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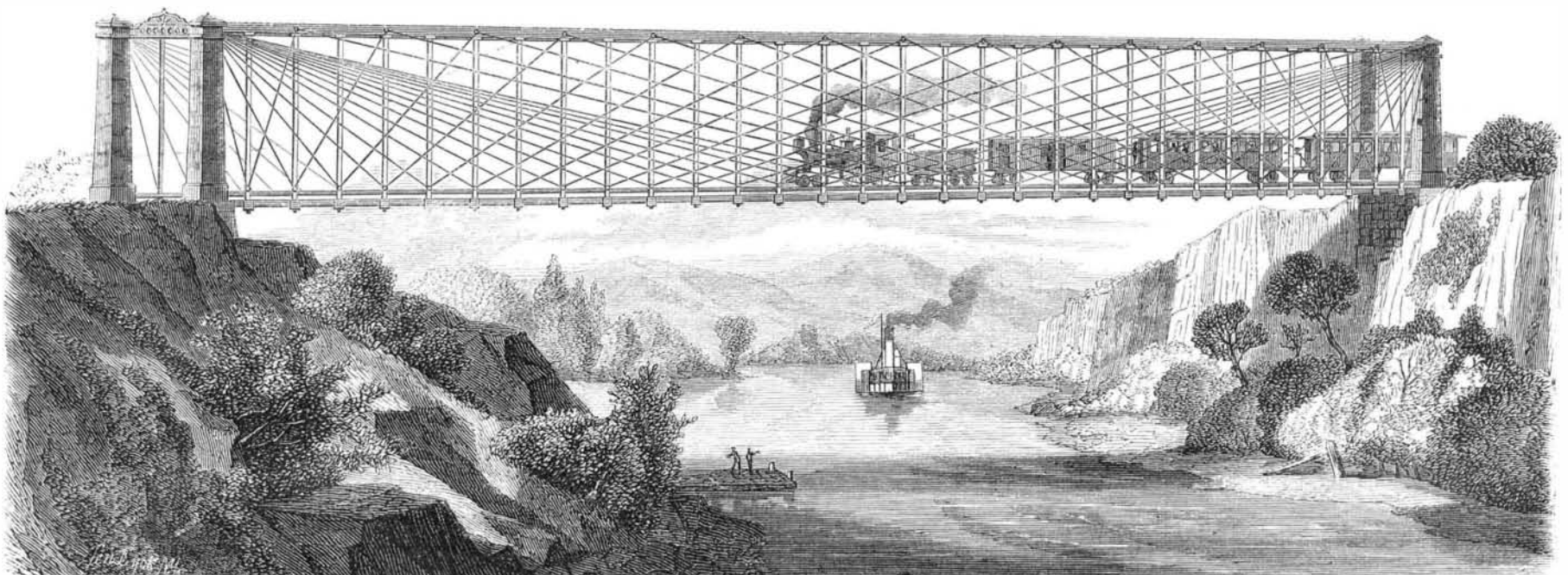
### Suspension Truss Bridge.

