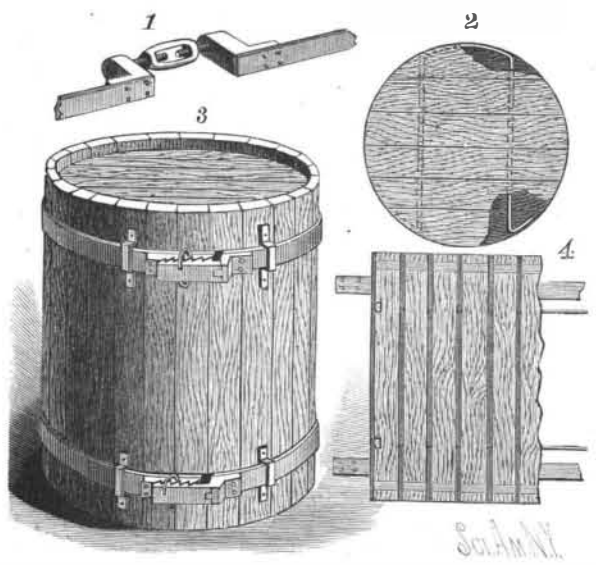
A COLLAPSIBLE SHIPPING CASK.

A convenient "knock-down" shipping cask which can be readily taken apart and put together, and returned in compact folded shape for a new shipment of goods, is illustrated herewith, and has been patented by Mr. John H. Mitchell, of Bloomfield, Iowa. Fig. 1 shows one of the hoops, with adjustable lengthening and shortening device, Fig. 2 is a bottom view of one of the heads partly broken away, Fig. 4 shows the means for connecting the staves, and Fig. 3 is a



MITCHELL'S COLLAPSIBLE SHIPPING CASK.

perspective view of the completed cask. The staves are connected together by wires extending through perforations, the vertical edges of the staves being beveled, so that when the cask is put together the edges of the staves will lie close together. The heads are formed of strips, also preferably connected together by wires extending through perforations in the strips, the wires having their ends bent and lying in grooves in opposite edges of the head. The staves have grooves at their top and bottom to receive the edges of the heads. Metallic hoops or bands are secured to the wired staves, when the latter have been folded about the heads by means of a serrated block riveted to one of the ends of each band, the other end of the band also having a block with serrated plate, their serrations engaging each other and being held by means of a wire passing through a staple and slot. When transported empty, the heads and wired staves are laid flat, and may be compactly folded together for convenient carriage.

Habits of Thalessa and Tremex.

Prof. Riley recently made some interesting remarks before the Biological Society of Washington on the habits of Thalessa and Tremex, illustrated by diagrams. The genus Thalessa includes our most remarkable Ichneumonid parasites, there being two species quite common in this country, the ovipositors in the female reaching sometimes over 5 inches beyond the tip of the body. They are among the largest parasites of the world, and have always attracted attention on account of this enormously long ovipositor. It has generally been supposed that the female bores into trees and stings some lignivorous larva, and particularly that of *Tremex columba*, and Packard, in his Guide, and Comstock, in the Standard Natural History, as also other authors, actually state this to be the fact. But from observations made in 1872 Prof. Riley proved clearly that the parasitic larvæ live externally on the Tremex larva and that the latter was never punctured or stung by the female Thalessa. The mode of oviposition is most curious. The female manages with some difficulty to bring the long ovipositor beneath the body so as to get its tip to the surface of the bark, bearing down upon it in such manner that the basal portion of the ovipositor rests within the tip of the abdomen and protrudes into a singular membrane between the sixth and seventh segments dorsally. The ovipositor makes a perfect coil within this membrane. The insect frequently gets stuck in the more solid wood and perishes in her endeavors to bore, and the fact that she does not reach the Tremex larva, and that she frequently bores into wood without reference to this last, has given rise to the belief among some entomologists that Thalessa may be lignivorous and not parasitic. Prof. Riley showed that this is impossible, not only by the nature of the mouth parts of the larva, which are incapable of gnawing the wood, but also by his actual observations, having found the parasitic larva of all sizes preying upon Tremex larva externally. He finally referred to some observations by Prof. J. A. Lintner, the State Entomologist of New York, who records having witnessed what he took to be *Thalessa lunator* ovipositing on external larvæ of the genus Datana. Prof. Riley showed by the structure of the ovipositor that this was impossible, and explained Prof. Lintner's error by assuming that he mistook another parasite, *Heteropelma datanæ*, and which is known to be parasitic upon larvæ of the genus Datana. The paper was a good illustration of the value of exact observations and of their need to dispel erroneous belief and conclusions, even in reference to some of our largest and most striking insects.

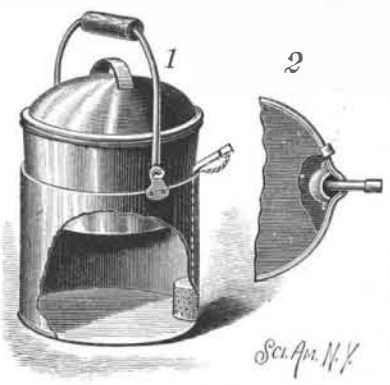
Fresh Boiled Water Necessary for a Good Cup of Tea.

