THOMPSON'S GRAVITY SYSTEM FOR RAPID TRANSIT IN TOWNS AND CITIES.

A new system of operating passenger railroads in towns and cities, in which the cars are operated by gravity, is shown in our first page illustrations, the distances apart of the stations being approximately such as would be represented by the passenger stations on a city railway. The operative features of such a construction have had numerous illustrations in various switchback railways and coasting tracks at seaside resorts and other places, not to mention the famous switchback road at Mauch Chunk, Penn., which was used for many years to convey coal from the mines to the banks of the Lehigh, and where the inclines are extensive. It has, however, remained for Mr. L. A. Thompson, of Philadelphia, to perfect the working details for the operation of a city railroad on this plan, for which letters patent have been granted to him here and in all the principal countries of the world.

In this new system the locomotive is dispensed with. Hence the railway structure may be very light and simple, offering but little obstruction to the streets. At the stations, it will be observed, there are two undulations in each track, a car approaching the station being carried up and over the slighter elevation of the first undulation, where it stops to discharge and receive passengers, after which it is carried up over the higher undulation beyond, and allowed to proceed on its way to the next station under the action of gravity alone, whereby a high velocity is imparted to the car. Attached under each car is a cable gripping mechanism designed to work automatically, and Figs. 2 and 3 illustrate the manner in which the cables are operated by the engine at the station, and extend out a short distance under the tracks at either side. As the car arrives at the end of each long incline, and without at all checking its speed, its gripping mechanism comes in contact with the moving cable, driven at the station, by which the car is kept continuously on its journey till the desired stopping place is reached, which is on a slight incline, when the cable is released. As the car stands on an incline, it starts of itself by the action of a lever.

The automatic gripping mechanism is shown in plan and section in Figs. 5 and 7, and in Fig. 6 is shown a transverse section of light elevated road construction deemed suitable for this plan of operating a railroad, the metallic supporting columns and cross beams carrying also the track supports (I-beams), adapted to serve as guards on the outside of the car wheels to prevent the cars from being accidentally derailed. The speed which the cars may be expected to attain will depend upon the grades adopted. It is calculated that an average speed of from ten to twelve miles an hour, including stops, can be readily obtained without having the tracks higher than they at present are in many places on the elevated railroads in New York City. Each car will be provided with a suitable brake mechanism to enable the train hands at all times to have complete control of its movement, and there are devices for preventing any retrograde movement of the car while ascending inclines. At each station elevators will lift passengers from the sidewalk to the platforms.

Mr. Thompson has had much experience in building gravity roads. He erected numerous switchback railway coasting tracks in this country prior to 1887, when he went abroad and built a score or more of such roads in England and France, which have proved a great attraction at numerous seaside resorts, watering places, and centers of public resort. Our contemporary, *La Nature*, in describing these railways, recently gave Mr. Thompson due credit as the constructor, but said he was an Englishman. He is, however, a wide-awake, enterprising American.

The Thompson gravity or switchback roads are now in operation in Atlantic City, Lakeside, Gloucester, Paterson, N. J.; Neshaminy Falls, Chestnut Grove, Pa.; Bay Ridge, Md.; Washington, D. C.; Alexandria, Richmond, Va.; Coney Island, Bowery Bay, Oak Point, Saratoga, Rockaway Beach, Rochester, N. Y.; Cheltenham Beach, Chicago; Reeds Lake, Grand Rapids; Coronado Beach, Santa Monica, Cal.; Providence, R. I.

Of the Thompson roads there are also now in operation, in London, three. Of the roadways, in Manchester, two; Newcastle-on-Tyne, one; Blackpool, one; Liverpool, two; Douglas (Isle of Man), two; one in Brighton, Skegness, Great Grimsby, Great Yarmouth, and Folkestone; in Glasgow, two; Hull, one; in Paris, three; Boulogne, one; Barcelona, Spain, one. Millions of passengers have been carried on these gravity roadways, and we believe no serious accident has ever occurred on them. Probably no safer mode of conveyance was ever devised. The form of these roads, as erected by Mr. Thompson, will be seen by reference to the engraving of the roadway built by him at Boulogne, given on page 150.

