"I have yet to learn the first case of deterioration of the core that has passed under my inspection."

Among the larger users of okonite cables are the following:

Western Union Telegraph Co., all parts of the country, New York; New England Telephone and Telegraph Co., Boston; Metropolitan Telephone and Telegraph Co., New York; Delaware and Atlantic Telephone Co., Philadelphia; New York and New Jersey Telephone Co., Brooklyn; Bell Telephone Co. of Canada, Montreal; City of Brooklyn; Thomson-Houston Electric Co.; City of Cleveland, O.; City of Chicago; Underground Electric Light and Power Co., Philadelphia; United States Torpedo Station, Newport, R. I.; Commercial Cable Co., New York, and many others, including most of the licensees of the American Bell Telephone Co.

Mr. Charles A. Cheever is the president and Mr. Willard L. Candee treasurer of the Okonite Company, whose general office and storeroom is at No. 13 Park Row, New York, the factory we illustrate being at Passaic, N. J.

### Aluminum in Flowering Plants.

At a recent meeting of the scientific committee of the Royal Horticultural Society, Professor Church called attention to the apparently general presence of aluminum in flowering plants. He said it was known to exist in the Lycopodiaceæ; it had been shown by a Japanese chemist to be present in the Japanese lacquer tree (*Rhus vernix*), and it had been found by himself in cherry tree gum, gum arabic, tragacanth, etc.; it had been stated also in the *Analyst* for January to be invariably present in the gluten of wheat in the form of phosphate. Professor Church assumes that it is probably absorbed accidentally by the roots, and that it plays no part in vegetable physiology.

### Motive Power by Compressed Air.

M. Victor Popp is making good progress with his system of distributing compressed air for motive power purposes. The works for compressing the air in the Rue St. Fargeau, at Menilmontant, are of considerable magnitude. They cover an area of 15,000 square meters, of which an extent of 2,000 meters is roofed over. There are already fixed and in operation seven steam engines of 400 h. p. and two of 100 h. p. each, a total of 3,000 h. p. The conduits have already been laid over the whole area comprised between the line of the boulevards and the Rue de Rivoli. These are sometimes laid in trenches cut for the purpose, and sometimes in the sewers. The total length of pipes laid was, at the end of last December. a little over thirty miles. This source of power is used for working electric light machinery in a large number of establishments, among which may be mentioned the Cafe-Americain, the Cafe de Paris, the Cafe Anglais, the offices of the *Figaro*, and the Jardin d'Hiver.

### A CHAIR FOR OUT-DOOR USE.

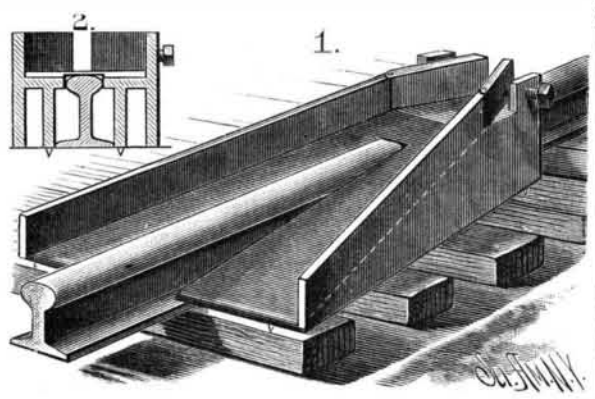
A chair which may be conveniently moved from place to place, and wherein the occupant may be protected from sun and wind, or may throw the chair open at top and sides at will, has been patented by A. Bunn, of Birdsborough, Pa., and is illustrated herewith. The

BUNN'S COVERED CHAIR.

curved side pieces constitute the legs of the chair and support the frame, being secured together by cross pieces, which support the seat. The front is inclosed from the seat to the bottom, and is fitted with a foot rest, which may be withdrawn. The side walls have openings to serve as windows, and have sliding panels, and there is a sliding top corresponding with the curved top of the chair. The chair is mounted on wheels to facilitate moving it from place to place, a pin fitted in the frame being adapted to engage with the wheel spokes, to prevent the chair from moving of its own accord when placed upon an inclined surface.

