Minneapolis Electric Street Railway.

The electric system of the Minneapolis Street Railway and the St. Paul City Railway companies is without doubt the most complete and one of the most extensive systems in the world. Among other innovations introduced on these roads has been the burying of the feed wires, thus removing from sight and danger the most obtrusive portion of the overhead structure. These feed wires have been buried elsewhere, but the particular feature of interest that attracts attention in this case is the fact that the wires are drawn *bare* into the ducts.

The conduit is located between the tracks and is built as follows: Two-inch plank, first treated by boiling in fernoline, is used for constructing a long trough of the desired size. This trough is so nailed together as to be continuous and without joints from manhole to manhole, a distance of 408 feet. The trough is placed below the surface at such a depth that the top is six inches below the paving blocks.

The conduit proper consists of a number of heavy paper tubes of the Interior Conduit and Insulation Company's make. The tubes employed are one inch and one inch and a quarter inside diameter, laid in the trough in ten foot lengths, and separated from each other and the sides and bottom of the trough by rings or spacers. The tubes are made continuous from manhole to manhole by use of a telescopic joint. After the tubes have been properly put in place, pitch, liquefied by heat, is poured in, filling the interstices and leaving a series of highly insulated raceways with a solid insulating filling, impervious to moisture, around them.

A large amount of this conduit has been in service since September, 1890, and has not as yet developed a single fault. In fact, notwithstanding the conduits have passed through the rigors of a Minnesota winter, recent tests of the various feeders show a maintenance of the originally high insulation resistances, which certainly speaks well for the plan adopted.

With these practical results before them it is not unlikely that others having roads under their charge may do likewise.—*Electricity.*

Tampico Harbor.

Concerning the work at Tampico harbor, Resident Engineer Wrotnowski, in charge of the work, says the north jetty is now 5,835 ft. long and the south jetty 5,340 ft. When 7,000 ft. long the jetties will be in 24 ft. of water, which will be reached by October next. The distance between the two jetties is 1,000 ft. The bar is of sand and mud. The river when in flood has a force of 225,000 cubic feet per second. This enormous force of water will quickly deepen the bar to about 25 ft. when the jetty works are completed. Work was commenced on June 1, 1890. Since that time 1,400 ft. of beach have been gained on each side of the jetties, and from 1,000 to 1,400 hands are now engaged in the work. About 700 cubic yards of stone are dumped daily. An inexhaustible supply of stone is had about 61 miles from Tampico, in the State of San Luis Potosi. The pilings are brought to Tampico from Pensacola and Pascagoula, Fla. The mattresses of brush are from 70 to 85 ft. at the bottom and about 30 ft. at the top. The average current of the river is five miles per hour. The Panuco river has a depth of 25 ft. a distance of about 80 miles inland to the town of Tamos. It is calculated by the engineers that vessels of the largest draught may enter in the fall. When the work is completed Tampico will be the only safe deep water harbor on the Atlantic coast.

A Chance for Inventors.

A well known railroad man declares that one of the most useful inventions that can be thought of in connection with operative railroading is one that will automatically take the rear brakeman by the nape of the neck, and shoot him back from the train a sufficient distance to protect it, when, for any reason, an unusual stop is made. He declares, as a result of considerable experience with the genus brakeman, that nothing short of this will suffice to make it at all sure that trains will be protected under such circumstances, because nothing short of some such device can compel brakemen to go back a proper distance with the flag or lantern.—*Industrial World.*

HOT AIR BALLOONING, WEEHAWKEN, N. J.

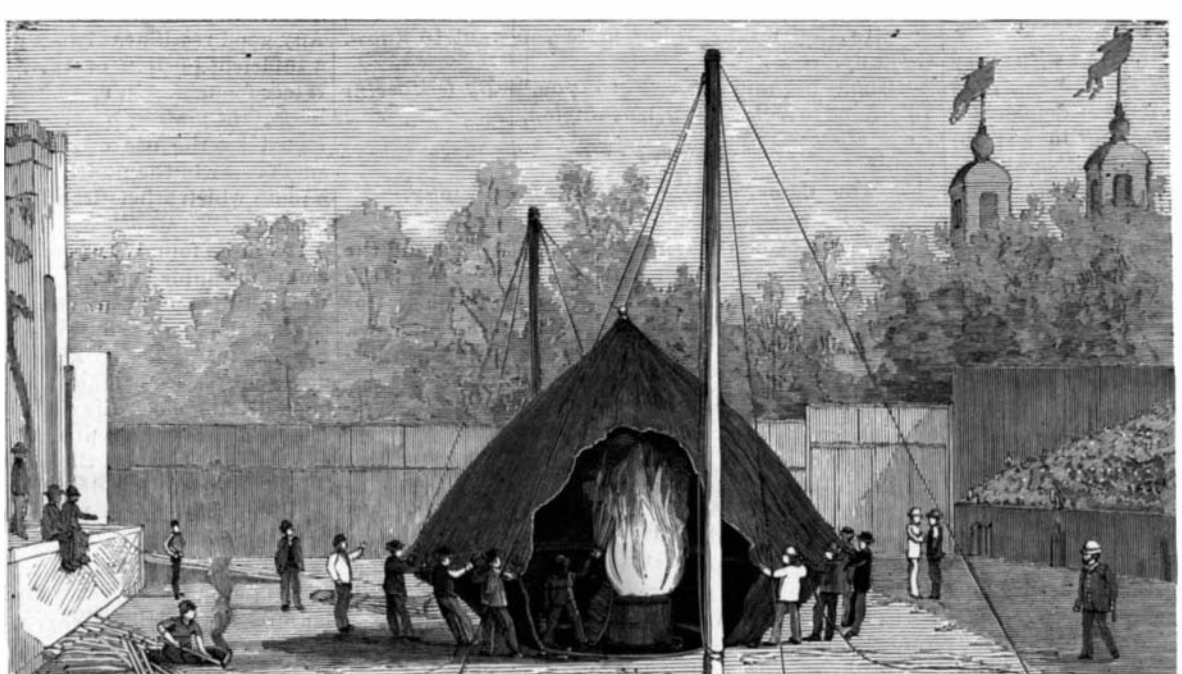
For some time past an exhibition of much interest to those interested in aeronautics has been produced daily at El Dorado, a pleasure resort upon the top of the Palisades on the Hudson River, just above Hoboken. It consists in the ascent of a Montgolfier balloon, to which a ribless parachute is attached. The aeronaut ascends with the two, and when a sufficient height above the earth is attained, cuts loose from the balloon, effecting his descent to earth in the parachute. We illustrate the principal features of the inflation, ascent, and descent with the parachute.