All tea and coffee drinkers can tell by their taste if the water from which the beverage is made has not boiled or has boiled too much. Either of these conditions will spoil the flavor of the costliest tea or the best coffee berry. But not every one knows the reason or how to avoid the result.

The secret is in putting good fresh water into a clean kettle already warm and setting it to boil quickly, then taking it right off to use in tea, coffee, and other drinks before it is spoiled. If the water is allowed to steam and simmer and evaporate till all the good of the water is in the air, and the lime and iron and dregs left in the kettle, you must not expect a well flavored cup of tea or coffee.

AN IMPROVED DINNER PAIL.

The accompanying representation of a liquid receptacle, which also supports a lunch can, with a pipe extending from the outside to the bottom of the receptacle, forms the subject of a patent issued to Mr. John H. Yarnell, of Somerset, Ohio. The liquid receptacle has lugs near its upper end for supporting the bail, and in the upper end of the receptacle is held a lunch can or box, leaving a space in the bottom for coffee, milk, or other liquid. A pipe, adapted to turn in suitable bearings, extends down through a crease or groove in the side of the receptacle, its lower end extending into a strainer in the bottom of the receptacle, while its upper end has an outwardly bent part, forming a spout, which can be turned and held in place on the side of the lunch can by means of a hook on the latter. Fig. 2 is a plan view of the dinner pail on the line of the spout. The strainer is removable, for convenience in cleaning the parts when desired, and the user is not compelled to remove the lunch can when wishing to take a drink from the receptacle.

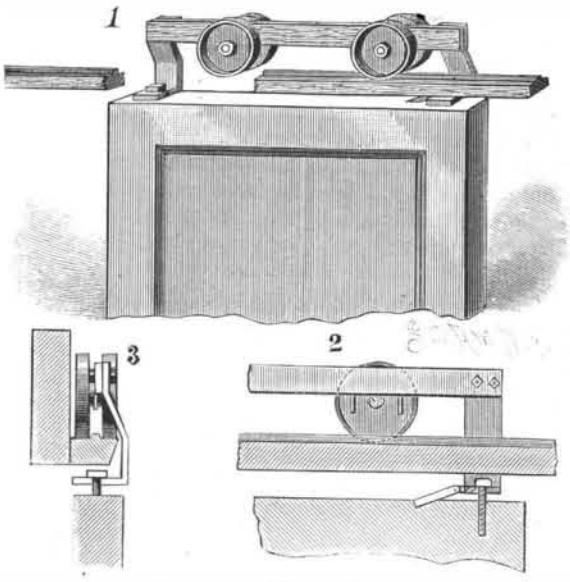


YARNELL'S DINNER PAIL.

HOUSES in which the inmates complain of headache and have a languid feeling are probably wrong in a sanitary sense. The condition of the premises should be examined.

AN IMPROVED DOOR HANGER.

An improvement in connection with sliding doors, providing a simple method of attaching the door and holding it in place, and conveniently adjusting it, is illustrated herewith, and has been patented by Mr. Wilber W. Smith, of No. 180 Second Avenue, Grand Rapids, Mich. Fig. 1 shows a partial side elevation of a door on which this hanger is employed, Fig. 2 a partial longitudinal, and Fig. 3 a partial vertical and transverse section. Screws with rectangular heads



SMITH'S DOOR HANGER.

are secured in the upper edge of the door, these screws holding in position brackets which at their upper end are secured to a horizontal hanger bar. On the under edge of this bar are spaced pins, as shown in Fig. 2, to limit the play of the trucks, designed to roll upon the usual horizontal track below. The trucks each consist of two wheels united by a common axle, on which rides the hanger bar. This mechanism may be readily attached to and detached from the door at will, and when the door is slid backward or forward, the trucks are designed to move noiselessly upon their tracks.