### AN IMPROVED CAR REPLACER AND PORTABLE SWITCH.

A simple and durable appliance for replacing on the tracks derailed cars or locomotives, or for transferring them from a main track to a spur track, has been patented by Mr. Thomas Holliday, and is illustrated herewith, Fig. 2 being a cross sectional view. An upper plate is supported by two outer plates at about the height of the tread of the rail above the ties, the outer plates flaring outward and inclining downward as they recede, interior plates being also arranged under the first named plate, and inclining downward. To the upper inclined edges of the two pairs of plates are secured top plates having flanges on their outer edges, which are continued at their upper ends by adjustable deflect-




HOLLIDAY'S CAR REPLACER AND PORTABLE SWITCH.

ing plates, arranged in connection with set screws, by which they are moved toward or from a central space between the edges of the plates, just wide enough to admit the tread of the rail. That the device may be held against accidental displacement when adjusted, downwardly extending spurs are arranged at one or both ends of the replacer. In replacing a derailed car the device is applied just in advance of the wheels of the car, the construction permitting the car to be replaced from either side of the track and guided properly to the rails by the deflecting plates.

For further particulars in reference to this invention address Mr. Thomas M. Murphy, Sanborn, Dakota Ter.

### Cobwebs and how they are made.

Every one has noticed the cobwebs which hang upon each shrub and bush, and are strewn in profusion over every plat of grass on a fine morning in autumn; and, seeing, who can have failed to admire? The webs, circular in form, are then strung thick with tiny pearls of dew, that glitter in the sun. No lace is so fine. Could any be wrought that would equal them in their filmy delicacy and lightness, it would be worth a prince's ransom. But for such work man's touch is all too coarse. It is possible only to our humble garden spider, known to scientific people by the more imposing name *Epeira diadema*. These spiders belong to the family of *Arachnidæ;* and the ancients, who were great lovers of beauty, observing their webs, invented the pretty fable of Arachne.

Arachne was a maiden who had attained to such expertness in weaving and embroidering that even the nymphs, leaving their groves and fountains, would gather to admire her work. They whispered to each other that Minerva herself must have taught her; but Arachne had grown vain as she grew dexterous, and, overhearing them, denied the implication with high disdain. She would not acknowledge herself inferior even to a goddess, and finally challenged Minerva to a trial of skill, saying: "If beaten, I will bear the penalty." Minerva accepted the challenge, and the webs were woven. Arachne's was of wondrous beauty, but when she saw that of Minerva she knew that she was defeated; and, in her despair, went and hanged herself. Minerva, moved by pity for her vain but skillful opponent, transformed her into a spider; and she and her descendants still retain a portion of her marvelous gifts of spinning and weaving.

Now, let us see how the garden spider uses its inherited talent. Each individual is endowed with a spinneret, or natural spinning machine, through which can be drawn innumerable strands, so fine that they can be seen only under a powerful microscope (Leeuwenhoeck claims that it takes four millions of these strands to make a thread as thick as a hair from a man's head).

First, our spider begins to draw from out her spinneret a cord of as many of these strands as seems to her good, and fastens it to some leaf or twig, then runs on another leaf, spinning all the while; fastens again to that; and to another and another; continuing until a circle is formed inclosing as large a space as she designs for the outer boundary of her web. Then she passes back and forth over her work, adding fresh threads, and strengthening this outer line, which she secures to every possible object. Finally she stops, fastens her thread with special care, and begins to run around the circle, spinning as she goes; but now carrying her fresh thread carefully raised upon one hind foot, thus keeping it from touching the older strands and becoming glued to them. When half way round she stops, pulls her thread tight, fastens it very strongly, and a firm line is drawn straight across the center of the circle.

She runs down this center line to the middle, fastens another thread to it there, carries it to a new point upon the outer edge, fastens it, and we now see that she is engaged in making those lines in the web that look so like the spokes of a wheel. She repeats this operation again and again, until all the radii or spokes are formed. When they are done she carefully tests each thread by pulling, to make sure that it is firm and strong; and, if one proves unsatisfactory, she either strengthens or remakes it altogether.

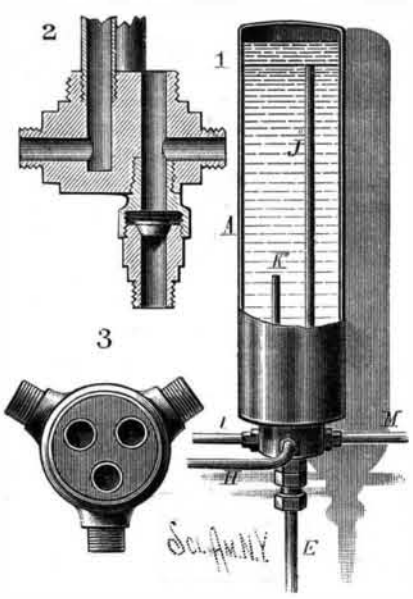
Now that the main lines are built, our spider goes once more to the center point, and begins to spin again—this time in circles—fastening to each radius as she passes. At first these circles, or more correctly spirals, are placed quite close together, but she leaves ever a wider and wider space between, as she approaches the outer edge. The outer circle and the radii were spun of a silk which becomes dry directly after leaving the spider's body, is of great strength, and very firm; but these spirals are formed of a substance which differs essentially. When first drawn from the spinneret it is extremely glutinous—a most important property, as by this it is enabled to adhere tenaciously to the radii—and it is, besides, so highly elastic as to be capable of being pulled far out of place without breaking.