THE CUTTING LOOSE BLOCK.

The balloon is made of sheeting. This is one yard wide, and in the balloon which we illustrate forty segments of it were required for the circumference. For 16 ft. from its top each segment was tapered nearly to a point. The next 15 ft. were untouched, and then the last 29 ft. leading to the neck of the balloon were also tapered to about one-fourth their width. The segments were sewn together, as in making a regular seam; a cord was then laid along side the seam, and the double edges bent over and resewed, making a sort of felling. The top was made of double thickness. The sheeting was sized with a mixture of glue, alum, soda, salt, and whiting, in water.

At the mouth of the balloon a hoop 8 ft. in diameter made of buggy wheel felloes is attached; from this hoop four ropes, called quarter guys, are brought down, to which the parachute is attached.

The parachute in general structure represents the cover of an immense umbrella. When expanded it is about 28 ft. in diameter. It is made in gores, and in its center has a 12 in. hole. From its periphery thirty-two cords lead down to what is known as the concentrating hoop, a strong wooden ring 18 in. in diameter, which the aeronaut grasps in making his ascent. The construction of the balloon with cords felled into it is such that no net is required. As the performer goes up clinging to the hoop of the parachute, it is necessary that he should have some means of detaching himself, at will, from the balloon. This is afforded by the arrangement shown in one of the small cuts. To the quarter guys of the balloon is attached a block of wood by means of a rope passing through a hole in it. Above this hole a knife blade is pivoted, which works in a slot in the block, and held out of contact with the rope by a rubber band. To the end of this blade a rope is attached leading down to the aeronaut's hand. By a second rope the parachute hangs from the same block. It is obvious that on pulling the cutting line the rope will be severed and the parachute detached. One more appendage remains to be noticed. Within the parachute, near its mouth, a wooden hoop 4 ft. in diameter is suspended, and by a proper system of guys is held in a horizontal position. The object of this is to insure the opening of the canvas.



COMMENCING TO INFLATE THE BALLOON.

The inflation is thus conducted: A trench about 18 ft. long, 2 ft. deep, and 2 ft. wide is dug in the earth where the balloon is to be inflated, and, except a small portion at each end, is covered with iron, boards, and earth. Over one end an iron cylinder 3 ft. high and about 3½ ft. in diameter is erected. Around this cylinder barrel staves are placed with earth between them and the iron, forming a sort of rough lagging. On each side of the chimney thus provided, and at a good distance therefrom, two poles 28 ft. high are erected; each carries a pulley, and a rope is rove through the pulleys and carried through a ring on the top of the balloon. The mouth of the balloon is placed over the chimney, and, by means of the rope, the top is hoisted well up from the ground.

A wood fire is started in the distant entrance of the trench; this gradually heats the trench and smokestack, the draught at first being about as much one way as the other. After a few minutes, however, the draught begins to tend strongly toward the chimney, which is encircled by the mouth of the balloon, the sides being held well out from the center by a corps of assistants. From time to time a little kerosene is thrown on the fire. All this while an attendant stands within the balloon, by the side of the chimney, armed with a circular board to act as fire screen, and with a pail of water and a cup near him to throw water upon the cloth should it become ignited The balloon gradually feels the buoyant effect of the heated products of combustion, and as it tends to rise, more and more cloth is fed out, the assistants shifting their hold lower down upon the sides of the balloon. After ten or fifteen minutes the suspending rope is cast off and pulled away from the balloon, and four guy ropes leading from its top are used to keep it in position. It swells continually, and the canvas rises until only the hoop rests upon the ground. A number of the assistants now stand upon this hoop.