Mr. Thompson's experience in this line has led him to the elaboration of the method herewith illustrated for street railway service. Among the advantages of this system are the following. There being no traveling engines or motors of any kind, the construction of roadway need cost scarcely half the amount that would be required if engines were employed. All hissing steam, droppings of dirt, hot water, oil, and coal are avoided. The roadway, being light and airy, does not darken the streets, and the cars running almost noiselessly is a feature of no small moment. The cars can be built very much lighter than any now in use on elevated railways, as there is no jerking or sudden stopping. The destruction of power by the application of air brakes at high speed in this system is entirely avoided, and no power is needed to stop. In other words, the force of momentum is utilized, as the car, encountering an incline on approaching the station, ascends by its own force nearly to the top; all the power required to complete the ascent being furnished by the short section of cable at each station, driven by small stationary engines, as shown in our engravings.

The grip is entirely automatic, taking hold of the running cable while the car is in motion (but at reduced speed), and releasing itself automatically at top of incline.

The attendant, by application of a brake, stops the car for passengers to alight or get on. Upon releasing the brake, actuated by a lever movement, the car immediately moves forward of itself, as it stands on a moderately descending grade, and again coming in contact with the moving cable, which carries it over the elevation, and the car then speeds on to the next station. A notable feature of this railway is the construction of the roadbed, its cheapness, and yet efficiency, and absolute safety.

The longitudinal I bars, sustained by straining rods —with cross ties—being of uniform thickness and length, resting on the lower flange of I bars, and held there securely by rods passing through from one I bar to the other, between the ties, the trucks of the car when standing on the rail being so arranged that they cannot get off, the breaking of a wheel or axle could not precipitate a car into the street. Hence its great safety.

Of the practicability and economy of this system there can be no question, as these points have been settled by the numerous examples of such structures now in actual operation. The reduction of this gravity system of propulsion to the local wants of towns and cities for the purposes of rapid transit reflects the highest credit upon the inventive and engineering abilities of Mr. Thompson, and we trust it will not be long before his plans will come into extensive operation. The system is at once effective, safe, and desirable. It is cheaper than steam, horse, or electricity. It furnishes a delightful method of high speed traveling, at low cost, free from many of the dangers and inconveniences of the ordinary steam cars. Further information may be had by addressing the patentee, L. A. Thompson, 914 Walnut Street, Philadelphia, Pa.

Blue Printing.

At the ninth annual meeting of the Ohio Society of Surveyors and Civil Engineers, Joseph N. Bradford, M.E., read a paper on the duplication of drawings, in which he recommended the following formula as giving the best results in the production of blue prints:

No. 1.

Red prussiate of potash	1	oz.
Water	10	"

No. 2.

Citrate of iron and ammonia	3	oz.
Water	10	"
Gum arabic or dextrin	¼	"

Use equal parts of Nos. 1 and 2. Keep these solutions in separate, light-tight, well-stoppered bottles.

The function of the gum arabic or dextrin is to keep the sensitizing solution on the surface of the paper, the quantity used depending upon the quality of the paper—hard, firm paper requiring little; soft, porous paper, more. As the iron and ammonia solution undergoes change when kept, it is better to have the salt in the dry state in a well-stoppered bottle, making the solution as needed.

In preparing the sensitized paper, take a solid, firm paper, free from impurities, and apply the solution to the surface of the paper with a soft sponge or a broad, soft brush, being careful not to have the sponge or brush charged too heavily with the solution, or else the paper will have a streaked appearance, which will show in the finished print. Go over the surface of the paper in two directions at right angles to each other, to insure an even coating. The sensitized paper must be allowed to dry in the dark, and in a horizontal position.

AT a recent meeting of the Paris Academy of Sciences, a paper was read on the thermic conductibility of mercury above 100 degrees C., by M. Alphonse Berget. In continuation of a previous note—*Comptes Rendus*, April 16, 1888—the author gives the results of his studies on the variation in the thermic conductibility of mercury between 100 degrees and 300 degrees C. For 1 degree he finds the variation in the coefficient of thermic conductibility to be —0·00045.

