SCIENTIFIC AMERICAN

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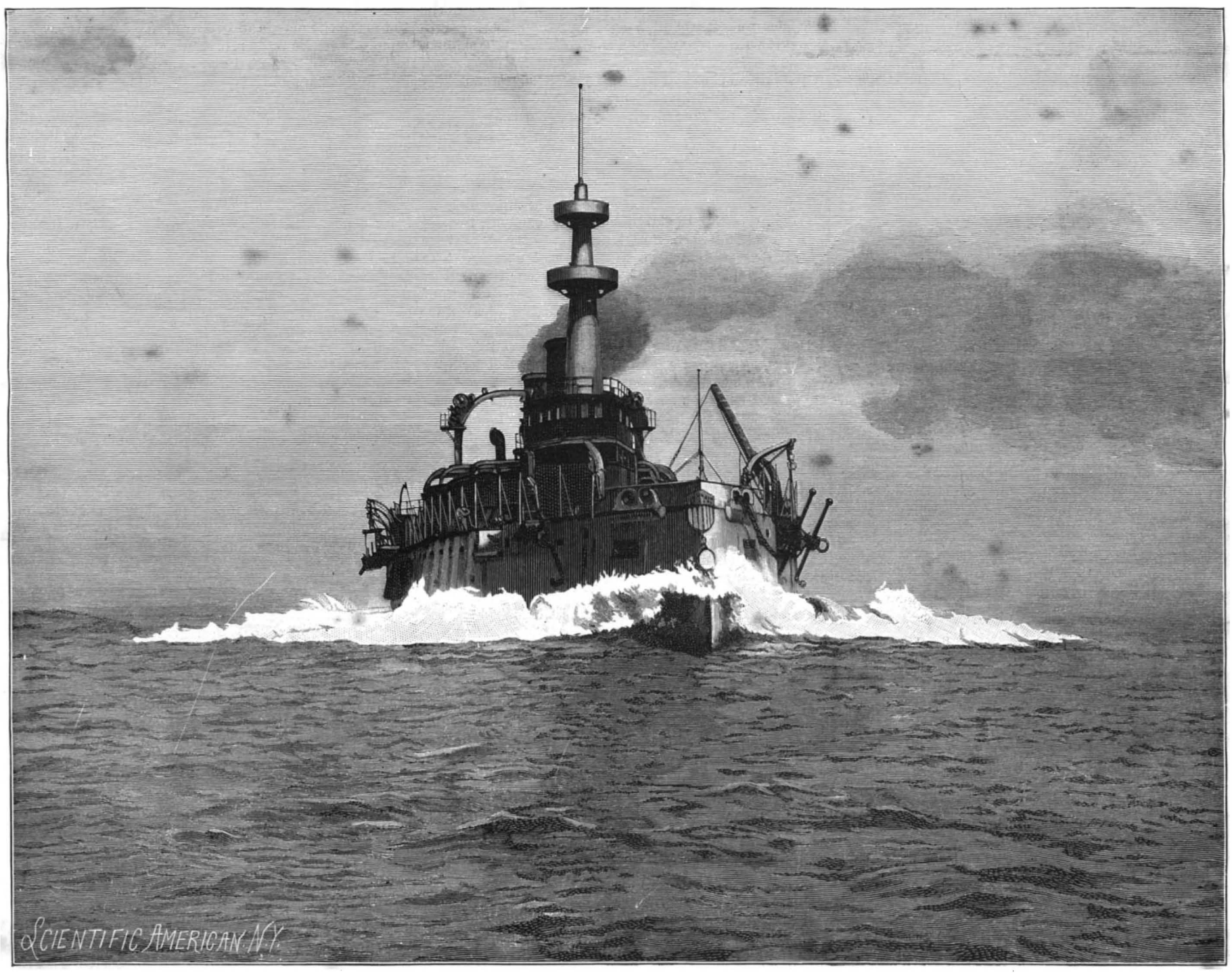
THE UNITED STATES BATTLE SHIP OREGON.