When the spirals are finished, the spider returns again to the center, and proceeds to bite off the points of all the radii close to the first encircling line, by which she much increases the elasticity of her web. It is in or beneath this central opening that the spider usually sits and watches for the coming of her prey.

But while these circular creations are perhaps the most beautiful, they are by no means the only cobwebs. You have probably seen, or rather felt, the long gossamer threads that sometimes draw across the face, as one walks beneath the trees on a summer evening. At certain seasons they are very numerous. They float in the air; they fall upon the grass; they gather on the trees. These are all cobwebs. They are made by spiders, and in a manner so marvelous as to be almost incredible. The spider spins the silk from its spinneret, pushing it off into the air. It is so light that it does not fall; it rather rises in the air. It grows a longer and longer thread, until it is carried by some current against an object, often at a surprising distance, to which it attaches itself. This spider's slack rope is quite strong enough to serve the little spinner as a bridge, over which it can pass at its pleasure. Indeed, in the tropics, spider's webs are found of gigantic size, sometimes even spanning streams; and of a strength so great that humming birds are caught and held by them, as flies are by the cobwebs of our own land.—*S. L. Clayes, Swiss Cross.*

### A PIPE COUPLING FOR KITCHEN BOILERS.

A pipe coupling especially adapted for use in connection with the ranges of kitchen boilers, whereby only a single opening in the boiler is utilized through the coupling to connect the various pipes to the boiler, is illustrated herewith, and has been patented by Mr. James Hollinger, of No. 2163 Second Avenue, New York City. The coupling, shown in plan and section in Figs. 2 and 3, is screwed into the bottom of the boiler, and has a vertical passage receiving the




HOLLINGER'S PIPE COUPLING FOR BOILERS.

screw-threaded end of the water supply pipe, E, in which is a valve to prevent back flow of water. From a side port leads the pipe, H, for conducting cold water to the range, I being the return pipe, communicating with a vertical passage, to which is secured the pipe, K, projecting a short distance up into the boiler, for directing the hot water upward. J represents a pipe reaching nearly to the top of the boiler and communicating through a horizontal outlet port with the pipe, M, leading to a sink or other place of use. By this arrangement the water drawn out is taken from the top of the boiler, where it is the hottest.

### Mr. Edison on Patent Protection.

The unthinking and unintelligent members of the body politic who are clamoring for the overthrow of our patent law, under the wholly mistaken impression that the consummation of their design would, in some unexplained way, aid in the suppression of their pet bugaboo, "monopoly," have received a notable recruit to their ranks in the person of one of the principal beneficiaries of the system which it is proposed to destroy. Ordinarily, the right of a private person to the unmolested enjoyment of his own opinions in respect to this or any other subject is not to be questioned; but when an inventor occupying so prominent a position before the public as Mr. Edison appears on record as an exponent of the opinions attributed to him in the published interview which we reprint, his action ought not to pass without comment. Mr. Edison is reported as saying:

"The present law is a constant temptation to rascals, and virtually offers a premium upon rascality. Under it the infringer of a patent is not interfered with until the real owner can show that he has the monopoly of the device in question. This process may take years, during which the infringer who has money and audacity enough to seize another man's invention can go on and perhaps wear the rightful owner's life out by litigation and annoyance. I have had so much of this sort of thing within the last five years that I have almost made up my mind never to take out another patent until the law is changed. The burden of proof is now put entirely upon the man who holds the patent, instead of upon the man who wishes to infringe it, whereas it ought to be all the other way."