Correspondence.

A Curious Treatment for Hydrophobia.

To the Editor of the Scientific American:

I recently met a gentleman of high educational attainments, who stated that, in six years' residence in the East Indies, he had known of three severe cases of hydrophobia, and that each case was permanently cured. The means used was to take the patient to a pool or stream of water, plunge him in and allow him to just about drown and then resuscitate him. In each case, as before stated, a permanent cure was effected. W. T. G.

San Francisco, Cal., July 16, 1888.

Lightning in City and Country.

To the Editor of the Scientific American:

In answer to inquiry in SCIENTIFIC AMERICAN, August 25, 1888, as to comparative frequency of lightning strokes in cities and open country, a brief account may be found in an article in the *United States Monthly Weather Review*, December 1886, translated from the German, and giving the results of an investigation made by the Royal Prussian Bureau of Statistics. Section 5 of this report says:

"The risk of danger from lightning decreases with increase of number of houses contained in any given district. In Prussia the risk in the country is five times greater than in the city districts. In Berlin the number of fires caused by lightning averages only 0·2 to 0·3 of one per cent. For an ordinary dwelling house which stands among others not particularly high, the erection of a lightning rod is not needed."

It may interest your correspondent T. H. S. and others to know that the same authority gives the statement, based on investigation, that of all trees the oak was most frequently and the beech least frequently struck by lightning. If 1 represents the frequency with which the beech is struck, 15 represents the value for pine trees, 54 for oaks, and other trees collectively 40.

The determination of just where lightning is going to strike depends upon many variable conditions, among which are the geological and geographical features of the locality, the electrification of the cloud mass, the velocity of cloud motion, and the condition of the interjacent air as regards what Sir Wm. Thomson calls its electric strength!

There is no reason why lightning should not "strike twice in the same place," but we can see that it may be of rare occurrence to have a repetition of all the conditions which prevail at the time of a given disruptive discharge. A. M.

New York, N. Y.

Oil on the Waters as a Preventive of Fogs.

To the Editor of the Scientific American:

Can you inform me whether the experiment of pouring oil upon the water of rivers, or ponds, or estuaries, or of the ocean, has ever been made with the object of preventing or removing fogs?

Brand's Dictionary of Science, Literature, and Art, under the head of *Fog*, says:

"Fogs, in general, are the consequence of the nocturnal cooling of the atmosphere. The air, by its rapid cooling, becomes surcharged with moisture; a part of which, being precipitated in the form of a cloud, gives rise to the ordinary fog. During the day the heat of the sun generally disperses the fog, because the quantity of moisture which the air is capable of holding becomes more considerable in proportion as its temperature is increased. In calm weather the surfaces of rivers, lakes, etc., are frequently in the morning covered with fog. The reason is this: During the night the air is cooler than the water; the strata of air in contact with the water are constantly heated, and become saturated with moisture. The mixture of the vapor with the air, together with its elevation of temperature, renders the air specifically lighter. It rises in consequence, and, mixing with the cold air in the superior strata, is cooled, and precipitates its moisture," etc.

It is obvious that the above explanation applies equally to the giving off of visible vapor—the "smoking," as it is commonly called, of hot water when standing in any uncovered open vessel.

Now in this case, as I have found by experiment, though no doubt any practical scientist could have assured me of the result in advance, it needs but a small quantity of oil poured upon the "smoking" water to arrest at once the process of its visible vaporization.

Reasoning from this fact, I should suppose that there might be other uses for pouring oil upon the water than the quieting of the waves. I take it for granted that the fogs most dangerous to navigation are precisely those still fogs due to sudden though slight changes in the relative temperatures of the water and air which are illustrated upon a small scale in the "smoking" of hot water in an open basin, and which can be prevented or stopped by the use of oil.

Again, if oil is effectual to prevent the vaporization of water, why may it not have a possible most valuable use, in river or sea-port settlements, to arrest the spread of malarial diseases, and even of yellow fever?

Cambridge, Mass. D. G. H.