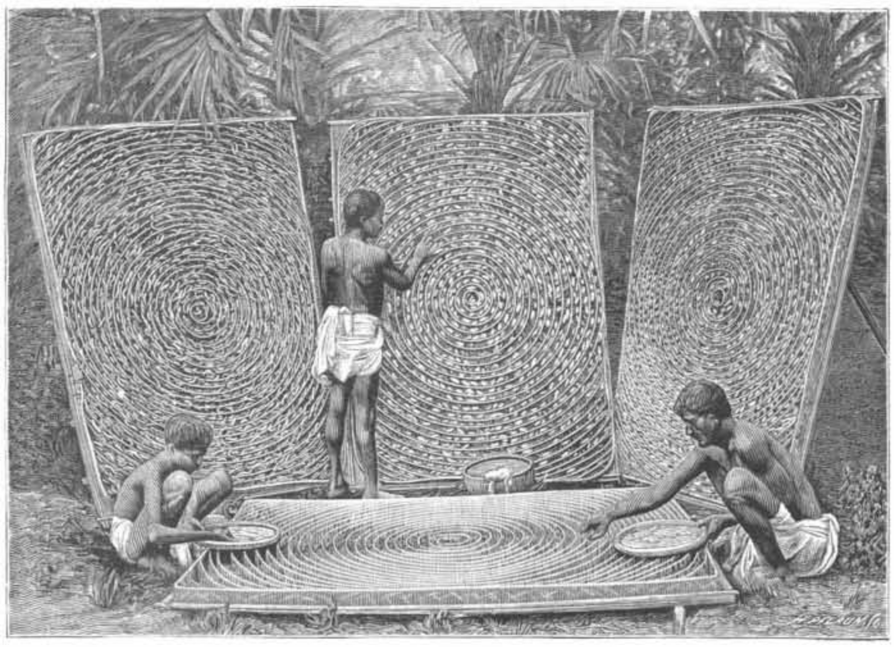
SILK GROWING IN INDIA.

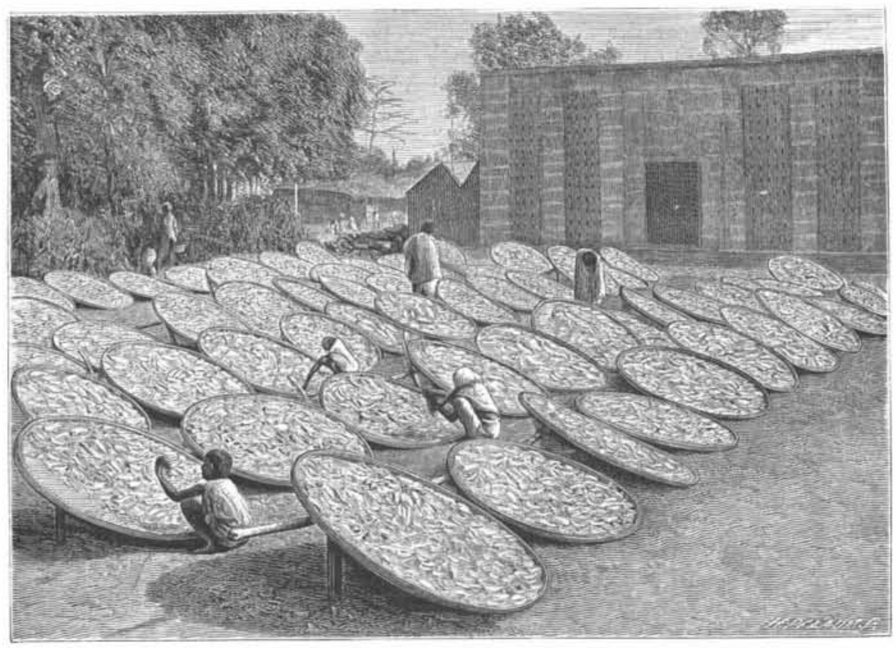
Though the Indian trade in silk has fallen off since the days when the Portuguese found the silk-laden ships of the merchants of Cambay the greatest prize they could win, or the industry constituted the chief source of revenue to the old "Honorable Company," yet still it forms in the raw a very appreciable item in the commerce of India. A recent number of the Graphic, London, contains an interesting article on the subject, from which we abstract the following particulars and illustrations: To see something of the conditions, both of silk spinning and weaving, no better centers can be chosen than Berhampore and Murshidabad. The Indian government has placed here its laboratory of practical sericulture under the direction of Mr. N. S. Mukerji, who was trained for his work at Cirencester Agricultural College (where he was gold medalist of his year), Lyons, and in Pasteur's laboratory. Unfortunately, among the other influences which have handicapped the Indian output of silk had come to be that of those diseases among the silkworms known to bacteriologists as Pébrine, Flacherie and Grasserie. By a long series is, of course, the exceeding cheapness of labor that would give India such an immense advantage in the world's markets could only her possibilities in silk growing be fully exploited, and meantime the primitive methods that have been in vogue for years are practiced for the winding and reeling with very little advance in the use of machinery.