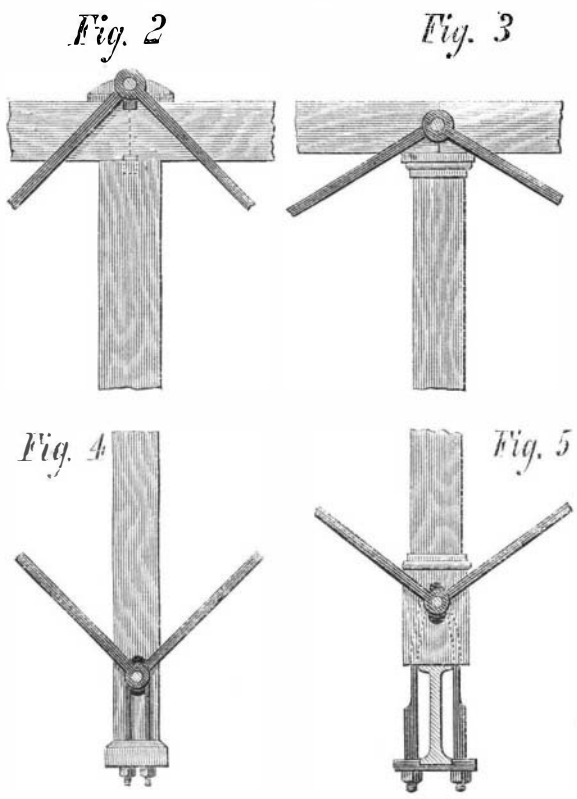
Our engravings illustrate a light and graceful bridge, invented by Mr. John H. Diedrichs, an engineer well known to the scientific world by his valuable work on the theory of strains. His object was to produce a suspension truss for bridges which should be durable and economical in construction, and should secure from a given quantity of material a greater proportion of strength than is derived in any other truss system. This is accomplished principally by a novel and judicious distribution of the tie rods which connect the lower ends of the pendent posts with the top chord of the bridge.



DIEDRICHS' SUSPENSION TRUSS BRIDGE.

Fig. 1 shows the arrangement of these parts, which the following description will explain:

From the top chord of the bridge, which is properly supported on the buttresses, are suspended posts at suitable distances from each other, but of which posts there should be an uneven number pendent from every top chord. Tie rods or braces connect the lower ends of these posts with the buttresses and top chord; and these tie rods are applied in the following manner: From the lower end of each post, project two tie rods in opposite directions, bent at equal angles, one




of which is continued to the nearest buttress, the other to the juncture of a post with the top chord. By this means every post is connected with one buttress only, but the middle post, which is united to both. At the upper ends, only every alternate post is braced, provided they are equidistant, which arrangement is preferable in practice. The top chords and posts may be made of wood or metal. In the first case, the upper ends of the tie rods are secured, where they join, to boxes placed upon the top chord, as shown in Fig. 2. In the second, the connection may be made directly to the metallic top chord, as shown in Figs. 1 and 3. The lower ends of the tie rods, where they project from the post, are united by a bolt passing through a vertical slot in the post. A strap is laid round the bolt in the slot, and its two ends passed through a plate at the bottom of the post and secured by nuts, as shown in Fig. 4. By this mode of fastening, the tie rods are made adjustable as to their length, and the tension on them can be regulated with extreme nicety. Fig. 5 shows an elongated form of strap adapted to the support of transverse beams below the posts.

The contraction and expansion consequent on changes of temperature cannot give rise to undue strain on the parts of this bridge, as the tie rods projecting from each post are of equal lengths. A lateral shifting of the connecting pins from the above causes is also rendered impossible, which is a feature of great importance. The system admits of the use of equally thick rods throughout bridges of considerable length, though the rods nearest the middle may be made somewhat thicker than the others. The peculiar distribution of the tie rods relieves the top chord of excessive strain, and the special bracing of panels is rendered unnecessary, while the general appearance secured is light and harmonious.

The improvement was patented through the Scientific American Patent Agency, April 2, 1872. For further information address John H. Diedrichs, care of Mr. C. Gewecke, 115 North Front street, Baltimore, Md.

### Powdered Coal for Unhealthy Plants.

In a communication, addressed to the *Revue Horticole*, the writer states that he purchased a very fine rosebush, full of buds, and, after anxiously awaiting their maturing, was greatly disappointed, when this took place, to find the flowers small, insignificant in appearance, and of a dull, faded color. Incited by the suggestion of a friend, he then tried the experiment of filling in the top of the pot, around the bush, to the depth of half an inch, with finely pulverized stone coal. In the course of a few days, he was astonished at seeing the roses assume a beautiful red hue, as brilliant and lively as he could desire.

He tried the same experiment upon a pot of petunias, and soon after, all the pale and indefinite colored ones became of a bright red or lilac, and the white petunias were variegated with beautiful red stripes. Some of the lilac petunias became a fine dark blue. Other flowers experienced similar alterations; those of a yellow color alone remained insensible to the influence of the coal.