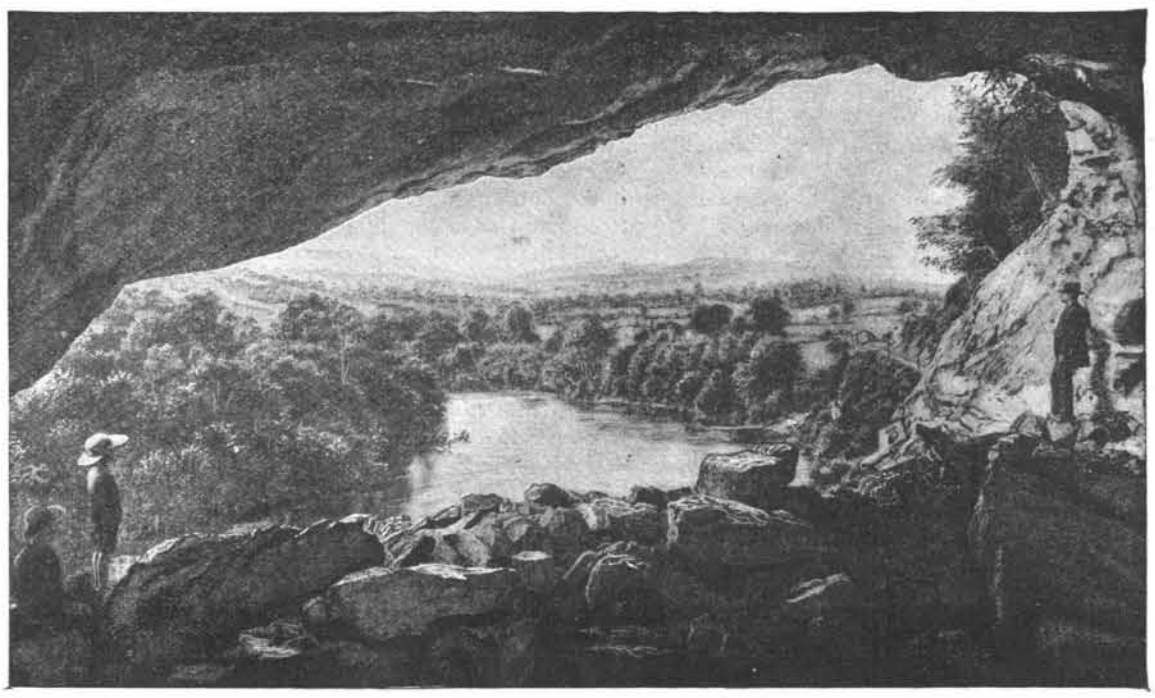
THE JEWELL CAVERN.

BY H. C. HOVEY.

The source of the Greenbrier river is at the base of the Cheat and Greenbrier mountains, West Virginia, more than 2,000 feet above tide level. The stream is 100 yards wide where it empties into the New river; that point being 1,325 feet above the level of the sea. Thus it falls about 700 feet in 100 miles, having many beautiful cascades and rapids. The entire valley is covered by a thick deposit of limestone resting on sandstone. It abounds in abrupt cliffs, alternating with deep ravines and gorges, which rise to what are called "levels" of considerable size. In these upper areas there are numerous sink holes through which the surface water finds its way to underground channels. Quite large streams are sometimes thus lost to view. A branch of Greenbrier river is known as Sinking creek before it passes under a large hill, and Muddy creek after it has emerged below. The region is evidently favorable for the formation of caverns—a fact noticed by President Jefferson, who, in his "Notes on Virginia," mentions that there are at least fifty in this one valley. Some of them yielded large quantities of saltpeter during the war of 1812; the product from a single cave being 10,000 pounds in one year. It was in one of these places that Jefferson found his famous megalonyx.

Orders were given to Captain Jewell, in the employ of the Chesapeake and Ohio Railroad, to cut down the face of a rocky cliff that juts out over the Greenbrier river, at a point five miles east of Alderson and a mile and a half west of Fort Spring. In the discharge of this duty, a few months ago, he found that, after cutting through an extremely compact stratum of black limestone, serving as an exterior shell, the rock that remained was in a singularly broken condition. On clearing the fragments away, there was suddenly exposed to view the hitherto hidden gateway of a cave of large dimensions, which has been appropriately named, for its discoverer, "The Jewell Cavern."

At the request of parties interested in developing the resources of Western Virginia, I recently visited the locality, supplied with the means for making a



THE JEWELL CAVERN, FORT SPRING, WEST VIRGINIA, GREENBRIER RIVER.

somewhat careful exploration; and accompanied by Mr. Harry A. House, a photographer.

The trip itself was delightful; including a passage on the Old Dominion line of steamers from New York to Norfolk, followed by a ride through the diversified scenery traversed by the Chesapeake and Ohio Railroad, with the further privilege of stopping over, here and there, to inspect interesting geological formations. Rising from the areas occupied by the more recent periods, we climb the hilly belt of Silurian rocks that extends entirely across Virginia from northeast to southwest, and from which have been carved the Natural Bridge, the caverns of Luray, and numerous other grottoes that have been repeatedly described, but that never lose their interest for the man of science or the lover of the picturesque. Above these tower the Alleghanies, with their Laurentian, Huronian, and Montalban crags. One has a surfeit of the tunnels that pierce these mountains. There are twenty-six in all, on this one railroad, that vary in length from 100 ft. to 6,800 ft., and some of them are remarkable specimens of engineering. One of them, 1,200 ft. long, is just beyond Fort Spring; after shooting through which, we soon come in full view of the majestic entrance to the Jewell Cavern. I never saw a more striking approach to any cave. The graceful bend of the river, which is here deep and wide, the sweep of the lofty hills and more distant mountain chains, the fertile farms and woodlands intervening, and then the bold cliff cut by the wide arch of the cavern mouth, make an unequaled combination. When the cave was first found, the effect was heightened by an array of huge stalactites standing forth like so many tusks. But these, and many other curious formations, have been broken off and carried away to decorate the door yards and hallways of the neighboring hamlets. Car load after car load have thus been removed, until the more accessible portions have been literally robbed of their stalactitic beauty. There are fine masses of dripstone, however, in the remoter chambers that remain intact, probably because it was too much trouble for the vandals to rob them. Possibly much of this lamentable spoliation might have been prevented had not the ownership of the cavern been a matter of dispute. The entrance is on ground belonging to the railroad; but its ramifications undoubtedly extend under the farm of Mr. D. Y. Huddlestun. Even now it would be well worth while for these parties to agree on some plan for preserving what remains, both for their own interest and for the welfare of the public.