Most of the rearing is done by villagers in their own homes, while the wild tussus cocoons are collected by the Santals—the great hunting and jungle tribe of Bengal—who go out with a large amount of superstition and many strange observances to gather in their harvest. The treatment of the silk is practically the same after the first process of steaming the cocoons to soften them has been gone through, the tussus being subjected to a chemical bath, which is not necessary for the cultivated material. When the cocoons are brought to the filature, they are spread out upon enormous trays of plaited palm leaf in the sun to dry, and a curiously brilliant scene of color one sometimes obtains from the mass of row upon row filled with bright canary and pale amber oval balls, against walls of dull Indian red, while about the inclosure move dark figures turbaned in some rich, bright hues, or habited in white or colored saris, with overhead the eastern sky glowing in its deep unclouded blue. Steaming is the next process, the cocoons being brought to the hot chamber in large baskets covered by a piece of sacking. When sufficiently softened they go to be unwound, and in a large factory this is perhaps the busiest scene of all. Each latai, as the wooden appliance on to which it is wound is called, is in charge of two persons, generally a man and woman or man and boy. The man (or sometimes a woman, as there is no sex restriction of custom in the matter) sits upon his heels upon a long raised stone bench before a bath in which the cocoons are kept moist. The fine silk filament passes through his fingers on to the latai beyond, which the woman or boy keeps in rapid motion so long as the thread remains unbroken. Among the poor native spinners in their own homes mechanism even more simple is employed, and one may often see there a woman winding the cocoon through her fingers while she keeps her small rough latai of bamboo sticks in swift movement with her toes. When spun, the silk, which to non-expert touch seems beautifully soft and even, is twisted by women's fingers into hanks, and is then ready for the market. The exceeding delicacy of touch which the natives show in sorting the different grades and thicknesses of silk is, perhaps, to European eyes one of the most marvelous features of the industry. They detect any variation of fineness instantly, and place a skein with unerring accuracy in the category to which it belongs.

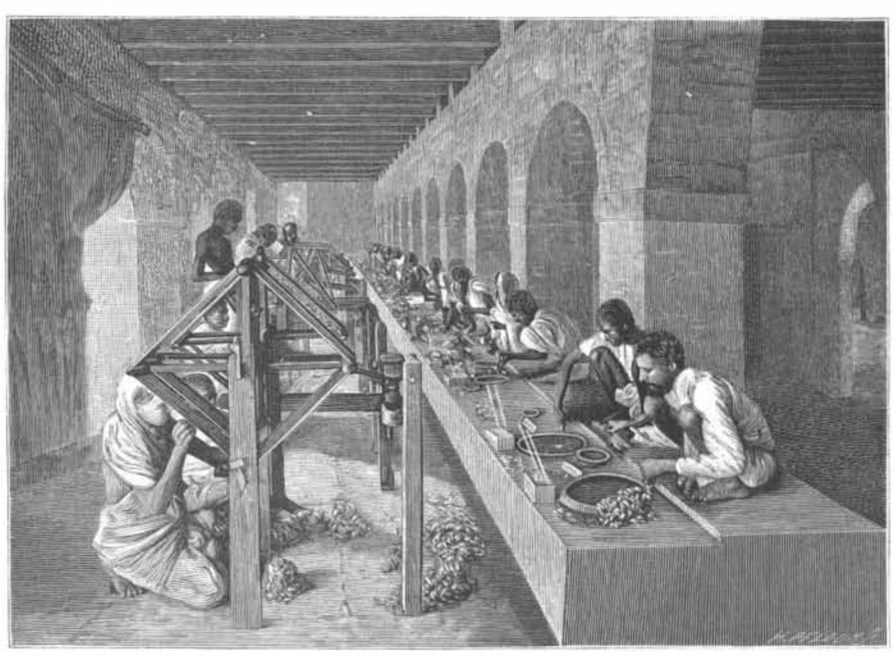
At the great Alliance Silk Mills of Bombay—the only ones in the Dependency—there is a very large and increasing outturn now of the lighter silken fabrics. There the machinery is all of the latest and most approved of modern patterns, and save for the presence of Eurasian and Parsee foremen and dusky skinned Hindoo hands, male and female, it would not be difficult to imagine one's self in one of the great factories of Manchester, Congleton, or Leek, whose products, indeed, these Bombay ones much resemble in quality, coloring, and design, as aniline dyes are used, and European patterns are freely copied. The Mohammedans are large buyers, but for them are woven specially the Mashru and Sufi, i. e., "permitted" and "lawful" materials with an appreciable admixture of cotton, in



PLACING SILKWORMS IN THE SPINNING TRAYS AND REMOVING THE COCOONS.



DRYING COCOONS IN THE SUN.



UNWINDING THE COCOONS.

TESTING, SORTING, AND PACKING SILK.

THE SILK INDUSTRY IN INDIA.

of patient experiments, Mr. Mukerji has not only succeeded in stamping out a great amount of disease, but has placed within reach of the village silk rearers a large available supply of perfectly healthy eggs, which, after the long time that seems absolutely indispensable for the native mind to overcome prejudice against any sort of innovation, they are now beginning to take advantage of. The Bengal worms are those scientifically classified as Bombyx Fortunatus and B. Crœsi. and differ from B. Mori of most of the other silk-producing countries in that they give more "crops" in the course of the year, and require their food in a much younger and less developed condition. Instead, therefore, of the mulberry trees associated with silk districts here in Bengal, one sees literally mulberry fields which are cut down three or four times a year with a sickle like so much wheat. Mr. Mukerji and other experts are greatly in favor of introducing the European worms and system of culture to a greater extent, and in Kashmir and the Punjab—looked upon by many as a coming field of silk production—it is probable that climatic and other influences might give satisfactory results in due course, though experiments so far have not given unqualified encouragement. It

obedience to that injunction of the Prophet which forbids the wearing of perfectly pure silk.