### Railway Torpedoes.

A neat and effective device for securing convenience and safety in railroad operations is the "torpedo" or alarm signals. This little affair consists of a tin box about the size and shape of the smallest sized blacking boxes. The box is filled with an explosive compound, and two strips of tin are soldered to two opposite sides of the box, perpendicular to its sides or edges, for fastening it to the rail. These boxes explode on the principal of the percussion cap, with a loud report. They are in use on some roads for night signals and in foggy weather, when lights or flags would not be seen in time to prevent accident. Track men are provided with these torpedoes, and in case of danger they are placed on the rail, far enough from the place of danger to prevent disaster. Usually three of them are placed, a few feet apart, to insure their being heard by the engineer. They are reliable, and will explode at the touch of the wheel at the slowest speed.

It is said that the Reading company uses 35,000 of these torpedoes per annum on the roads which it operates. This is a good showing in favor of the contrivance, and doubtless many serious accidents are prevented by their use. They cost but a trifle. The Reading company is always ready to adopt good improvements. Some genius might do a good thing by contriving a plan by which a torpedo could be placed on the rail at drawbridges and switches in case of misplacement.

### SELF-LUBRICATING BOX AND SHAFT BEARING.

In this invention, centrifugal force is utilized for the pur


pose of lubricating upright bearings. Our engraving shows the several parts of the device, partly in sections and partly in perspective. A is the outer shell of the box, which is lined with the composition metal, B. Through this lining up

right passages are made, as shown in the engraving, extending from the circular oil chamber, C, to the top of the box. D is a sleeve which projects upwards from the bottom of the box around the shaft and forms the inner wall of the oil chamber. It does not touch the shaft. Projecting downward over the sleeve into the oil chamber is an enlargement of the shaft shown at E. It is so chambered out as to admit the sleeve without touching it. This enlargement is turned so as to form a taper bearing, larger at the top than at the bottom, as shown.

The operation is as follows: The rotating shaft carries with it the enlargement, E, and produces centrifugal force in the oil chamber, by which the oil is driven up the passages in the lining, B, and through apertures therein to the sides of the bearing. The same force also carries up the oil between the bearing and the lining to the top of the box. Surplus oil at the top is returned by the passages to the oil chamber, into which the drippings from the bearing fall. The bearing is thus made to move constantly in oil, and when running at considerable speed never comes in contact with the box, as the centrifugal force developed is sufficient to keep a sheet of oil always between them under any ordinary pressure on one side of the shaft. This has been proved in practice; and shafts fitted on this principle, and rotating 4,500 times per minute, have run for fourteen months without sensible wear of the box or need of readjustment. They can be run for months without re-oiling, as, by the construction, no oil can escape, and it must consequently be all used up.

A patent for this device has been granted, February 13, 1872, to Mr. J. P. Grosvenor, of Lowell, Mass., from whom further information may be obtained.

### Cholera and Sun Spots.

Mr. B. G. Jenkins recently read, before the Historical Society of London, a remarkable paper on cholera, in which he maintained that the disease is intimately connected with auroral displays and with solar disturbances. "I believe that I am able to show that a remarkable connection exists between the maxima and the minima of cholera epidemics and of solar spots. You are all probably aware that the great astronomer Schwabe discovered that the sun spots have what is called a ten year period; that is, there is a minimum of spots every ten years. It was also discovered that the diurnal variation in the amount of declination of the magnetic needle has a ten year period. The same was proved in regard to earth currents, and also auroræ. The maxima and minima of the four were found to be contemporaneous. This was a great result; but Professor Wolf, on tabulating all the sun spots from the year 1611, discovered that the period was not ten years, but 11·11 years. This period is now the accepted one for the sun spots, and it has been established for the magnetic declination, and by Wolf for the auroræ. Now, it is a curious fact that the last year of every century, as 1800, has a minimum of sun spots, so that the minima are 1800, 1811·11, 1822·22, 1833·33, etc. The maxima do not lie midway between the minima, but anticipate it by falling on the year 4·77 after a minimum; for example, 1800 was a minimum year, then 1804·77 was a maximum year. Now, cholera epidemics have, I belive, a period equal to a period and a half of sun spots. Reckoning then from 1800, we get as a period and a half the date 1816·66, which was shortly before the great Indian outbreak; another period and a half gives 1833·33, a year in which there was a maximum of cholera; another, 1849·99, that is, 1850, a year having a maximum of cholera; another, 1866·66, a year having a maximum of cholera; another, 1883·33, as the year in which there will be a cholera maximum. It follows from what has been already said that 1783·33 would be a year in which cholera was at a maximum. Now it is a fact that in April 1783 there was a great outbreak of the disease at Hurdwar.