The mouth of the cave is 40 ft. wide and 30 ft. high. The vestibule is 50 ft. deep; and what might be called the throat of the cave—a narrow and irregular aperture—is to the left, as you go in. It bears the musical name of the "Magnolia Gate." Just at this point, in a stratum of oolitic limestone, I found some excellent specimens of pentremites, crinoids, and other fossils, serving to determine the formation as sub-carboniferous and referable to the so-called "Umbral series" of the Virginia survey. This series here includes what are known as the Greenbrier limestones and shales; the latter being soft and readily decomposed, while the former vary remarkably in character, from kinds almost as hard as granite down to the oolitic variety already mentioned. On analysis the oolite shows 96·46 parts of carbonate of lime in 100, the small residue being merely clay and sand, with no sulphur, phosphorus, or iron. As may readily be seen, this is an excellent material for the manufacture of lime; for which purpose it is quarried near by, with good results.

By barometrical measurement, the entrance to Jewell's Cavern is 1,660 ft. above the level of the sea; and it is about 50 ft. above the level of the adjacent river. The crest of the hill is between 300 and 400 ft. high. The surrounding country is broken into hills and hollows, many of the latter being sink holes connected with underlying caverns. A ravine near by cuts the ridge down to the river's margin, but grows rapidly shallow as one ascends, and its course being transverse to the cavern axis, the idea is suggested that the ravine was itself once a cave whose roof fell in long ago. At the upper end I found well marked sinks plainly connected with the cavern below, though it might require a great deal of digging and blasting to force one's way through.

The general trend of the cave is from north to south. Such arms as branch to the west soon come to an end; but those to the east and southeast extend for a long way, and all further discoveries are to be looked for in that general direction. Going as directly as possible from the entrance to the extremity, the distance is about 3,000 feet; but one who should thread all the passageways would probably travel between two and three miles. The main cave, to which the name of Huddlestun Avenue is attached, is of ample dimensions; being from 10 to 40 ft. wide and from 5 to 100 ft. in height. The floor is encumbered with immense banks of red clay, some of which was washed in by the subterranean stream that inundates the cavern during the rainy season; but most of it may be regarded as the breaking down of the Greenbrier shales, to which cause Prof. Rogers attributes the surface clays of the region. In many parts of the cave the free use of the pick and shovel would facilitate progress. Here and there steps might be cut for the convenience of visitors. One or two places ought to be bridged. Thus, at comparatively slight expense, all the more interesting portions might be made accessible, and the locality would then become a place of resort for West Virginia, at least, and an interesting addition to the numberless attractions of the route.

At the foot of a steep descent called Slippery Hill, a large arm of the cavern begins that runs in a northeasterly direction, to which the name of Hovey's Avenue was given. At the time of our visit the floor was dry; but during a part of the year it is the bed of a rippling stream, that has formed, partly by erosion and partly by concretion, the prettiest imaginable ruffle-like dams across its channel. In several places deep pools remain. The general bed of the stream is composed of flat, oval pebbles, of a shining black mineral, which proved to be argillaceous ironstone. Large fragments of limestone have fallen from the roof; in some of which the water, aided by sand and pebbles, has cut numerous bowls, of which what is called "The Bird's Nest Rock" furnishes the most striking example. Al-Sirat is a natural arch, seeming slight enough for the passage of disembodied spirits, yet really strong enough to carry the men of flesh and bone safely over. It has an ugly look, however, as if fashioned expressly to drop too ambitious adventurers into the abyss below.

Other places to be noted in this avenue are the Hermit's Cell and Pluto's Chimney—a singular crevice communicating with the upper part of the main cave. The entire length of Hovey's Avenue is about 600 ft.; and as the channel is rapidly downward, it is certain that it leads to the river, and is the true outlet of the cavern. This is confirmed by the existence of a large spring on the margin of the river, and in line with the trend of this avenue.