Of greater interest, perhaps, from the point of view of an art craft, are the works that are executed upon the hand looms of the silk districts. Down in Murshidabad and Berhampore are still woven the old-fashioned saris with the anchlas, or bordered end, in which is reproduced the immortal and universal knop and flower pattern, or those strangely conventionalized forms of mango, the sacred fig, or the lotus, which have come down through the centuries, as well as the chelijor which are seven yard lengths of (usually) plain, colored and bordered silks, which form part of the ceremonial garb of the Hindoo bridegroom. The shawls, too, are very interesting, though the art of weaving these is on the verge, it is to be feared, of extinction. For at present the secret in this district of setting the complex naksha looms necessary for making them remains a secret of an old man of eighty years of age, named Dubraji. There is a beautiful example of his work in the Imperial Institute of a white twilled ground, with a design probably suggested by the ivory and inlaid work characteristic of many parts of India.

The Funeral of Pasteur.

Amid the signs of national sorrow, the funeral of Pasteur took place on Saturday, October 5, 1895. France, more than any other nation, knows how to do honor to the memory of those who have contributed to her greatness, and by giving a national funeral, as well as taking the cost of it upon herself, she has once more shown the esteem in which she holds those who have devoted their lives to the increase of the world's knowledge and happiness. How very full was this expression may be gathered from the report of the London Times correspondent at Paris. We read: "Quite a small army of infantry, marines, cavalry, artillery, and municipal guards, mounted and on foot; deputations from all the schools and learned societies; most of those who speak and of those who govern and command in the name of France came to render homage to the stainless glory of this Frenchman, whose genius devoted its efforts to the whole of mankind, and who deserves the gratitude of the world, not merely for the labors which he accomplished, but for the new paths which he opened to science by the fresh discoveries which he made for the benefit of mankind." Shortly after ten o'clock on Saturday morning, the troops and innumerable deputations, which had assembled in and near the Pasteur Institute, marched past before the coffin containing the body of the illustrious investigator. The funeral procession was then organized. General Saussier, surrounded by his staff, and followed by the first division of infantry, preceded the hearse, and behind him came a long line of deputations, many of which had wreaths in their center. A number of wreaths were borne on litters, and others were carried on six cars, each drawn by a pair of horses.

"Along the route from the Rue Dutot to Notre Dame," says the Times correspondent, "the compact and silent crowd respectfully uncovered their heads as the hearse passed, and the two thousand soldiers and policemen, drawn up in line to keep the way clear, had absolutely nothing to do. The pall bearers were M. Poincaré, M. Joseph Bertrand, M. Georges Perrot, Dr. Brouardel, M. Gaston Boissier, and M. Bergeron. After marching for an hour and a half along the left bank of the Seine, the procession reached the square of Notre Dame. The aspect of the cathedral was most impressive. The presence of President Faure, the Grand Duke Constantine, Prince Nicholas of Greece, Cardinal Richard, the whole of the Diplomatic Corps, the ministers, the Institute of France, the office bearers of the Senate and the Chamber of Deputies, the red robed judges, the members of the university faculties, in orange, red, and crimson robes, and the other distinguished persons invited—all this display of official mourning was coupled with and yet eclipsed by the profound silence, the manifest grief. The immense crowd was a rare and impressive, if not a unique spectacle."

The Royal Society was represented by Mr. W. T. Thiselton-Dyer, C.M.G., director of the Royal Gardens, Kew. At the final funeral, which was held in connection with the centenary of the Institute, on the 25th ult., several of the officers and fellows of the society were present, together with many delegates from other of our learned societies.

After the service in Notre Dame, the coffin containing Pasteur's remains was removed to a catafalque outside the cathedral, and M. Poincaré delivered an oration before it, on behalf of the government.

"Thus," says Nature, "does France venerate the memory of her noblest son. But France is not alone in her grief. The human race joins with her in mourning the loss of one who has done so much for humanity and science. The name of him to whom the world owes so much good is imperishable."

The Chicago Times-Herald Motocycle Contest.

All contestants will be on hand with their motocycles at 8 o'clock Saturday morning, November 2, at the junction of Jackson Park and the Midway Plaisance. At a signal from the starter, a platoon of mounted South Park policemen will proceed west on the Midway Plaisance, followed by the competing motocycles formed in parade line, the vehicles being separated by spaces of about forty yards. In this order the motocycles will move west on the Midway, through Washington Park and Fifty-fifth Street Boulevard to Halsted Street, where the contest proper will be started. The judges decided on this programme for the reason that three important railroad crossings are situated between State and Halsted Streets, over which it would be impracticalto conduct a contest in which the element of speed was a factor. At Halsted Street and Fifty-fifth Street Boulevard the motocycles will be started in pairs at intervals of one minute. Each motocycle will have assigned to it a referee or umpire who will pass upon all questions which may arise on the route from Chicago to Waukegan and the return to Lincoln Park. Each motocycle will register at the established relay points, namely, Jefferson Park, Half Way, Waukegan and Winnetka.

The judges decided to make a time limit of thirteen hours, which is based on the minimum time specified in the recent Paris-Bordeaux motocycle contest. It is confidently predicted that some of the vehicles will make the 100 mile run in less than half this time. No motocycle will be admitted to competition unless it first passes the examination at the preliminary tests which will be held October 29, 30, and 31. An exception to this rule will be made for such foreign vehicles as won prizes at the Paris-Rouen or Paris-Bordeaux races. All competitors should bear in mind that the judges will take largely into consideration the showings made in these preliminary tests.