An old proverb bids one to speak well of the bridge that has carried him safely across the stream. It is not many years since Mr. Edison was earning, by diligence and industry, a modest stipend of three dollars per diem as a telegraph operator, and it is but just to say that he was accounted a very skillful one, and well worth the money. To-day he occupies the finest estate in the vicinity of the metropolis, and if he is not twice a millionaire, it can be for no other reason than that, like too many of the rest of us, he has found it less easy to keep money than it is to get it. We venture to assert that had it not been for the patent law which he now decries, Mr. Edison would, in all human probability, have been "pounding brass," as the phrase is, at this moment, although it is doubtful if, in the absence of the inventions which the patent law has fostered, anybody could afford to pay him more than $1.25 per day. Who would have given him a dollar in exchange for his quadruplex and automatic telegraphs, and his electric light inventions, had it not been for the patent law? Would he not have been obliged to content himself with the modest wage earned by daily industry? He adds, mysteriously:

"I have already found one chemical device which promises to pay me handsomely, and the Patent Office will never hear anything about it. To apply for a patent would simply invite a lot of rogues to share with me, or, what is more likely, to take all the profits."

Every right-minded person will be gratified to learn that the prospects of polyform, if indeed it be that excellent remedy which is referred to, are so flattering. But to return to the patent law. Mr. Edison complains:

"There is scarcely an invention of importance made within the last generation which has not been disputed upon frivolous grounds, and the inventor put to all sorts of annoyance. In my own case, I am sure that, no matter what I may patent, some one will come up as soon as the patent is seen to have any value, and show by dozens of witnesses, if necessary, that he is the rightful owner of the invention. If I patent to-morrow a process for making good flour at a cost of two cents a barrel, the publication of my patent would bring out about ten men who could prove that they did that sort of thing years ago, and that I had no right to a patent."

This is not simply an indictment of the patent law, but of all law whatsoever, and the real root of the trouble obviously lies, not in the statutes, but in that inborn proclivity of the unregenerate human animal which prompts him to appropriate his neighbor's property, and which it is one of the principal functions of the common law to prevent and punish. The patent law merely serves to protect the inventor by declaring that an invention is property, and that it may, therefore, be the subject of larceny.

The federal courts have never, to our knowledge, pronounced any patent whatever invalid because of prior knowledge or prior use by another, except the anticipating invention had been actually embodied in a concrete and operative machine or method, and that fact had been proved beyond a reasonable doubt. That the law is designed to protect, and that it does in fact protect, the real originator is abundantly shown in the cases of such inventors as Goodyear, Howe, Morse, Bell, Edison, Westinghouse and many others, whose achievements have served to render the annals of American industry illustrious.

The fact is, and it is well to bear it in mind, that the pre-eminence of the United States, as distinctively a nation of inventors of improved machinery and processes, dates back no further than the patent law of 1836, which is substantially the one now in force, and it is to the fostering care of this wise statute, more than of any other which has ever been enacted by Congress, that this country owes its present prosperity and greatness.

Do not lay rash hands on the patent law. Let the American inventor be protected. *In hoc signo vinces.* —*Electrical Engineer.*

### THE BIRTHPLACE OF JAMES WATT.

The inventor of the condensing low-pressure steam engine was certainly one of the greatest benefactors of mankind. James Watt was born at Greenock, on the Clyde, in 1736. The house in which he was born, No. 13 Dalrymple Street, in that town, has lately been pulled down by the Greenock Improvement Commissioners. We have to thank Mr. Cathcart W. Methven, engineer to the Greenock Harbor Trust, for a sketch of the street, showing the position of the house. It will be marked by a memorial tablet on the new building to be erected on this site. James Watt, in his youth, was apprenticed to a maker of mathematical instruments. He began, at the age of twenty, to make experiments with steam as a motive power. In 1770 he commenced practice as an engineer, and in 1774 entered into partnership with Mr. Matthew Boulton, of the Soho works at Birmingham, where his grand inventions were applied with speedy success and results of


THE BIRTHPLACE OF JAMES WATT.

amazing magnitude. James Watt retired from business in 1800, and died in 1819. He was the inventor also of the copying press, of improvements in the process of bleaching, and of many useful appliances in the manufacturing arts.—*Illustrated London News.*

### Mechanical Progress.

The lecture which commemorates the birth of James Watt, in Greenock, on Jan. 19, 1736, was this year delivered in the Watt Institute, Greenock, by Mr. John Scott, C.B. In the course of it the lecturer said he proposed to direct attention to some of the records bearing on mechanical subjects which have come down to us in the cut stone work of the temples and the mural tablets in the tombs which still exist in Egypt, and supply the earliest definite records of the civilization and advancement of the wonderful people who inhabited that country more than 2,000 years before the Christian era. Much controversy has been raised among Egyptologists as to how the stone cutting of the temples, with the gigantic monolithic statues and incised hieroglyphic ensamples, had been performed.