The accompanying view of the Oregon is of peculiar interest, as it was taken, not without some danger, from directly in front of the vessel when she was at the top of her speed, to show the waves thrown from her bow, a matter to which much thought is given by naval experts and constructors. An excellent side view of the Oregon under way, with details of her construction, was published in the SCIENTIFIC AMERICAN of January 19, but to show the great "feather" rolled up by the ship from a point directly in front, Mr. O. V. Lange, an experienced California photographer, arranged with the captain of a little tug to "shoot across" the Oregon's bow as she came on at full speed, a plan of which the Oregon's commander had no knowledge. The vessels were almost together, and it was too late for the Oregon to swerve either way, when the tug was seen moving directly across the course of the battle ship, at whose stem a foaming wave was piled nearly twelve feet high and spreading far on either side. The tug could not turn back as the high steel prow of the Oregon seemed about to bear directly down upon her, and there was consternation aboard the little vessel. The photographer says: "The Oregon seemed to be coming like a cannon ball, but I determined to get that picture if it was my last. I steadied my nerves a moment, glanced into the finder, and clicked the shutter. Then, with the camera under one arm, I ran to a stanchion and grasped it. The next moment there was a noise of rushing water and a violent whirling and pitching of the tug," which, it was said, had escaped collision by the fraction of a second, the ship's side flashing by within ten or twelve feet.

The Oregon is an armored coast line battle ship of the first class, built at San Francisco, and is one of the largest and most important vessels of our new navy. She has a displacement of 10,230 tons and a maximum speed of 16·2 knots, her length being 348 feet, beam 69¼ feet, and draught 24 feet. She has a coal capacity of 1,800 tons, sufficient to carry her 5,000 miles at full speed or 16,000 miles at a speed of ten knots. Her engines are of the triple expansion type, the cylinders being 34½, 48, and 75 inches in diameter respectively, with a stroke of 42 inches, and she has twin screws. Her armor is 18 inches thick from three feet above the water line to four feet below it. Her battery was designed to include four 13 inch breech-loading rifles, although there has been not a little difference of opinion as to whether the largest guns should not be limited to 12 inch bore. These large rifles will be mounted eighteen feet above the water. Besides these, her battery includes eight 8 inch breech-loading rifles, four 6 inch, twenty 6 pounder rapid fire guns, two Gatlings, and six torpedo tubes.



THE UNITED STATES BATTLE SHIP OREGON.

Aluminum Horse Shoes.

Among the recent patents is one for an aluminum horseshoe having finely divided particles of hard metal embedded in the wearing face of the shoe. This forms a very light shoe, of considerable durability.

The Box as a Specimen Shrub.

The assertion in a recent issue of the Garden that the common box is a much abused subject is, I think, quite justifiable. How seldom do we see it planted by itself where it can spread and develop to the fullest. Few, I think, have any idea to what proportions this shrub in good ground will attain. Some of the finest specimens I have ever seen are at Gunton, growing in the pleasure grounds. They stand quite clear of the neighboring shrubs, and have plenty of air and light, and are most useful and handsome. The variegated forms appear to be more stiff and erect in growth, and not nearly so graceful as the common variety. Were I planting new pleasure grounds, I would certainly accord the box a prominent place among shrubs and give it plenty of room.—J. Crawford.

Anthrax in Human Beings.

Some extraordinary statements as to the ravages of anthrax, and the attitude of the Board of Agriculture in relation thereto, were made at a recent meeting of the Leicestershire County Council, England. The disease broke out on the farm of a Mr Warren, at Arnesby, and not only the cattle, but human beings and all kinds of animals were attacked. The farmer and sixteen men were all ill at one time, one man dying at the Leicester Infirmary. A woman in passing the plague-stricken spot was stung by a fly and died from anthrax. Cats, dogs, and birds in the neighborhood also died.

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NEW YORK, SATURDAY, JUNE 8, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1014.

For the Week Ending June 8, 1895.

Price 10 cents. For sale by all newsdealers.

THE PRESENT STATUS OF THE BICYCLE.