There were present at the session of the judges, October 22, Prof. John P. Barrett, city electrician; President Henry Timken, of the National Carriage Builders' Association; Colonel Marshall I. Ludington, C. F. Kimball and Leland L. Summers.

Prevention of Smoke on Locomotives.

The third annual convention of the Traveling Engineers' Association was held at Pittsburg, beginning September 10 and lasting until the 12th. The balance of the week was spent by the members in visiting the Galena Oil Works at Franklin, Pa., and the Pennsylvania Railroad shops at Altoona, Pa. Among the reports was one on the following subject:

"How can the traveling engineer assist in preventing the unnecessary emission of black smoke."

The committee on the above question say:

We consider the brick arch one of the greatest aids to the engineman in the prevention of smoke, inasmuch as the smoke and gases to a great extent are consumed in coming in contact with it, which in its absence would escape through the flues.

We consider a good solid fire the best, i. e., about six to eight inches good white fire, then when fresh coal is added there will be more heat units to ignite the smoke and gases than there would be if a light fire was carried, and there will be less likelihood of the air coming through the grates in too great volume. And further, because, if service is heavy, the heavy fire will stand the action of the exhaust better than a light one.

We recommend the wetting of the coal when weather will permit of it, as the vapor arising from the coal when put in the fire will materially assist in the consumption of smoke.

We consider the baffle plate over the door of great value, inasmuch as the cold air that enters at the door when open will be turned downward onto the surface of the fire, a great percentage of which, in the absence of the plate, will pass direct to the flues.

In cities where a little smoke is annoying, we recommend the use of a good smoke consumer, which, if in the hands of careful men, will do good work and prevent the emission of smoke.

Gigantic Long Horn Beetle in Spruce Timber.

I send you a bug for a name. I found it in a cavity which it had to all appearances cut out for itself in an old piece of (I think spruce) timber, that had been for I don't know how long under a pile of lumber. This bug was in the cavity, headed out, and fastened its jaws viciously on a piece of straw when it was placed close to its head.

The cavity was oval in shape, about 1¾ to 2 inches long, ¾ to 1 inch wide and perhaps ⅝ inch high, with an opening in front. The wood was somewhat rotten on top of the hole, but only dozy for the larger part where it had cut it out.

It was exceedingly lively when discovered, but did not attempt to run far. C. A. SUMNER.

ANSWER BY THE LATE PROFESSOR C. V. RILEY.

The light brown beetle with long feelers having cylindrical joints and three rather stout spines on each side of the thorax, sent by Mr. C. A. Sumner, of Milford, Mass., is known as the Cylindrical Orthosoma (Orthosoma brunneum, Forst.) There are several of these brown longicorns known to occur in the North American fauna, some of them three times as large as the present species. The larvæ of this and the allied species are large, fat, elongate creamy white grubs, the posterior portion somewhat narrowing, but the anterior portion broadening and terminating in a dark horny head armed with a pair of strong jaws. The whole body is quite wrinkled and there are especially a series of transverse wrinkles both on the upper and under or dorsal and ventral surfaces of the principal segments. It has long been known that the larva of this particular species feeds in old stumps, whether alive or dead, of various pines and spruces, so that there is nothing surprising in the beetle being found in an old piece of spruce timber. The larva had fed on the timber and had transformed to the beetle, which was probably just ready to eat its way out to the surface when found. The larvæ of some of the other species, especially of the broad necked Prionus (Prionus laticollis, Drury) and of the tile horned Prionus (Prionus imbricornis, L.), affect not only the old stumps, but the live roots of a number of different trees, including various orchard trees, like the apple, and have been found particularly injurious at times to grapevine roots, as was shown many years ago (Riley's First Report on the Insects of Missouri, 1868, pp. 87-91).

The Baltimore Tunnel Electric Locomotive in Service.

The first of the lot of four electric locomotives to be built by the General Electric Company for the Baltimore & Ohio tunnel at Baltimore is in active service. The second one is being shipped in parts. The contract requires the engines to haul 15 loaded passenger cars and a locomotive at 35 miles an hour and 30 loaded freight cars and locomotive at 15 miles an hour through the tunnel up an 0·8 per cent grade; the object being to keep the tunnel free from locomotive smoke, which would, of course, be aggravated when pulling up the grade. The tunnel is large and handsome and well lighted by incandescent lamps on the walls, and through it passes the traffic of the Philadelphia Division of the Baltimore & Ohio Railroad.

There have been some changes on the electric locomotive since it was put in service, but probably not more than might be expected from the limited experience had so far with such motors. The locomotive is now pulling all the eastbound freight trains through the tunnel, that is about 12 trains a day. Going west the trains run through without steam, the grade descending at 42 feet per mile all the way.

The speed made with the guaranteed load is not so fast as agreed upon. About eight miles an hour is all that the locomotive is capable of making with the 30 loaded cars and a locomotive, according to the statement of the engineers on the ground. It is said that the motors will not stand the current required to haul such a train up the grade at 15 miles an hour. This is not to be wondered at when it is known that the current required at eight miles an hour is 1,500 amperes, the motors being in series, so that all the current flows through all of the motors.

The locomotive is not being used now on passenger trains. The smoke clears from the tunnel between trains when pulled by steam locomotives, if the trains are not too close together, so that the freedom from smoke that could be obtained by the use of the electric locomotive is not very important. The steam locomotives on the freight trains that are hauled through make a good deal of smoke while in the tunnel and moving at eight miles an hour.

An observation made recently shows that the freight locomotives hauled at a slow speed foul the tunnel as much as the passenger train locomotives running at a high speed and using steam.