I am not, however, prepared to say that sun spots originate cholera; for they may both be the effects of some other cause, which may indeed be the action of the other planets upon the earth and upon the sun.

My own opinion, derived from an investigation of the subject, is that each planet, in coming to and in going from perihelion—more especially about the time of the equinoxes—produces a violent action upon the sun, and has a violent sympathetic action produced within itself—internally manifested by earthquakes, and externally by auroral displays and volcanic eruptions, such as that of Vesuvius at the present moment; in fact, just such an action as develops the tail of a comet when it is coming to and going from perihelion; and when two or more planets happen to be coming to or going from perihelion at the same time, and are in, or nearly in, the same line with the sun—being, of course, nearly in the same plane—the combined violent action produces a maximum of sun spots, and in connection with it a maximum of cholera on the earth. The number of deaths from cholera in any year—for example, the deaths in Calcutta during the six years 1865 70—increased as the earth passed from perihelion, especially after March 21, came to a minimum when it was in aphelion, and increased again when it passed to perihelion, and notably after equinoctial day; thus affording a fair test of my theory."

### American Sailors as Firemen.

The American squadron, consisting of the *Wabash, Congress, Brooklyn, Plymouth, Shenandoah, Juniata* and *Wachusette*, under the command of Admiral Alden, recently lay in the Napoleon Basin, at Marseilles, France, amid innumerable merchantmen of every description and from every nation. Shortly after midnight, an explosion startled the city, followed by fire and dense clouds of heavy smoke which issued from an Italian ship just arrived from Philadelphia with a cargo of petroleum. The nature of the danger soon became evident, and it seemed impossible to prevent the spreading of the fire from ship to ship, as they lay in such a mass, and a general conflagration seemed imminent, for the houses extend down to the wharf on every side. No city of France has the means to extinguish a great fire, and hence the people gathered, contemplating the scene in panic stricken, fascinated horror.

Presently a well manned boat came from the part of the basin illuminated by the blaze and pulled directly toward the burning ship. This was soon followed by another, then a third, ten, twenty, all the boats of the American squadron. A moment later men were seen on the deck of the burning ship. The silence of the people on the shore was such that they could hear, through the smothered roar and crackle of the fire, the word of command and blows of axes. The people are thinking of the hundreds of barrels of petroleum below and its possible escape on shore and communication to other ships, perhaps others with petroleum, and in imagination conceived the whole surface of the basin covered with blazing oil. Presently the burning vessel began to settle. She had been scuttled, and her cargo was now under water, the deck being level with the surface. The danger from the escape of burning petroleum was still imminent when a line of boats, lashed together stem and stern, was seen pulling away, and as the file straightened out the burning ship moved also, and was slowly towed out to the bay by over two hundred well manned oars. It was only then that an immense cheer broke from the thousands of people, who felt inexpressible gratitude for the salvation of the city.