The last heating remains to be done. At short intervals kerosene is thrown upon the fire, by this time largely consisting of a mass of very hot embers. The oil is at once volatilized and rushes as a gas into the balloon, within which it suddenly bursts into ignition, producing a great sheet of flame, plainly distinguishable through the cloth. This is repeated over and over again, each addition of kerosene producing a great flame as it ignites, almost with explosive violence, within the expanded canvas, now straining violently upward. The upper end of the parachute during the inflation has been attached to the balloon, and the aeronaut, Mr. M. L. Macdonald, of New Haven, Conn., professionally known as "Daring Donald," stands off to one side, as the balloon is nearly ready, grasping the concentrating ring. When all is prepared, the word is given, and the balloon is released. The chimney is covered, and, as the balloon rises, the aeronaut walks or runs forward under it, and is carried up clinging to the parachute ring. A loop of rope is attached to the ring, and, when some distance up, he steps into this loop and thrusts his head up through the concentrating hoop, so as to leave his hands free to manipulate the cutting rope. When a sufficient height has been attained, and he deems himself over a favorable ground for a descent, he pulls the cutting rope and severs the connection between himself and the balloon. He commences to drop with accelerating velocity until the air, catching the parachute, suddenly opens it just as an umbrella is opened by hand. The velocity of the descent is checked. With some oscillation the earth is approached quite rapidly; in half a minute or less the surface is reached. The object of the aperture in the center of the parachute is to make these oscillations as slight as possible. The earth is struck with some violence, about as if the jump was from six or eight feet elevation, indicating a velocity of about twenty feet per second. The deserted balloon capsizes, owing to the greater weight of its top, the hot air and products of combustion, with considerable smoke escape, and it collapses and rapidly falls.

As the ascent is made, the entire distance from the top of the balloon to the aeronaut hanging to the parachute is about 175 ft.; the inflated balloon is about 40 ft. in diameter. The general operations of the inflating and of the ascent are in charge of Mr. Mortimer McKim, aeronautical engineer, of this city, himself an experienced aeronaut. Accidents in the descent are often to be anticipated: sometimes the parachute falls among the trees, from whose branches the operator drops to the ground, the parachute losing its effect the moment his fall is checked. Immediately under the Palisades are the cars and track of the West Shore Railroad, a descent among which might be the cause of very serious consequences. The descent is frequently made into the river. When this is anticipated, a life preserver is worn, to provide against sinking.

The cubic capacity of the balloon is about 28,000 cu. ft. Its lifting power is greater than would be the case with a similar gas balloon, on account of its extreme lightness. The absence of net and car and of heavy varnish conduces to its power.

Ex-Commissioner Mitchell tells about the Patent Office.

"Halloo! Is this Hon. Charles E. Mitchell, Commissioner of Patents?"

"Mitchell is my name, but I'm no longer Commissioner. I have resigned."

"I'm sorry to hear it. Why did you leave your post?"

"To attend to neglected private business, and because I am unwilling to do such an amount of judicial work that I cannot do justice to the office or myself."

"I have heard it whispered that you could not afford longer to accept so small a salary."

"That is not quite true; nevertheless, the emolument is totally inadequate to the position."

"Will this deter first-rate men from accepting the office?"

"Not from accepting it, but from remaining long in it. The Commissioner of Patents occupies a position of the greatest responsibility, and should be as permanent as a judge, with a salary equal to that of the higher courts."

"I see why you make this plea. On his decisions depends the validity of patents, and patents often involve millions."

"Sometimes they do. The Commissioner must judge between applicants and people, whether patents shall be granted. In interference cases, too, the value of the contested inventions is often large, not to say enormous."

"Is there no appeal from the Commissioner?"

"None whatever in interference cases. So you can readily understand the importance of his trust. Last year the Commissioner and Assistant Commissioner gave 900 written opinions."

"Are all the important officers turned out with every new administration?"

"Fortunately, no. The Patent Office demands a force of experts, many of whom have been in government employ 20 years or more. It would otherwise be impossible to get the work done satisfactorily. The three examiners-in-chief have a permanent tenure. One of them, Judge Clark, came in, I think, during Grant's first term."

"They, in their turn, have experts under them, I presume?"

"Yes. There are 32 principal examiners, each one at the head of an examining division; and the principal examiner, by nature of his employment as well as training, becomes the best informed person in the country on the science and art pertaining to his department."

"How many assistant examiners are there?"

"About 170. They also are accomplished. Many are graduates of polytechnic schools, and all pass a very rigid examination."

"Are these experts paid in proportion to their ability?"

"No. The salary of a principal examiner was fixed at $2,500 more than 40 years ago, and has never been changed."

"What an outrage! How, then, can good men be secured?"

"The fact of permanent employment and an honorable position compensates, in a measure, for the absence of shekels; but human nature is human nature, and clever employes leave quickly enough to take better places; whereas, with adequate salaries, they would gladly remain."

"A nice state of things! But just like our Congress, ever penny-wise and pound-foolish, utterly reckless in wrong directions and as mean as a miser when money ought to be spent. How many patents were issued last year?"