The length of the tunnel run is about 1·4 miles, and the useful service of the electric locomotive is about 28 miles a day, as learned from the attendants. The cost per mile run is, of course, very great, as it must include a heavy charge for that part of the stationary electric plant that is not needed for lighting the tunnel, yards and shops.

Whatever may be the outcome of the use of electric locomotives in the Baltimore tunnel, there is one valuable practical lesson already: there is a possibility of getting any reasonable pull with an electric locomotive. This fact will be impressed on the mind of any one who sees the machine take hold of a train of 30 cars and start them without using the slack. In the matter of speed, there is nothing about this service that is intended to show how fast electric locomotives can run.

A far better example is found in suburban street car lines. It has been said in the press reports that the Baltimore electric locomotive has reached 61 miles an hour. This is quite probable, as there is sufficient power to drive the locomotive and several cars at 100 miles an hour if the motors were all placed in multiple instead of series. Speed with electric motors is largely a matter of connection of the wiring, and high speeds are generally more feasible and economical than slow speed with heavy loads.

Taken as a whole, the Baltimore tunnel engine is a very interesting mechanism, and the controller in the cab for directing the electric current is a study in details that makes a profound impression on the layman. The sparking in the overhead conductors has been reduced by using two collectors, but the rusting of the iron conductors is a continual source of annoyance. It is well worth a trip to Baltimore to see the locomotive pull a train, and the experience of the next six months with this plant may be very interesting to electricians as well as to railroad men who are looking to electric locomotives to bring back the passenger traffic which the street lines have "stolen." It may be well to say, in closing, that this theft is simply an illustration of the fact that the natural public, like nature herself, follows the line of least resistance, and it is often easier and more comfortable to take the trolley car than to walk to the station and wait for a train.—Railroad Gazette.

Traction Trials in Berlin.

The Elektrotechnischer Anzeiger announces that the municipal authorities of Berlin have resolved to grant a credit of 50,000 marks ($10,000) for the purpose of carrying out experiments with various forms of traction, more particularly with the Serpollet steam car, the Dessau gas car, and the improved accumulator systems.

The Lignite Industry of North Dakota.

According to the American Manufacturer, lignite is found in all the western half of North Dakota, cropping out of the bluffs and hillsides. In most localities there are three or four strata of it, the upper being from a foot to 3 feet thick, and the lower one from 5 to 30 feet thick. The upper veins are softer than the lower veins, and are too thin to be of any value. Most practical miners believe that still lower veins would be found if the shafts were sunk, and that these veins would prove to be harder than the ones now worked, but the industry of mining in the State is everywhere in a rather rudimentary stage, and there is no capital available to make experiments. A level is run in from the face of some bank convenient to a railroad, a track is laid into the opening, and the coal is taken out by the simplest and most economical method.

The mines now worked for shipping are at Sims, on the Northern Pacific, 35 miles west of Mandan; at Lehigh, 106 miles west of Mandan, and also at Minot, where the Soo road crosses the Great Northern, and at Burlington, a short distance from Minot, on the latter road. Mines worked by settlers to supply neighborhoods with fuel are numerous. Perhaps the most notable of these are in McLean county, north of Bismarck, where a superior quality of coal is found.

So vast are the lignite fields of North Dakota in their extent and so wide in their geographical distribution, that only such as are very near to a railroad track and present thick veins exposed for the most economical mining operations have any present commercial value. In other words, coal lands are worth no more than other lands unless they are contiguous to a railroad and unless the lower vein is thick and can be entered on a level.

The cost in carloads on the track at Fargo is $3.25 per ton. This is now the furthest eastern point of supply, but it will not be long before lignite will cross the Red River and become established as the favorite fuel in the northern Minnesota towns. At Mandan lignite costs $2; at Bismarck, $2.25; at Jamestown, $2.55; at Carrington, $2.90; at Leeds, $3 25; at Oakes, $3.10; and at Lisbon, $3.15. It is not possible to market it in South Dakota by reason of the excessive charges of the railroads operating in that State. They demand as much for hauling it from Oakes to Aberdeen, about 50 miles, as they charge for hauling Eastern coal all the way out from Chicago, about ten times the distance. Such rapid progress has lignite made in public favor during the past year or two, and so ample have been the demonstrations of the economy resulting from its use, that it is evident that this home fuel will soon almost wholly supplant Eastern coals throughout North Dakota, except for locomotive use.

The mine now working at Sims is on a 7 foot vein. The owners say that their coal compares with the best Pittsburg coal in the ratio of 14 to 20, and with Iowa coal in that of 16 to 20. The freight rate to points of consumption is 25 cents a ton less than that from the Lehigh mines, which are 70 miles further west, and this difference is added to the coal, so that the product of the two localities comes into equal competition at all places where it is sold. The Minot coal, which finds its markets along the lines of the Great Northern and Soo roads, is sold at the mines for $2 a ton. It is of no better quality than that mined at Sims and Lehigh. The coal field worked at Sims is broken by numerous ravines.

The Lehigh and East Lehigh mines at Lehigh, near Dickinson, work a 26 foot vein, but only 15 or 16 feet of coal is taken out. Rooms are excavated in the thick coal body each side of the entry, and sufficient coal is left above to form an arched roof, which requires no timbering. The pillars between the rooms are "robbed" after the rooms have been fully blasted out, and then the mass of superincumbent clay, having a depth of about 50 feet, caves in. The process of mining is exceedingly simple. Holes are bored with a breast auger and dynamite shots put in to bring down the coal. A track runs into each room from the main line of the entry and the cars are loaded with fork shovels which allow the slack and fine coal to slip through the tines. All this fine stuff, although it is good coal, is left on the floor of the mines and only the lump coal is taken out in the cars. About 30,000 tons will be mined at Lehigh during the year and the product of the Sims mine will be about the same. At either place 100,000 tons could be mined annually.