### The Steam Jet Air Exhaust.

At a recent meeting of the Institute of Mechanical Engineers, London, the President, C. W. Siemens, read a paper "On a Steam Jet for Exhausting Air, etc., and the Results of its Application." The form and application of the steam jet having remained hitherto essentially the same as in the original steam blast of the locomotive, it occurred to the writer that much might be done to improve its effect by a judicious arrangement of the parts, so as to avoid eddies in the combined current of steam and air, and to utilize more completely the initial momentum of the steam. These objects have now been effectually accomplished by the employment of a very thin annular jet of steam in the form of a hollow cylindrical column discharged from an annular nozzle. The air to be propelled by the steam jet is admitted through an exterior annular orifice surrounding the jet, and also through the center of the hollow jet; and the area of the air passages is gradually contracted on approaching the jet, whereby the velocity of motion of the entering air is so much accelerated before it is brought in contact with the steam as to avoid the great difference in the velocity of the two currents at the point where they come together, which caused the eddies that previously impaired the efficiency of the steam jet. By the annular form of the steam jet, the extent of surface contact between the steam and the air is greatly increased and the quantity of air delivered is by this means very much augmented in proportion to the quantity of steam employed. The combined jet of steam and air is discharged through an expanding delivery pipe of considerable length, in which its velocity is gradually reduced and its momentum accordingly utilized by being converted into pressure.

This improved steam jet has been applied for exhausting one of the pneumatic despatch tubes employed at the Central Telegraph Station, in London, for conveying the carriers containing telegraphic despatches from one station to another. The result of a comparative trial made with the steam jet and with a good steam engine and exhausting pump has been found to be that the expenditure of steam is about the same in the two cases in doing the same work, the advantages of the steam jet being its very low first cost in comparison with that of the engine and pump, and also its great simplicity, and the small space occupied as compared with an engine and pump.

Another application of the steam jet is to the lifting of water from a moderate depth, by employing the jet to exhaust the air from a closed vessel, into which the water then rises under the pressure of the atmosphere, the hight of lift depending upon the size of the jet and the pressure of steam, and the consequent degree of vacuum obtained in the vessel. The discharge from the steam jet, being then admitted into the top of the vessel, allows the water to escape through a delivery valve in the bottom and aids in its expulsion. By using a pair of these vessels in conjunction, and putting the exhausting jet in communication with each alternately, by means of a self acting float and reversing valve, one vessel is filling while the other is discharging, and a continuous delivery of water is thus obtained.

It is also proposed to apply the steam jet for exhausting the vacuum pans employed in sugar boiling, so as to dispense with the present costly vacuum pumps and steam engine and the condenser for condensing the vapor from the evaporating pan; the supply of condensing water, which in many places in the sugar growing colonies is a consideration of vital importance, will thus be rendered unnecessary. The steam jet is further expected to prove very useful for draining the molasses from the sugar, by exhausting the air from below the perforated bottom of a strainer containing the undrained sugar, whereby the present modes of draining by gravitation or by centrifugal strainers can be superseded with advantage.

Numerous applications have been made of the steam jet as a blower for accelerating the distillation of fuel in gas producers for heating purposes, the jet being admitted into the space underneath the fire grate, which is enclosed by doors. By this means it is found that coal dust of the most inferior description may be used, and the rate of production of the gas is doubled, while at the same time its quality is improved, owing to the generation of hydrogen from the steam which enters intermingled with the air.

A specimen was exhibited of the steam jet apparatus; and the particulars were given of the proportions which have been found by experiment to be attended with the greatest efficiency, rendering the jet capable of realizing results comparable with those obtained from a steam engine working an air pump.