Returning now to the foot of Slippery Hill, we observe with admiration an extensive enlargement called the Cyclopean Hall, where huge folds of rock hang from above in strange and fantastic forms. The imagination finds the heads of elephants, dragons, and other monstrous resemblances, which my artist tried to catch by the camera. We named the spot, just beyond this hall, Harry's Laboratory, because here the cave suddenly narrows, with convenient ledges overhanging a limpid pool, and offering other facilities for the mysterious processes of subterranean photography. Cavern conditions are quite peculiar. Experiments elsewhere in instantaneous photography by artificial light hardly prepare one for the absolute blackness of darkness prevailing in these rooms that have never for a moment been touched by sunlight. Then again the walls and most of the formations are of uniformly dark material, with only here and there any object of a yellow or cream color tint. The cavern atmosphere is naturally very pure and clear. But if any smoke is made, it may take hours, or even days, for it wholly to escape. We had, therefore, to find the points most desirable to be taken, fix our instruments, and get the proper focusing, with as little torchlight as possible. For the most part we relied on coach candles. We were annoyed daily by troops of visitors, who would insist on carrying big torches, each emitting its mass of smoke, and who would want to stand around and watch our operations. Finally, we got rid of this annoyance by circulating word through the neighborhood that, if they would keep entirely away from us till our last day there, we would reward them by a grand illumination with fireworks; but if they persisted in hindering us, there would be no display of pyrotechnics. The plan worked admirably, and we had the cavern to ourselves.

Having selected our point of view, and made ready for the exposure, our plan was to burn, first, several yards of magnesium ribbon, and then fire off six or more magnesium cartridges placed so as to secure as many details as would comport with a good general effect. Before disturbing the camera, the artist would take several duplicates, so as to have them to choose from. We also tried a mixture of green fire and magnesium dust; but with less satisfactory results. Our conclusion was that, on another visit, we should take with us portable cylinders and depend on the calcium light, which, while less vivid than the magnesium light, makes no smoke and could be freely used at less expense.

Just beyond the Laboratory is Bruce's Gallery, a spacious enlargement of the cavern; near which the main cave bends at a right angle, and presently subdivides; one arm going to the east, while the other leads to the southwest. Here is the largest pool that we found in the cavern, which is called Black Rock Lake, on account of the black pebbles that form its bed. In its waters we found eyeless crawfish (*Cambarus pellucidus*); and in nooks and crannies there were hundreds of wingless grasshoppers (*Handenœcus subterraneus*). These little "cave crickets," as they are commonly called, have eyes, but do not seem at all sensitive to the light. I held my candle within an inch of some of them, that did not stir. But at the least touch of their long, waving antennæ, they will scud away with the most comical agility; and when fairly boxed they will escape, if given the slightest opportunity.

By going under the Hanging Rock, and through a frowning gateway called the Portal of Erebus, we found another and smaller lake, whose farther margin could only be reached by climbing to an upper avenue joining the two arms of the cave, and then descending again. Fifth Avenue, as this is named, leads to a deep rift in the rocks, at whose upper end is a cascade, the musical murmur of which may be heard long before it comes into view. The rivulet that causes it unites with another flowing down the right arm of the cave, and these two feed the lakes below. Among interesting features in the vicinity may be mentioned a natural water clock, quite equal to the one so greatly admired by visitors to Mammoth Cave, and made in the same way, by a rill that trickles down into a concealed basin.

Proceeding a few paces further, we found the way obstructed by an enormous limestone ledge that must have shaken the hills when it toppled over. It is partly buried in the clay, but the portion in view and standing erect must be about forty feet high. Beyond Mount Ararat, as they call this eminence, a descending crevice curves away, first to the right and then to the left, to a lower chamber, where there are some fine stalactites. But still another path, leading through a region as wild as Chaos, trends to the northeast, and consequently away from the outside ravine formerly mentioned, and deeper into the hill. Pressing on between huge fragments, or under grotesque arches; pausing here and there to inspect some alabaster pillar, or to lower our lamps into some pit or crevice, we make our way to the remoter parts of the cave. After dragging our camera and other apparatus through a muddy and tortuous passage, we are rewarded by gaining access to a small but very ornate chamber, really the prettiest room in the whole cavern, which we named "Clara's Grotto." Cautiously continuing our explorations, we follow a creeping avenue lined with botryoidal stalagmites, reminding one of rich clusters of ripe grapes. Helen's Grotto comes next, a room studded with various forms of dripstone, in the center of which stands an alabaster pillar four feet high and surrounded by what resembles a mossy carpet. Of course some pagan has tried to demolish this marvelous creation; but his effort was happily unsuccessful. At a point not far beyond the way is completely blocked by an enormous stalagmite named by us Jefferson's Monument, in honor of the scientific statesman who was the first to call public attention to the wonderful series of caverns in the Greenbrier valley.

The estimated vertical distance from this terminal mass down to the lowest point yet explored is about 150 feet. Doubtless this cave has grand surprises yet in store for daring adventurers. The ample dimensions of the rooms thus far opened would agree with this idea. When, in keeping with our promise, we came to illuminate the Jewell Cavern from end to end, which we did on the last day of our visit, in the presence of a large party of delighted spectators, we ourselves were surprised at the revelation. The vastness of some of the arches reminded me of similar scenes in the great caves of Kentucky and Indiana, which this locality resembles more than it does the profusely ornamented grottoes in the Silurian limestone along the eastern slope of the Alleghanies.