"Twenty-five thousand. The number of applications for patents number nearly 45,000 a year. During the last two years there were 10,000 more applications than during the two years immediately preceding."

"Why are 20,000 rejected?"

"Because they either are not original or lack patentability."

"I suppose electrical patents predominate?"

"Two out of 32 examining divisions are devoted exclusively to passing on applications relating to electricity."

"How many models are exhibited at the Patent Office?"

"One hundred and fifty thousand. Fire destroyed a large proportion of the models deposited prior to 1877, and since 1880 models have not been required."

"Not required? How extraordinary? Why not?"

"I fancy on account of lack of accommodation. I am in favor of models, and think room should be made for them. If the government possessed suitable models of electrical and other great inventions of the last ten years, there would be a permanent exhibit at Washington which would rival the World's Fair of '93, in one respect at least."

"What shameful ignorance on the part of our legislators! I should think, too, that models would be vastly better for inventors."

"Certainly. They come here with paper inventions, and often don't know whether they work or not."

"I've visited the Patent Office, and know how abominably crowded the rooms are and how foul the air is in consequence. To ask human beings to breathe it is a crime. To abolish models is a blunder, so Congress is impaled on both horns."

"The quarters allotted to the Patent Office have for years been entirely inadequate. My predecessors, Commissioners Marble, Butterworth, Montgomery, and Hall, have protested in their reports. So have I. We have merely asked for suitable room in the noble building erected out of the money paid into the Treasury by inventors."

"When you reflect that inventors have actually paid for the Patent Office building, it is adding insult to injury to devote any part of it to other bureaus."

"Congress has appropriated $16,000 to pay rent elsewhere for the General Land Office, which, when removed, will leave room to meet the present need of the Patent Office. Secretary Noble is very friendly to the Patent Office, and I'm sure will do everything in his power to carry out the intent of Congress."

"I hope so. What do you think of your successor, ex-Congressman William E. Simonds, who comes from your State of Connecticut? Mr. Simonds did splendid work in the international copyright struggle."

"It affords me great pleasure to know that the Patent Office will be in such excellent hands. Mr. Simonds has had an extensive and successful practice in patent cases. Moreover, for years he has lectured on patents before the Yale law school, so he comes to Washington fully equipped for his office."

"Very glad of it. Do you think—"

"No, not another word. You'll be asking me next to map out a policy for Mr. Simonds. I must turn you over to him for anything more you want to know. Good by."

"Good by, and success to you."—*By Grapevine Telephone to Kate Field's Washington.*

The Camera for Celestial Photography.

BY S. W. BURNHAM, LICK OBSERVATORY.

Every possessor of a good rectilinear lens and the ordinary landscape camera may not be aware of the fact that he has the best kind of an instrument for making pictures of the sky. The requirements in a lens for landscape photography are exactly the same as those which have to be considered in the department of celestial photography. About the same angle of aperture is desirable, and in a general way, the same class of lens as in landscape and outdoor photography. To get a satisfactory picture of a portion of the heavens at night, as we see it with the naked eye, the picture should include an angle of not less than 30° or 40°. There is this difference between terrestrial and celestial pictures: in the former we rarely get as much as we can readily see with the naked eye from the point where the picture is taken, while in the latter we can easily get infinitely more by prolonging the exposure. If the exposure is much extended in daylight work, the plate is hopelessly fogged, and instead of increasing the details in the darker portions of the picture, nearly all delicate details are lost, and the negative becomes flat and valueless; but with the plate exposed to the dark sky of a clear night, where the light emanates only from minute points, the exposure may be continued for hours, and when the plate is developed it will be almost clear glass except where those specks of light have made their impression. Negatives of this character possess this unique peculiarity, that no matter how long the exposure may be continued, they are always under-exposed with reference to the great majority of the stars shown; and at the same time, unless the exposure is very short, they are over-exposed with regard to the brighter stars visible to the eye. The longer the exposure, the more stellar points we get on the plate, and this could probably be continued far beyond the time one would be likely to give to the following of the stars as they move across the face of the sky.

Almost every amateur photographer has a lens and camera well adapted to do this work, but unfortunately not many have the means of mounting such an instrument so as to hold the stars fixed on the plate during the necessary time of the exposure. For this purpose an equatorial mounting, driven by clock work, is indispensable. In other words, the photographer must have the use of an equatorially mounted telescope of some kind, with a driving clock so adjusted as to compensate for the revolution of the earth on its axis, and keep the camera and the stars relatively fixed, the telescope itself being used as a sort of a finder, to keep the star selected for following exactly in the same place in the instrument, by changing the position of the telescope and the camera attached to it, with the slow motions with which all such instruments are provided. No driving clock, however perfectly made and adjusted, can be trusted to hold the star exactly on the fine wire or spider web in the focus of the telescope for any considerable length of time. This must be done by watching the finder, and whenever the star shows a tendency to get ahead or fall behind the bisecting wire, bringing it back to position by the slow motions which move the instrument independently of the clock. Everything depends on careful following and keeping the images of the stars all the time on exactly the same places on the plate. If this is not attended to, the stars will be elongated in the direction of their motion across the plate, and the negative will be unsatisfactory for any purpose. In addition to this, the fainter stars will be lost by the images spreading over the greater area on the plate. If the following is perfect, and the camera is accurately focused, the smaller stars will be exceedingly minute specks, and if the exposure is an hour and upward, there will be thousands of these tiny points scattered over the plate where perhaps only a score or two of stars are visible to the naked eye, while not a dozen of them could be seen at all on the ground glass of the camera.