Rust.

The following are some interesting remarks made by Professor Skidmore, of Philadelphia, with regard to the distinction between minerals and metals. It is not possible, he observed, to define exactly what a metal is, yet there is little liability of mistake in distinguishing a metal from a non-metal. The metallic properties of luster, toughness, fusibility, opaqueness, conductivity, and rust may be possessed separately by non-metals, but they are not associated as they are with metals. Most metals may be bent, twisted, drawn, and hammered to an extent far beyond what any mineral not a metal could endure. Professor Skidmore showed by a series of interesting experiments that sodium, potassium, lithium, and, in a lesser degree, calcium, strontium, and barium, rust instantly when exposed to moist air, their white rusts quickly dissolving in water and forming alkalies. Other experiments demonstrated the fact that another group of metals, in which are zinc, lead, magnesium, and antimony, have white rusts which are not soluble in water. These rusts form a thin adherent coating, which only half conceals the metal, and gives to it a dull, tarnished appearance. It was shown that at higher temperatures than the ordinary, and especially if the metals are finely divided, the chemical energy of rusting is so great that the metals burn with a vivid light and emit a dense white smoke. The permanency of these rusts and their protective character are utilized in white paints. Professor Skidmore then directed attention to a third group of metals, which include those which have dark or colored rusts, as with copper, iron and silver. A series of experiments followed to show how these rusts were formed, and the changes which iron undergoes in appearance in the tempering process were carefully noted. Attention was directed finally to the fourth group of metals, which never rust. These are gold and platinum, and it was noted that they are also the metals which are found as metals in the earth, and not as ores from which the metal must be manufactured. In the case of the other metals it is an advantage that they are found in the rust or ore condition, as they can be manufactured much easier than they could be cut from ledges of the pure metal.

The Flight of Birds.*

We often have, while the sun is shining, a layer of cold air superposed on a layer of hot air. Now as hot air has a less specific gravity at the same pressure than cold air, it follows that these two layers of air are constantly changing places, the relatively warm air at the surface of the earth ascending, expanding, doing work and becoming cooled, while the cold air from above settles to the earth to take the place of the warm air. The velocity with which these vertical currents move is, say, from one mile to six miles an hour, and their movement is quite independent of any other horizontal current that the air may have as relates to the earth at the same time. These currents may be going on in a valley surrounded by mountains without any other action of the atmosphere. On a plain, however, there is also another action taking place at the same time, but which does not in the least interfere with the vertical action, that is, the whole body of air may be passing along over the surface of the earth at the rate, we will say, of ten miles an hour, while the vertical action is going on at a velocity of, say, four miles an hour.

The soaring of a bird may be compared with a boy sliding downhill on a sled. If a hill is, say, 100 feet high, and the sides slope off in a horizontal direction 2,000 feet from the summit, and if the snow is smooth, a boy can mount a sled and advance 2,000 feet while he is falling, as relates to the earth, 100 feet; that is, the sled with the boy on it in falling through a distance of one foot develops sufficient power to drive the sled forward 20 feet, but when the boy is at the bottom of the hill and can develop no more power by falling, the sled soon comes to a state of rest. Suppose now that a hill could be made in such a manner that it would constantly rise at such a velocity that the sled would never reach the bottom of the hill. The boy would then be able to slide forever, and this is exactly what occurs with a bird. A bird places its wings in such a position that, as it falls in the air say one foot, it moves forward through the air 20 feet; that is, it slides along on the surface of the air underneath its wings in the same manner that the boy slides down the hill. Suppose now that the velocity of the bird should be about 30 miles an hour, this would account for the whole phenomenon of soaring on an upward current of only 1½ miles an hour. With an upward current of 2 miles an hour, the bird would rise, as relates to the earth, one-half a mile an hour while actually falling through the air at the rate of 1½ miles an hour.

There is no doubt that a bird, by some very delicate sense of feeling and touch, is able to ascertain whether it is falling or rising in the air. In all probability the numerous air cells which are found in the body of a bird are provided with delicate nerves, which operate in a similar manner to those of the swim bladder of a fish, so that as the bird is moving forward through the air it is able to take advantage of a rising column of air. As a whole, we may consider that the rising columns of air would be half of the total area of the earth's surface, so that a soaring bird would always have a rising column of air which would serve as a support. Referring to the eagles which I saw in the Pyrenees, on one occasion I observed five of these birds about 500 feet above the peak of a mountain, and they were balancing themselves in a stationary position on an ascending column of air produced by the wind blowing over the peak, and seemed to be as much at ease as if they were roosting upon a tree. As a ship passes through the air, the air is divided exactly in the same manner as water would be, and as it comes together again at the stern of the ship it produces an upward current, and it is on this ascending column of air that the albatross and the seagull find a resting place and follow the ship for days at a time without any apparent exertion; but whenever they find themselves in front of the ship or at one side where there is no ascending column of air they have often to work their passage very much as other birds do.

But all birds do not soar. Ducks, geese, partridges, and pheasants are types of birds which are provided with comparatively small wings. They only remain on the wing for a short time and while in the air exert an enormous amount of energy and move at a high velocity. They do not seem to have the power to take advantage of ascending columns of air, but move in a straight line quite independent of air currents, and it is these birds we should seek to imitate in our attempts to navigate the air.