Temperature observations with a Hicks thermometer showed: In the shade outside, 90°; at the mouth of the cave, 66°; at a point 100 ft. within, 56°; at all points further in, 54°; in the water of Black Rock Lake, 53°—a difference perhaps due to evaporation from the surface of the thermometer. It should be remarked that this agrees with the average temperature, as already determined by me, for Mammoth, Wyandot, Luray, and other American caverns, being doubtless the mean temperature of the crust of the earth in this latitude.

Our thanks are due to Supt. Fuller, Supt. Dill, Mr. L. W. Bruce, and Messrs. Jewell and Huddlestun for favors granted.

A Glib-Talking Fakir.

A contemporary describes the lingo of a fakir the writer came across the other day following in the wake of Forepaugh's circus. The same fellow will be found at our country fairs next fall. His talk was as constant as the flow from Niagara; no period, colon, semicolon, or comma: "Yesterday I sold this almost priceless object to-day I am giving them away simply giving them away as an advertisement for the ridiculous sum of ten cents or a dime to-morrow I may be selling them again thank you sir it magnifies as well as any three dollar microscope and you are getting it for the paltry sum of ten cents it is recommended by all the most celebrated lawyers doctors ministers and scientific men as the most wonderful invention of the age and the gentleman here takes one why it is worth one dollar alone to examine a drop of water before you drink it and you will plainly see the seven kinds of insects in each drop ants grasshoppers crickets bees flies beetles and centipedes look at them and then drink your water and the gentleman here takes one thank you and you'll thank me before the day is over and the little boy takes one ten cents or a dime its worth more than that to see the skin on your hand thank you sir," etc.

The Italian Cruiser Piemonte.

At the recent meeting of the Institution of Naval Architects, a paper was read by Mr. P. Watts, on the Piemonte, which has recently been built at Elswick for the Italian government, a vessel of 2,500 tons displacement, 300 ft. long, 38 ft. broad, and 15 ft. mean draught. She has a protective deck, 1 in. thick in the middle, and increasing to 3 in. on the slopes. Her armament consists of six of the new Elswick 6 in. quick firing guns, four of which are sponsoned out, so that two can fire ahead and two astern. There are besides six 4¾ in. guns of the same pattern, ten 6-pounder Hotchkiss guns, four of which can fire ahead and four aft; six 1-pounder Hotchkiss guns, of which there are two in each of the two lower tops; two 10 mm. Maxims in each of the two upper tops; and three torpedo tubes, two on each broadside and one straight ahead. The penetrative power of the guns is considerable. Thus the 4¾ in. guns, weighing only 2 tons 1 cwt., can pierce 10½ in. of wrought iron; and the 6 in. gun, weighing 5¾ tons, can pierce 15 in., both taken at muzzle velocity. The 4¾ in. gun fired ten rounds in 47½ seconds, as against 5 minutes 7 seconds for an ordinary breech-loader of that size. Lord Armstrong has recently pointed out that the Piemonte can discharge against an adversary in a given time twice the weight of shot and shell that can be fired by the largest war vessel afloat. The engines and boilers are wholly below the water line, and the armor deck above is supplemented by packing of patent fuel or coal. The ship is divided throughout into many watertight compartments, and has a double bottom. There are coal bunkers along the side throughout the machinery compartment, and dwarf bulkheads divide the bunkers into spaces of 10 ft. to 12 ft. long. Below the armor deck, before and abaft of the machinery, is a flat that could be packed with patent fuel or stores, so as to form a raft body. Patent fuel is recommended for the lower bunkers, as it practically excludes the water, however the sides may be riddled, and is less liable to be blown out. The thickness of the vertical armor, with its backing, that might have been attained instead of the sloping deck, is 10½ in., whereas the sloping deck and its fuel covering are equal to 6 in.; and this, divided by the size of the slope, gives 14 in. as the horizontal thickness, or 3½ in. more than a vertical belt would have. A sloping armor is also more efficient in resisting projectiles, and as the shells would burst in the fuel, the armor would only have to resist the broken pieces. Sloping armor is also cheaper, and enables 100 tons more coal to be carried, though it has the disadvantage that the fuel might be blown out, and the ship's structure damaged by shells that would not penetrate the vertical armor. The engines, constructed by Messrs. Humphrys, Tennant & Co., are two sets of vertical triple expansion engines, giving a speed of 19½ knots without using the fans, 20·168 knots with an I. H. P. of 7,760 at ¼ in. pressure, and 20·3 knots with 8,000 I. H. P. at ½ in. pressure, while with closed stoke holds and forced draught, giving 11,600 H. P., the speed was over 21 knots. The turning trials have not yet been made. The full coal supply is 600 tons, enabling the ship to cruise at 10 knots for fifty-five days, during which she could cover 13,200 knots. The vibration at the highest speed was never more than 0·12 in., as measured by Mr. A. Mallock's seismometer.