Of course not many photographers have the necessary facilities for making pictures of this kind. If, however, some friend or good-natured astronomer has a small telescope of the kind referred to, which can be made available, the thing is easily managed. The camera can be strapped or tied to the tube of the telescope in a few minutes, and then everything is ready to proceed with the exposure. The camera should be focused previously with the utmost care, using the full aperture on a well-defined distant object, and then marked or clamped in such a way that nothing can be changed when the camera is attached to the telescope. It is almost indispensable that the full aperture should be used if the exposure is to be continued long enough for the fainter stars, as otherwise the time would be greatly increased, with very little corresponding gain. Any good rectilinear lens will give sharp images over a sufficient portion of the plate, provided it is accurately focused. In most uses of the lens this is not an important matter, because any ordinary error is corrected by the use of stops, but in stellar pictures a small error in the position of the lens will utterly spoil a plate which otherwise would have been entirely satisfactory.

It will be found very convenient to have one of the common simple shutters attached to the camera lens, with a tube and bulb running down to the eye piece, so that the lens can be closed in an instant if anything goes wrong. The clock may need winding, and the dome shifted from time to time, and, although with a good driving clock the observer can leave the instrument long enough to attend to such matters, it is safer to be able to shut off the light in the event of the clock stopping, or any accident occurring. Then the instrument can be brought back to the original place, and when everything is all right, the exposure continued as long as may be desired.

It is perhaps now generally known that the exquisite pictures of the Milky Way, and other portions of the heavens, made by Professor E. E. Barnard, of the Lick Observatory, were made with an ordinary portrait lens tied to the tube of a six inch telescope. These pictures have never been excelled by any one, and rarely, if ever, equaled. They show, as pictures taken with no photographic telescope could, the wonderful structure of the invisible heavens, with the millions of stars lying beyond the reach of the unaided eye. The number of individual stars shown on a single 8 × 10 plate, and that of a region not in the Milky Way, and in which but few stars are seen with the eye, is estimated to be not less than 60,000. This required an exposure of about four hours, using an aperture of about one-sixth of the focal length of the lens. Such pictures require the greatest care in making the exposures, and extreme skill in developing the plate to get the best results. But very interesting pictures can be made in less time. With an hour or an hour and a half, a vast number of telescopic stars will be shown, and such a negative of a prominent constellation, like Orion or Ursa Major, will repay the amateur for all the trouble it may cost to get it. Lantern slides from such negatives are more wonderful and interesting than any other stellar photographs. When thrown upon the screen, it is difficult for many to believe that such a wilderness of stars could be really photographed with a lens through which not one in a thousand could be seen on the ground glass.—*Anthony's International Annual of Photography*, 1891.

Combating Insects with Disease.

A few weeks ago we published an article in reference to destroying chinch bugs in sorghum fields by introducing insects infected with contagious disease. By the kindness of Mr. M. B Clement, of Sterling, Kan., we have received a small bundle of forage stuff, having many dead bugs attached to the leaves where they died from the effects of contagious disease intentionally introduced.

In this case, as we are informed, myriads of chinch bugs hatched in a wheat field, and as soon as they were able to move about, migrated to the adjoining corn and cane fields, literally covering the plants and destroying them, row by row, as they advanced. A few chinch bugs which had been exposed fortwenty-four hours to infection, by being put into a jar containing diseased chinch bugs, were scattered among the destroying insects.

In five days after the introduction of the contagious disease, the destruction of the crop ceased, the myriads of moving insects were motionless, and it was difficult to find any living chinch bugs in the field.

As chinch bugs sometimes injure sorghum, by invasion in countless numbers from the wheat fields where they principally breed, it is a matter of interest to sorghum growers to know whether there are any practicable means of preventing the losses caused by these insects, and for this reason repeated experiments have been made this season in this line at the Sterling Sorghum Experiment Station.

When young the chinch bugs migrate on foot in countless numbers. When winged they fly. Having double means of locomotion, there appears to be no way to bar their entrance into a field of cane. It appears to be impossible to poison these insects in a wholesale way. They live through the coldest winters, they thrive most in the hottest and driest summers. They find a home in the foot stalks, or the funnel-shaped parts of the sorghum leaves which encircle the canes and suck the sweet sap of the cane. A very moderate estimate of the loss caused by chinch bugs in Kansas for a single year is $11 for each man, woman, and child in the State.