* Hiram S. Maxim, in the North American Review.

The Laurel and Sassafras.

Few of the forest trees of eastern North America are more beautiful at this season than this member of the laurel family when its large variously formed leaves have turned to delicate shades of yellow and orange, sometimes tinged with red. The fruit, which, as a rule, is sparingly produced, is abundant in some years, and as it ripens in September and October, it adds much to the beauty of the tree at this season, being dark blue and surrounded at the base with a bright scarlet calyx tube and raised on a thick scarlet stalk. The birds relish its aromatic flavor, however, and they usually eat it as soon as it begins to color. The beauty of the sassafras is not confined to autumn. Its shining green branches in the winter, its drooping clusters of pale yellow flowers in early spring, the red brown and deeply furrowed bark gives the trunk a most picturesque appearance. The sassafras ranges from the shores of Massachusetts Bay to Florida and west beyond the Mississippi, and reaches its maximum size in southern Arkansas and the Indian Territory, where trees are not uncommon with trunks six or seven feet through and eighty feet high. Large individual trees are often seen much farther north, and on page 215 of vol. vii we gave the portrait of a tree on Long Island which has a diameter of forty-three inches at two feet from the ground. Although it is so common, like many other native trees, it is much neglected by planters, notwithstanding its usefulness. It is easily raised, too, for if the seeds are planted as soon as they are ripe, they will germinate next spring, and the suckers, which are often produced in great abundance, can be easily transplanted. To many persons the sassafras is interesting from its relationship to such trees as the bay, the cinnamon and the camphor, and perhaps its aromatic flavor helped to give it the reputation for sovereign curative properties which made it so eagerly sought for by Europeans for two centuries. Thoreau, who found poetry about him everywhere, wrote in his journal, "When I break a green twig of sassafras as I go through the woods in February I am startled to find it as fragrant as it is in summer. It is an importation of all the spices of an oriental summer into our New England woods, and very foreign to the snow and the brown oak leaves."—Garden and Forest.

A New Water Supply Project for London.

Mr. T. H. W. Idris, the chairman of the Special Water Committee of the London County Council, accompanied by several members of the committee, and Mr. A. R. Binnie, the engineer to the council, have visited a number of localities which it was believed might fairly be regarded as available sources of water supply for London; and the chief engineer has prepared an elaborate report.

The aqueduct required would be 150 to 170 miles in length. The engineer has so designed the works that the total quantity of 415 million gallons a day can be conveyed to London in two separate and distinct aqueducts, which can be carried near to and parallel to each other, or, if thought more desirable for safety, can be many miles apart.

The sources of supply are in Wales, at altitudes above 600 feet, extending to 2,800 feet above sea level at the head waters of the Usk, Wye, and Towy, in the counties of Cardigan, Brecon, Radnor, and Montgomery. On these highlands, the rainfall, as compared with that of the Thames valley (27 inches) is very heavy, varying from 45 inches up to 75 inches or more per annum; consequently from a total area of 312,400 acres, or 488 square miles, 415 million gallons a day can be obtained after making full allowance for dry years and evaporation, and giving due compensation in water to the streams and rivers from which the supply is derived, as compared with 300 million gallons a day without compensation from the 3,542 square miles in the Thames valley above Molesey.

For a gross supply of 415 million gallons a day to provide for all contingencies for a period of 50 or 60 years, the estimate is £38,800,000, at the rate of £93,494 per million gallons.