### British Army Telegraph.

For this service there is at present one troop of the Royal Engineer train which is divided into three sections, each carrying twelve miles of wire, in half mile lengths. These pieces can be conveniently joined by an ebonite jointer which makes a practically watertight joint in less than half a minute, and which in the case of searching for faults, can be undone in even a less time. The cable consists of a strand of seven No. 22 B. W. G. copper wires, insulated by Hooper's compound and made three inches thick; it weighs 300 pounds per mile. For service it is carried on wooden drums, which again are placed on the "wire wagons," and are to be drawn by six horses. The wagons consist of an under carriage and wheels of an ordinary service wagon, the whole made as light as possible of "Clarkson's material." Upon this carriage are ranged six drums in two rows, so placed on framework that the wire may be paid out as required from the rear drum as the wagon advances. Thus on each wire wagon is carried three miles of wire and two dozen iron poles intended to lift the wire overhead when passing cross roads; for, although the insulation is so strong and good that it has stood and will successfully stand a great deal of ill treatment, such as carts and carriages passing over it when laid unprotected on a hard macadamized road, yet it is not to be expected that anything less durable than a rod of iron could stand the traffic of an army. The poles are formed of wrought iron tubing in two lengths, the butt ten feet long and one and a quarter inches in diameter, the top nine feet long and one inch in diameter fitting inside the butt and fastened, when in use, by a bayo' net catch. These poles can be stayed, if necessary, by three guys provided for the purpose. The wire is held in a wooden plug which fits into the top of the pole.

There is also carried, by each wire wagon, a hand barrow which is fitted with legs, and, as occasion demands, with wheels, so that it is capable of taking a drum of cable when the wire wagon may either not be able or not required to go. There are, moreover, two wrought iron earth plates eighteen inches long, four and a half inches wide, and some one half inch thick, which are strong enough to be driven home in any possible soil, and a six gallon cask of water to insure some moist earth. This, with a jointed ladder of two nine feet lengths, and some spikes to lift the wire on to a wall if wanted, comprises the main part of the furniture. There is a very neat arrangement on the hind wheel, by means of which the wire when laid out can be rolled up by the action of that wheel. Finally, there is a little hooked stick for lifting the wire as delivered on to the hedges or fences which ordinarily bound the road. The office wagon, not unlike a travelling photographer's van, contains a pair of Morse recording instruments fitted with Siemens' polarized relay, and with Digny's felt ink roller, which has been deliberately preferred, to the possibly more scientific arrangement of Messrs. Siemens, as being more portable. The pattern of battery at present in use is a form of Daniell's, arranged for portability by Sergeant Mathison, R. E., of the Electrical School at Chatham. This school is intended to facilitate the training of men from the ranks to the duties of telegraphers.

### Thermometrical Experiments.

The Providence *Journal* describes the following interesting experiments made in that city with an excellent glass mounted thermometer.

In the house with open windows, it stood at 90·2°. Out of doors in the shade, at 95°; freely suspended in the sun, six feet above the greensward, 99·5°. In the same position, with wet bulb, 79·9°; with bulb covered with black silk, 109·96°. When laid upon the grass in the sun, it rose to 104°. Laid upon white cloth, placed upon the grass, 105·0°, and when similarly placed upon black silk, it indicated 113°.

The experiments with different colored coverings show very conclusively the utility of light colored clothing for those who are obliged to be exposed to the direct range of the sun at high temperatures; and the experiment with the wet bulb shows as clearly the value of free perspiration in keeping down the temperature of the body, which, however, the observer finds in his own person, notwithstanding the perspiration while making these experiments, to have risen to 100·5°, which is about two degrees above the usual standard for cooler days. The average temperature of the healthy human body throughout the year, in temperate climates, is 98·4°; while in tropical regions it is about one degree higher

DURING a recent fire at Ithaca, N. Y., one of the steamers was stationed on the high bridge over Fall Creek, just below the foot of the main fall. When the fire was nearly out, the bridge, without any warning by cracking, fell, carrying with it the engine and the people who had congregated there to the number of about 200. The bridge was 20 feet above the water, and the whole of it went down together. Fifteen persons were seriously injured.

SEVERAL citizens of Sacramento, Cal., having been poisoned by the use of what is there known as the "sanitary composite" water pipe, the Board of Health have ordered its use to be discontinued. Water flowing through this pipe was found, on chemical analysis, to contain lead and arsenic. The pipe in question is believed to be composed of a species of brass.