The legislature of Kansas appropriated several thousand dollars to be expended, under directions of Prof. Snow, in cultivating and spreading contagious chinch bug diseases. Infected bugs have been sent by thousands all over the State of Kansas, and the evidence which is now accumulating seems to point very strongly to the welcome fact that the losses caused by chinch bugs may be greatly reduced by cultivating contagious chinch bug diseases, and by causing infected insects to spread the disease.

Prof. Galloway, of Washington, is now propagating myriads of germs of a disease which is deadly to the caterpillars. It is said that when a diseased caterpillar is stabbed with a needle, and the needle is put into gelatine or extract of beef, the germs of the disease are transferred to the liquid, and soon every drop contains thousands of the germs of the disease. It is believed that, having the germs of disease, a farmer can prepare quantities of such solution and can distribute it in his fields with an atomizer. Any worm touched must die, and must give the contagion to other worms.

It may be that the cotton boll worm may thus be checked. By cultivating disease we may, perhaps, be relieved of the plague of flies and other noxious insects.

The ethics of the twentieth century may consist in avoiding diseases which now afflict humanity and in giving deadly disease to all living creatures whose interests conflict with ours.—*La Planter.*

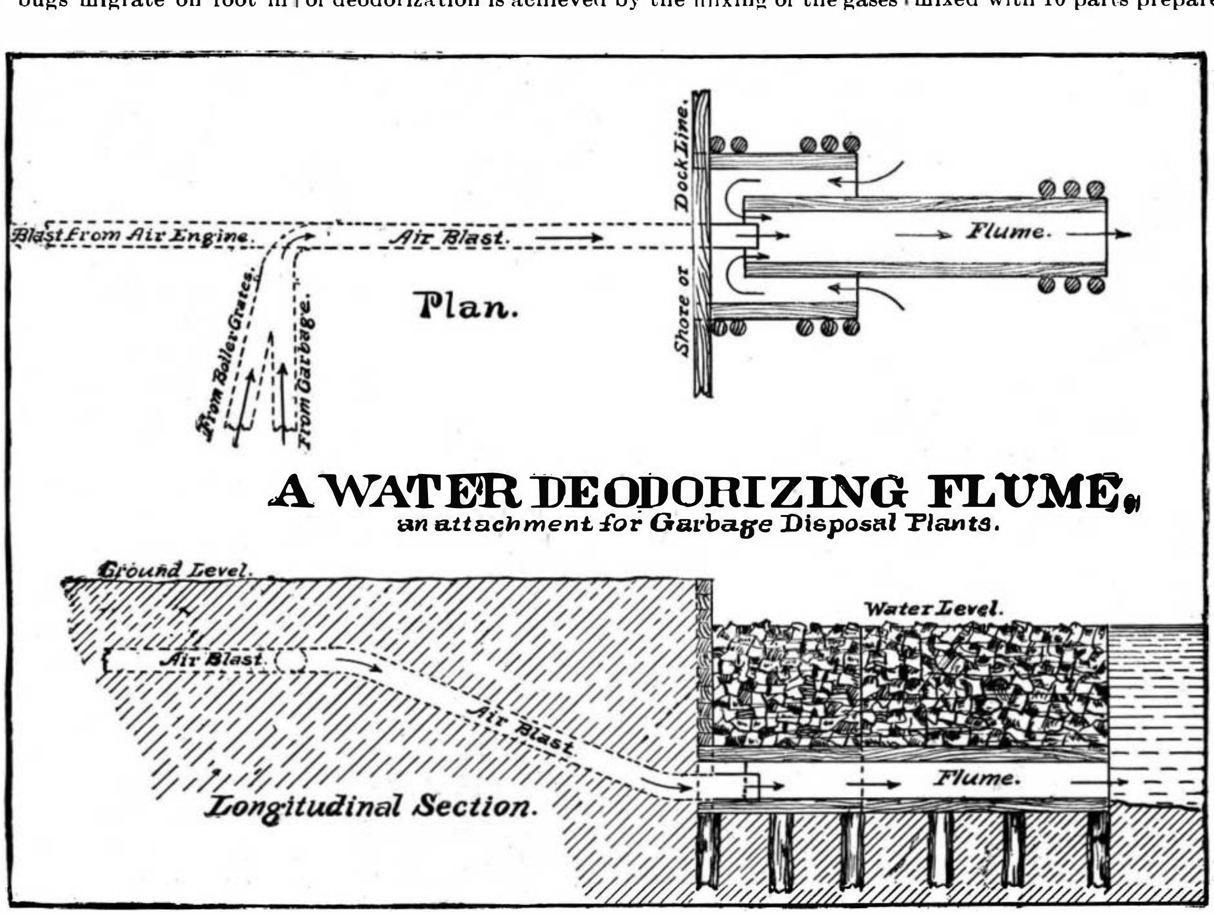
Scallops.

They like the long sedges, or eel grass, and at low tide can easily be taken with a crab net or with the hands. They often have their shells open, and when they see you they seem to give a spring, that is, they shut their shells quickly, which gives them an impetus that makes them rise a little, and they fall about twelve inches farther away than they were at first. The line of motion is a curve, and they generally turn over just as they commence to fall. When caught they seem quite indignant, spit out a stream of water, and open and shut their shells quite rapidly. The part which is eaten is the hard muscle which controls the shells; all around this muscle is soft flesh, like the edges of an oyster, and this extends to the edges of the shells. All around are rows or spots of the most beautiful steel blue. These are probably organs of sight.—*J. Husson.*

A WATER DEODORIZING FLUME.