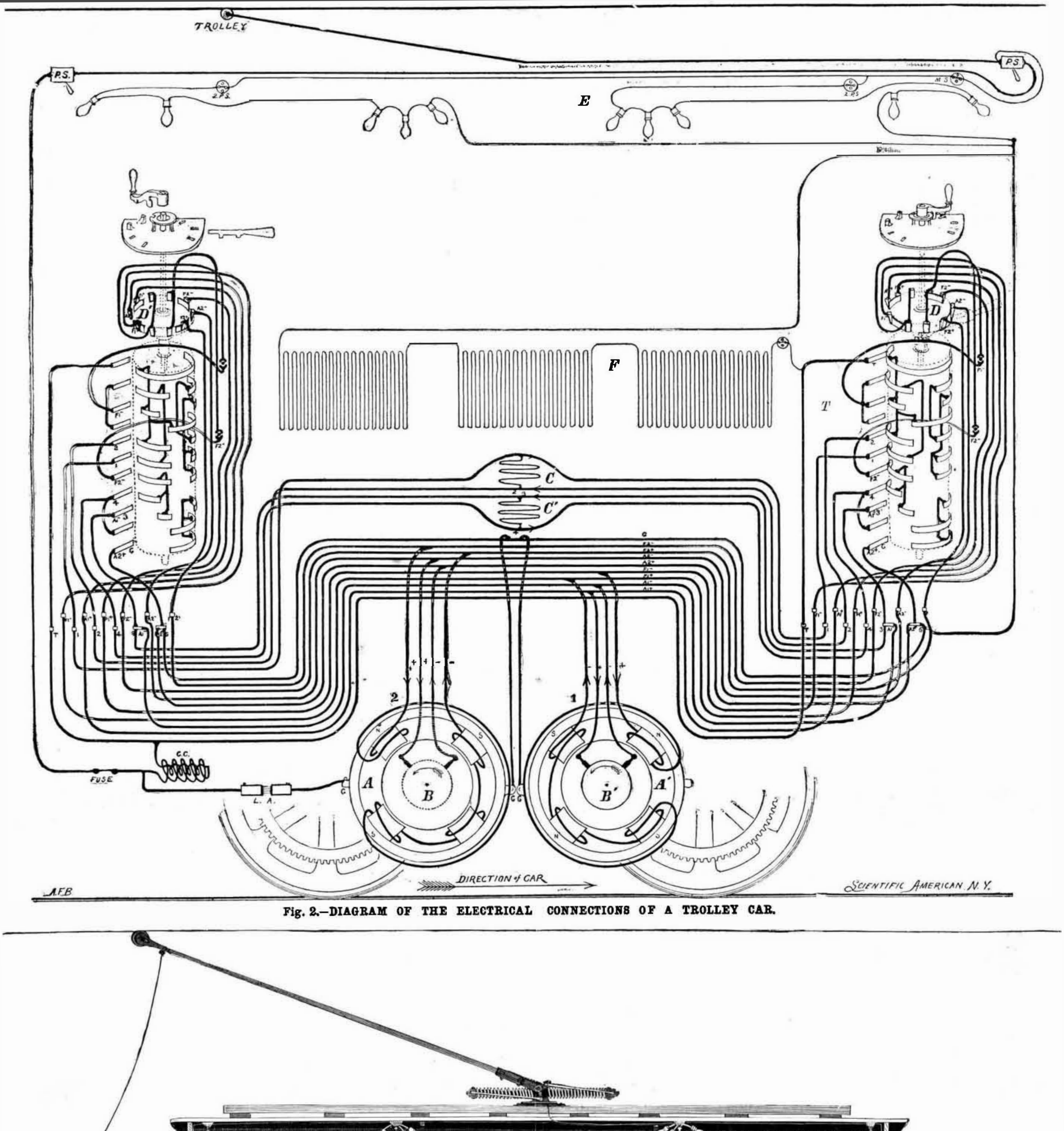
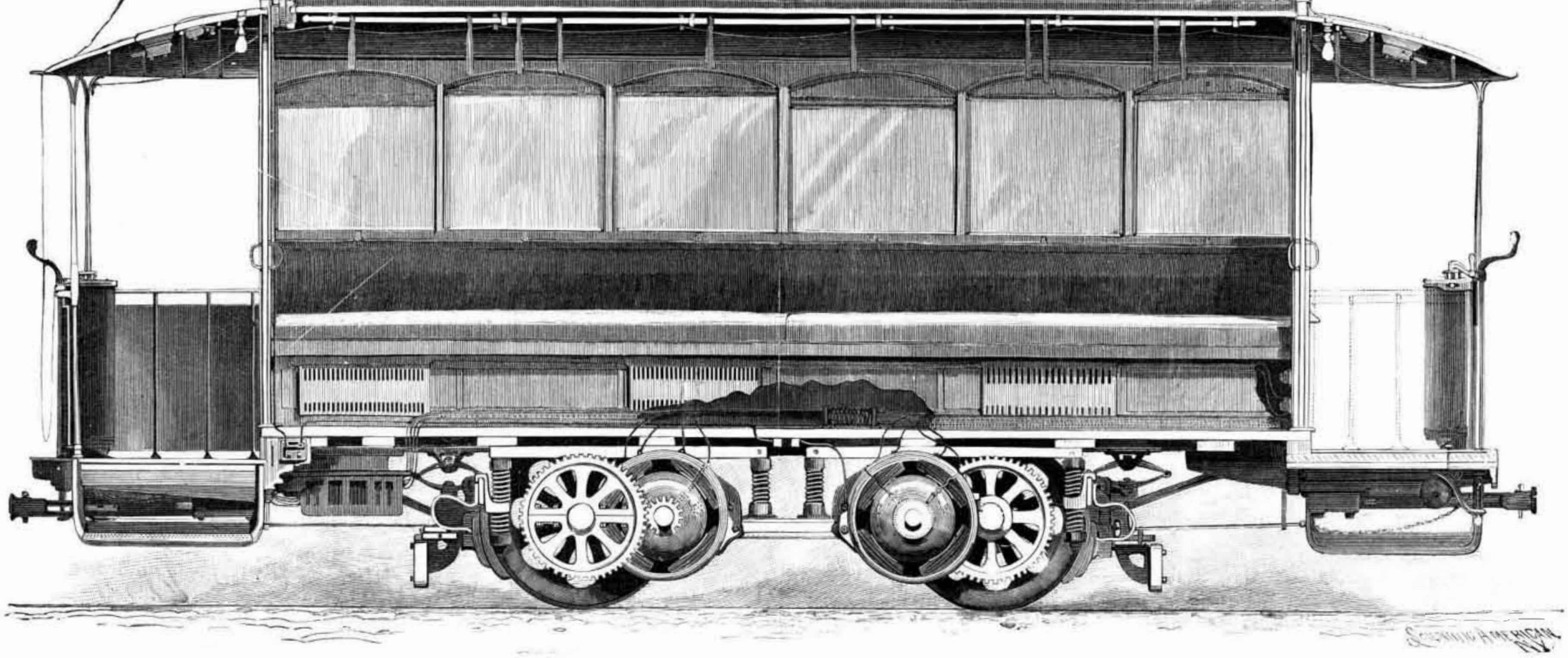


Fig. 2.—DIAGRAM OF THE ELECTRICAL CONNECTIONS OF A TROLLEY CAR.



FAIR HAVEN AND WESTVILLE ELECTRIC RAILROAD.—Fig. 1.—LONGITUDINAL SECTION OF A TROLLEY CAR.