Water Gas.

Even at 1,000° the decomposition of watery vapor by carbon is incomplete. Before water gas can be commonly used for heating or lighting, like coal gas, a method must be found of communicating to this gas, which is in itself inodorous, a scent much more penetrating and persistent than that of coal gas, since, by reason of the large proportion of carbon monoxide which it contains, it is at least five times more poisonous than coal gas. The deadly character of a gaseous mixture seems to increase much more rapidly than the proportion of carbon monoxide. According to the researches of Dr. Wyss, the dangerous results of the inspiration either of coal gas or water gas are due solely to carbon monoxide. During the months of January and February, 1888, seven cases of poisoning from water gas have occurred in New York. It is proposed that water gas might be rendered odorous, so that its escape could be at once detected, by means of mercaptan.—*J. Lange and J. Lunge, in Zeitschrift fur Angewandte Chemie.*

Castor Oil.

The authors infer from their experiments that the liquid acid of castor oil is not a single compound, as it has been hitherto supposed, but a mixture of two isomeric acids of the composition $C_{18}H_{34}O_3$, one of which, ricinoleic acid, yields on oxidation trioxystearic acid, while the other, ricinisoleic acid, yields isotrioxystearic acid. The proportion of these acids is about one of the former to two of the latter. As no dioxystearic acid has been obtained from the oxidation of the liquid acids of castor oil, it may be concluded that of all the fatty oils hitherto examined, castor oil is the only one which contains no oleine.—*K. Hazura and A. Grussner, in Zeitschrift fur Angewandte Chemie.*

The Monitor Puritan.

The new double-turreted war vessel Puritan recently arrived at the Navy Yard, Brooklyn, N. Y., from Norfolk, Va. The ship is to be completed at Brooklyn.

The Puritan is a low freeboard, twin screw monitor. She is built of iron throughout, and will be armored with steel 12 inches thick, extending the entire length of the vessel. She will carry four 10-inch breech-loading rifles in two turrets and an efficient secondary battery. The steel armor of the turrets will be 11¾ inches thick. The guns will have a range of over eleven miles.

The principal statistics of the vessel are: Length between perpendiculars, 280 feet; length on load line, 291 feet; length over all, 295 feet 8½ inches; extreme breadth, 60 feet 1½ inches; draught, 18 feet 2½ inches; displacement to load water line, 6,060 tons; indicated horse power, 3,600; speed, 13 knots.

The motive power is furnished by two direct-acting, horizontal compound engines placed in watertight compartments. The cylinders are 50 and 86 inches in diameter by 42 inches stroke. There are ten return fire-tube boilers, with a grate surface of 700 square feet. The working pressure is 80 pounds. The two screws are of the Hirsch pattern, and are made of cast iron. They are four-bladed, 15 feet in diameter, and 23 feet mean pitch.

The Puritan will be a really formidable vessel. Carrying in her turrets four 10-inch breech-loading rifles, elevated, trained, and loaded by machinery, protected by 11¾ inches of steel armor, and firing a projectile weighing 500 pounds, capable of piercing 23 inches of wrought iron at the muzzle or 17½ inches at the distance of a mile, the Puritan need fear but few vessels afloat. In addition to the heavy guns, she will carry a secondary battery, consisting of two six-pounder and two three-pounder rapid-fire Hotchkiss rifles, two thirty-seven millimeter revolving cannon, and two Gatlings. She will have a torpedo net of heavy steel rings, which can be rigged out all around the vessel, and so protecting her from torpedo attacks. There will be a powerful search light for use at night.

The Puritan compares more than favorably with the Conqueror, one of England's modern turret vessels, and with the Tonnerre of the French navy.

The Measurement of the Candle Power of Electric Street Lights.*

In measuring the candle power of electric street lights while burning in their position on the street, one has certain difficulties to contend with which are absent in ordinary photometric measurements. The chief of these difficulties lies in the facts that the lamp to be tested is at a considerable height above the horizontal plane which the photometer can, in most cases, conveniently occupy, and that the work must be done out of doors. In compliance with the request of the editor of the *Journal*, I will briefly describe the way in which I have sought to solve the problem which presents itself.

In the first place, the photometer must be modified, so that the light coming from a point considerably above its plane shall yield a beam parallel to the bar. This may be done in two ways:

First.—By having the photometer bar horizontal, as usual, and placing at one end of it a reflector, which shall throw the beam from the electric light along the bar. This reflector must, of course, be a plane surface, and may be an ordinary mirror or a totally reflecting prism.

Second.—By inclining the bar in the vertical plane so that it shall point directly at the lamp. Of these two methods I prefer the latter, because the use of a reflector of any sort involves loss of some light, the amount of which must be carefully determined and introduced as a correction in the final calculation, while it offers no advantage over the direct method to compensate for the greater trouble and liability of error in the results.