We know the difficulty experienced by our most experienced granite cutters in getting tools of the best steel to stand, and as nothing in the shape of tools has been discovered, except in bronze, the solution of the problem must still remain an open one. It may be possible that they possessed some now unknown method of tempering the tool bronze. But this seems unlikely, as the analysis of most of the tools which have been tested shows that the alloy contained 88 per cent copper, 12 of tin, and some impurities not of any practical consequence. This is the exact alloy, if a small quantity of zinc were added, which is now used as the regulation mixture for all gun metal or bronze castings used by the Admiralty for Her Majesty's service.

Among the implements in use by the Egyptians, and frequently shown on the mural drawings, is the beam and scale with equal ended levers. The Italian or Roman balance is not found. The siphon was used by them for purifying muddy water, which was allowed to settle in one vessel placed at a higher level; and after the mud had subsided the water was drawn off from the top by putting one end of the siphon quietly into the vessel, whence it then flowed into another placed below it, in a pure state. The use of iron and steel does not appear to have been known in Egypt until after the exodus of the Israelites, but in the tomb of Rameses III., better known to us as Sesostris, 1235 B. C., iron forming a butcher's knife was discovered. So few traces of iron mines have been discovered in Egypt, it is difficult to believe that iron could have been a native product. It was probably introduced from India, where iron from native ores has been produced from very ancient times, and is still produced in small quantities. It is known as worked iron, and is the material used in the manufacture of Damascus blades and Indian cimeters.

Among the Greeks and Romans, in the periods which are covered by extant writings of authors of these nations, a vast advance in mechanical knowledge has to be signalized. Practical mechanics in those days had but two leading objects: warlike implements of offense and defense, both for sea and land, and machines for aiding in the construction of temples and public edifices and for temple worship. That such warlike instruments were then produced there is undoubted evidence, and that many of them held their own until within the last three hundred years is undoubted. But little evidence exists as to how their manufacture was carried out, except such as can be gleaned from the writers of a much later period. That the material used was principally timber, and that metals were but sparingly introduced, seems certain.

### A Horse that Draws the Water He Drinks.

The sagacity exhibited by some of the horses employed by the fire department in this city is very remarkable, and their exploits have been frequently described in our daily newspapers. But for the first time we read in one of our evening contemporaries of a horse in the service of our ambulance corps, which is not far behind any fire engine horse we have read of in point of intelligence. The horse pulls the ambulance in search of patients for the New York Hospital, and during the whole period of his philanthropic career as an ambulance horse, he has never once been given a drink by any of the stable hands. He believes in the maxim that God helps those who help themselves, and helps himself accordingly.

A *Telegram* reporter went down to see how he quenched his thirst, and was edified by the intellectual behavior of the animal, which he describes as follows:

There is an ordinary faucet with a pail under it in the stable, and to this faucet the horse made a bee line.

First he dipped his nose in the pail to see if there was any water there, but finding there was none, he proceeded to open the valve by turning the handle with his nose. He did not turn it on quite enough at the first attempt, so he gave it another nudge, and held his nose under the spigot while the water poured over it to his apparent immense satisfaction. "But what a lot of water will be wasted when he leaves it running the moment he has had enough!" ejaculated the reporter.

"Wait and see," answered the driver.

And there was no water wasted, for the moment the horse had concluded his drink, he went at the faucet again with his nose and shut off the flow completely.

"Does he always do that?" again queried the newspaper man.

"Certainly," answered the driver, as he patted his four-footed friend on the shoulder. "As long as I've known him, that horse has never had a drink that he did not draw from the tap for himself just as you have seen him do this time."

### Packing for Ice.

Sawdust to pack ice in is believed to be the best material, but this is very difficult to obtain in some parts of the country where there are no sawmills. A correspondent of the *Country Gentleman* comes to the rescue in such cases, and recommends, next to sawdust, oat straw cut short, if the oats have been thickly sown so as to make the straw small and soft, capable of packing well, without air crevices. If uncut, or cut rather long, it is liable to contain small crevices through which air may find its way, but if cut only a fourth of an inch in length, it may be placed nearly as compact as sawdust. Next to oat straw is fine soft hay. Wheat straw is too stiff, and will not pack solid, although by very short cutting it will answer if a greater amount is used. Good fine sawdust, well packed, need never be more than a foot in thickness, chopped oat straw will answer, well packed fifteen inches, but chopped rye or wheat straw should be twenty inches or two feet. Unchopped fine hay or oats will be quite as good as chopped wheat straw. Much will depend, however, on the care and skill with which the packing is applied, so as effectually to prevent the entrance of air through small crevices.