The illustration represents an attachment for garbage disposal plants, to render inodorous the gases and smells which arise during the process of reduction of the garbage, whether the garbage be burned or dried. All the garbage drying or burning ovens are connected with a pipe leading to the air blast pipe, also the flues from the boiler grates are connected in the same manner, causing a suction of all the smoke and gases from the boiler grates and the garbage ovens, which are delivered into the air blast pipe and are thence driven into the flume, located in twelve or eighteen feet depth of water.

The pressure of air from the air engine causes an outward current from the flume, and the wings upon either side of the flume supply fresh water to assist the operation. The flume may be extended into the water any length desired, and can be used in any stream or body of water where the necessary depth can be obtained naturally or artificially, or by the erection of a tank or reservoir. In the latter instance the flume and wings would be set vertically, not horizontally as shown in the illustration. The process of deodorization is achieved by the mixing of the gases of the ovens and the boiler grates with the oxygen of the water, all moving in ebullition under direct air pressure, through the flume, at a velocity of about five or more feet per second. The plan and operation have been patented by W. F. Goodhue, civil engineer, Milwaukee, Wis.



A WATER DEODORIZING FLUME, an attachment for Garbage Disposal Plants.

Marine Phosphorescence, etc.

During the first week of June was seen, off the south coast of Devon, one of the most beautiful natural phenomena it has ever been my privilege to witness. Across Torbay, beyond Hope's Nose to Babbicombe Bay, on to Oddicombe and Petit Tor, far as the eye could reach, the sea was dyed with brilliant crimson, which in the bright summer sunshine looked as if the water was turned into arterial blood, reflecting the light with a weird and wonderful effect. But it was at night the strange phenomenon revealed its full splendor. Then, right and left, far and near, the sea looked like molten silver, tinged with amber, and rich with gold. The far-off horizon was one long bar of glorious light, and as the waves broke upon the rocks, and the surge dashed upon the white pebbles of beautiful Babbicombe Bay, showers of phosphorescent spray were hurled high into the air, producing a spectacle grand in the extreme. The phosphorus which produced this magnificent sight was caused by the surface of the sea being covered with the spawn of the common mussel. When the tide was out, rocks, pebbles, and sand were coated with a thin film of transparent gelatine, which speedily vanished with the light and heat of the noontide sun. What renders the phenomenon peculiar is that I could find no trace of mussel beds in the neighborhood. The phosphorescent effects were greatest on the third night after the spawn was seen upon the water. In another forty-eight hours it had completely disappeared.—*Th. S. King, Science-Gossip.*

Asphalt and Coal Dust Fuel.

The Southern Pacific Company has long had a serious problem to consider in obtaining a proper and cheap fuel for its locomotives. No large bed of coal has ever been discovered in California that could furnish a supply of proper fuel sufficient for this company. The coal now used comes most from Victoria, and is brought to West Oakland in steamers built especially for that trade, and from West Oakland the coal is sent over the road.

The company has now turned its attention to the manufacture of artificial fuel.

A plant has been purchased in England, for the manufacture of an artificial fuel brick from coal dust and asphaltum ; capacity five tons per hour. If this process is as successful on this coast as it has been on the Continent, it will be an enormous saving for the Southern Pacific Company.

The machinery will be set up alongside of the coal bunkers on Long Wharf and the coal bunkers will be utilized.

The outfit will cost $75,000, and will have a capacity of five tons of coal bricks an hour.—*Enquirer.*

Luminous Paints.

For orange luminous paint, 46 parts varnish are mixed with 17·5 parts prepared barium sulphate, 1 part prepared India yellow, 1·5 parts prepared madder lake, and 38 parts luminous calcium sulphide.

For yellow luminous paint, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts barium chromate, and 34 parts luminous calcium sulphide.

For green luminous paint, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts chromium oxide green, and 34 parts luminous calcium sulphide.

A blue luminous paint is prepared from 42 parts varnish, 10·2 parts prepared barium sulphate, 6·4 parts ultramarine blue, 5·4 parts cobalt blue, and 46 parts luminous calcium sulphide.

A violet luminous paint is made from 42 parts varnish, 10·2 parts prepared barium sulphate, 2·8 parts ultramarine violet, 9 parts cobaltous arsenate, and 36 parts luminous calcium sulphide.

For gray luminous paint, 45 parts of the varnish are mixed with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 0·5 part ultramarine blue, 6·5 parts gray zinc sulphide.

A yellowish-brown luminous paint is obtained from 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auripigment, and 34 parts luminous calcium sulphide.

Luminous colors for artists' use are prepared by using pure East India poppy oil, in the same quantity, instead of the varnish, and taking particular pains to grind the materials as fine as possible.

For luminous oil-color paints, equal quantities of pure linseed are used in place of the varnish. The linseed oil must be cold-pressed and thickened by heat.