In the second place, a direct measurement of the distance from the arc to the Bunsen screen is, in general, not easy, and the modified photometer should provide some way for its indirect, and, at the same time, accurate determination.

Thirdly, the photometric work must be done in the open air, and in a number of more or less widely separated places on the same evening. The photometer must, consequently, be readily portable, and at the same time must be provided with a special lantern to protect the standard light from draughts, and with screens to cut off all extraneous light.

To meet these points I have constructed my photometer as follows: The graduated bar is fastened by a pin passing through one end to the edge of a thick board which serves as the base of the instrument. On this pin it moves freely in a vertical plane. At a convenient distance from the pivoted end a graduated circular arc, of some 50°, is attached to it in such a position that when the bar is raised, the arc plays in a slot in the edge of the base board. By means of a thumb-screw the arc can be clamped to the base at any point, and thus serve both as a support for the bar at any angle above the base and as a means for determining this angle by the reading of the graduation. The base has fastened to it a carefully adjusted level. The lantern containing the standard light is mounted on the base just beyond the pivoted end of the bar. When a measurement is to be made, the photometer is first brought into the same vertical plane with the electric lamp, and the base accurately leveled. The bar is then raised until it points directly at the lamp, and clamped in this position. The carrier, with its Bunsen screen, is then mounted on the bar together with blackened diaphragms, which serve to cut off all light except that coming from the standard and the lamp to be tested. If the night is a dark one, and other lights not too near, no further precautions in the way of screens are necessary; otherwise, the photometer is mounted in a covered wagon.

After the readings have been made [giving the distances of the Bunsen screen from the zero mark at the pivoted end of the bar], the horizontal distance from the zero mark to a point vertically beneath the electric light is measured, and the angular elevation of the photometer bar is read on the graduated arc. From these data the direct distances from the screen to the electric light are readily calculated. The corresponding distances from the screen to the standard are obtained afterward by placing the bar at the angle noted and measuring directly from the screen [at its reading] to the point which the standard occupied in the out-door work.

* By Prof. J. T. Stoddard, Smith College, Northampton, Mass., in the *American Gas Light Journal.*

The New Trade of Electrical Plumber.

The extensive adoption of lead-coated cables for subway electrical lines has given birth to an occupation which is in some sense a new trade—the electrical plumber. The subway cables have to be joined at frequent intervals, at the least at every second manhole. In uniting the ends, the skill of both electric lineman and plumber is required. A cable may contain a hundred or more wires, which may be grouped in pairs to add to the complexity. To join such a cable the wires have to be properly connected with each other, each splice has to be carefully insulated with tape or equivalent wrapping, and finally a sleeve is slipped over the joint and secured by two wiped joints. At this point the lineman has to change his trade and become a plumber, when he "wipes" the joints at each end of the sleeve, so as to protect the wires perfectly from moisture. Much other work falls within his scope. Lateral connections have to be made. One or more wires have to be picked out and led to one side or the other on new routes. As the system grows in extent, so will his work increase in complexity. In fact, what is to some extent a new trade has been created. It is said that there are now about one hundred skilled electrical plumbers in this country, and that the best men are well known and are in constant demand.

The World Full of Death Traps.

According to the *American Analyst*, the worst enemies of the human race are the doctors, who try to prolong our miserable existence in a world full of death traps. One medico tells you not to eat or drink what you relish because you will eat or drink too much. Another says that you must only eat what you fancy, because otherwise you will bolt your food without giving to each morsel the thirty-six mastications which are necessary for digestion. You must wear a respirator over your mouth, a pad on your chest, and a swarth of flannel round your loins. If you live in town, you will die of fog; if you go to the country, you will be poisoned by bad drainage; if you drink water, you are tempting the typhoid fiend; milk spells scarlatina, and tea cake is sudden death. Do you shun these tempestuous pleasures of the senses and take refuge in the recreations of the mind? Do you borrow a novel from the circulating library? That is to import the germs of disease into a healthy household. The volume in your hands may have been perused by a person recovering from an infectious illness!

Dixon's Silica Graphite Roof Paint.

To give satisfaction, a paint should be a protection against the changes of temperature, the wear and tear of storms. It should be easily laid on, durable, and economical. Graphite and silica stand equally well extreme cold and changes of temperature; they are not touched by rust, and both resist the influence of a salt atmosphere. Graphite is very light. One pound of it is three times the bulk of white lead and twice that of mineral paints. The natural color is slate, but it can be furnished in all shades, from slate to a jet black, suitable either for regular surface painting, metal or shingle roofs, or any exposed metal or wood surface needing a durable paint. All the ingredients are harmless. Painters will not be affected by its use, and it is said cistern water gathered from roofs painted with it is not contaminated. This paint is prepared ready for use in several different styles by the Joseph Dixon Crucible Co., Jersey City, N. J., who will be glad to furnish any additional information desired.