All the above luminous paints can be used in the manufacture of colored papers, etc., if the varnish is altogether omitted, and the dry mixtures are ground to a paste with water.

The luminous paints can also be used as *wax colors for painting on glass* and similar objects. by adding, instead of the varnish, 10 per cent more of Japanese wax and one-fourth the quantity of the latter of olive oil. The wax colors prepared in this way may also be used for painting upon porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass.—*Ztschr. Oest. Ap. Ver.*

THE list of articles to be admitted free of duty to Cuba and Porto Rico from the United States, under the new reciprocity treaty with Spain, on and after September 1, includes the following: Woods of all kinds, in trunks or logs, joists, rafters, planks, beams, boards, round or cylindrical masts, although cut, planed, and tongued and grooved, including flooring; woods for cooperage, including staves, headings, and wooden hoops; wood boxes, mounted or unmounted, except of cedar; woods, ordinary, manufactured into doors, frames, windows, and shutters, without paint or varnish, and wooden houses, unmounted, without paint or varnish.

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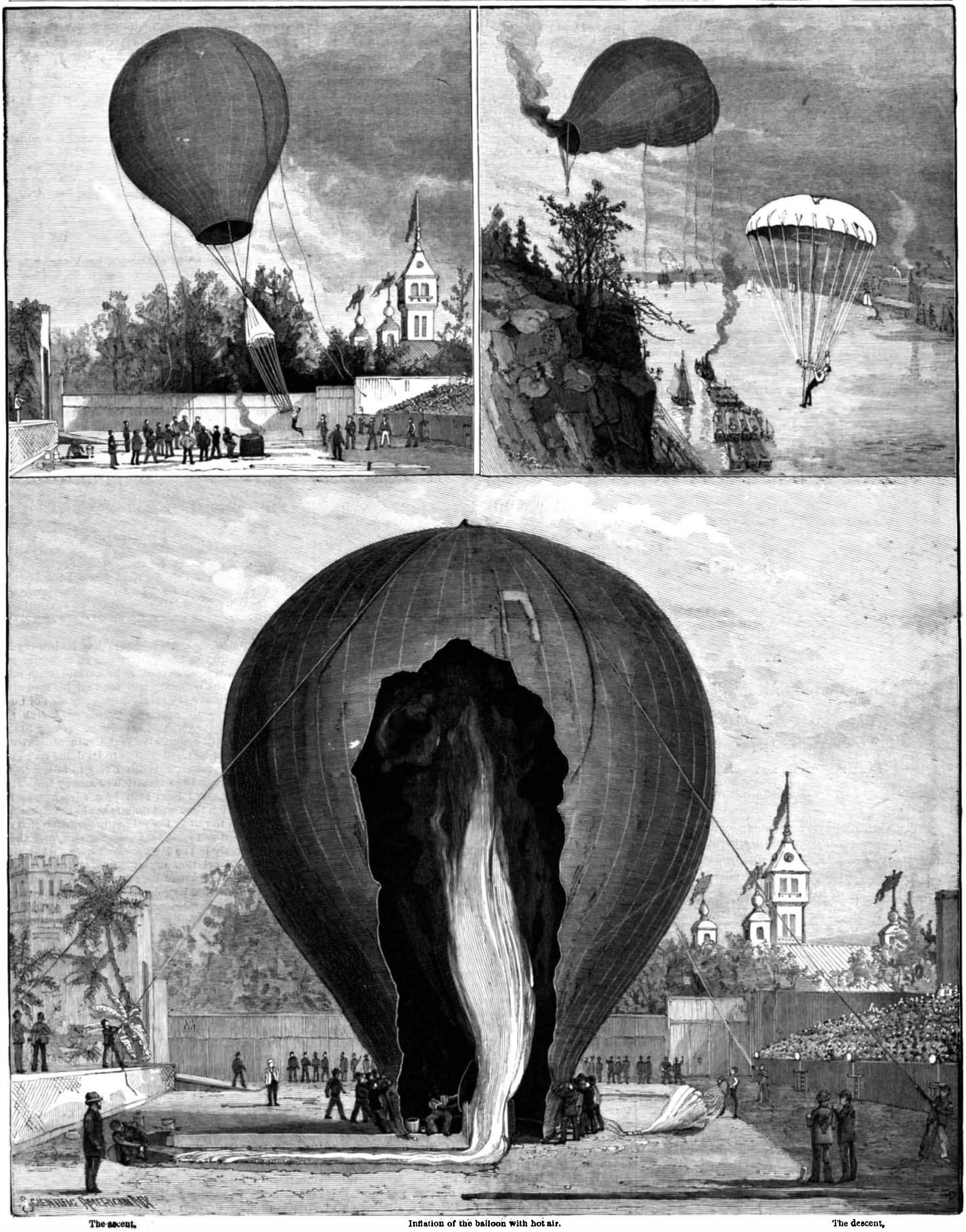

The ascent. Inflation of the balloon with hot air. The descent.

HOT AIR BALLOONING, WEEHAWKEN, N. J.—[See page 147.]