The development of the use of the bicycle, which has been often spoken of in these columns, has attained now a wonderful extension. Wherever one travels in the country, whether near or far from the center of population, the omnipresent bicycle is found. On country roads the woman school teacher is met riding home from the district school; in manufacturing places the artisan is seen, perhaps dressed in his overalls and carrying his dinner can, going on his wheel on his way to and from his work. In road houses and in some stores special provision is made for the care of bicycles. Men go to their business on them, and it is at last proved that a new mode of everyday, practical locomotion has been developed.

All the above is trite. Coincidently with this immense development of what was once a sport, but is now no more a sport than is any other means of locomotion, has appeared a considerable amount of opposition to the wheel on the part of those who do not ride. A disposition exists to enforce ordinances more rigidly in the case of riders of wheels than is the custom against others, while the old tendency to legislate directly against their use is still shown in places. The wheel, with its pneumatic tire, stealing along silently at a relatively high speed, seems to possess the power of irritating the pedestrian from the apparent danger of collision. It seems not to occur to him that while legislation is being invoked to force trolley cars to be provided with fenders, the very element which makes the bicycles noiseless, which is the pneumatic tire, provides it with a reasonably effective fender. The pneumatic tire is certainly a great safeguard, if, by accident, a pedestrian should be struck by a wheel. Meanwhile, in spite of opposition, the use of the bicycle continues to increase, and one of the best safeguards against inimical legislation is certain to be afforded by the probability that the majority of legislators in the near future will be riders themselves.

To transform the everyday progress of a man through the streets from a speed of three or four miles an hour to a speed of ten, to give him as environment, instead of a crowd of other pedestrians, a quantity of vehicles of all descriptions, is a most radical change. The country road invaded by the trolley car running at twenty miles an hour is a parallel illustration of the change of conditions. In the matter of all governmental ordinances the existing conditions have to be considered. The regulations formulated in past days, concerning traffic on roads, in a general way recognize the wagon drawn by horses, the horseback rider, and the foot traveler as the elements to be provided for. As the bicycle came into prominence, the old view of it as an instrument of sport, pure and simple, something for pleasure, not for use, was hard to abandon, and many relics of this opinion still exist.

It is not saying too much to assert that the time has now come for a change. On the roads and streets it is no longer the two thousand pound truck, the lighter carriage and the slow-moving pedestrian that are to be considered; the bicyclist is a new element, which has created a new condition of things which must be recognized and provided for, and is destined sooner or later to have its interest conserved. The day for inimical legislation passed long ago; the time has come for special consideration. The streets of our large cities, as a rule, are ill adapted in the business districts especially for the bicycle. In cities where the business streets are ridable, the bicycle has come into the most extensive use for business men and tradesmen of all classes. But the stone-paved street, adapted to heavy traffic, is but ill adapted to the bicycle, and what seems to be wanted is a compromise pavement, which will suit all classes of traffic. Taking the city of New York, it would not seem impossible to provide one or more through bicycle routes from the upper part of the island to the Battery. A street with proper pavement on it, adapted especially for bicyclists, would not be too much to be granted to the ever-increasing army of riders, but it would be far better to devise some form of pavement which would meet all classes of traffic and which would enable the bicyclists to ride about the business portion of the city as comfortably as they now do in the parks and boulevards. An immense field for the civil engineer is opened in the providing of such streets in business cities. Asphalt, which gives a smooth though dead surface, is being introduced very extensively in the residential portions of the metropolis. It seems questionable if it would answer for the districts devoted to heavy traffic. Vitrified brick has been adopted in many places with satisfaction to bicyclists and truckmen. A small experimental piece has been laid in this city, and it may be laid upon the Ocean Parkway, in Brooklyn. To provide a bicycle path, the asphalting of the space between the tracks of cable car lines or of trolley car lines has been suggested, and this has been done in this city on one street, though not to accommodate cyclists. As the case now stands, there is a new form of traffic to be provided for, one whose magnitude is daily increasing, and which in the near future will excite attention greater than it is now receiving. The friction between the bicyclists and the pedestrian is bound to decrease in time; it seems at present to be merely due to the difficulty mankind has in recognizing the existence of a new state of things in daily life.

Incidentally the lowering of the price of bicycles and the possibility of procuring cheap ones second hand has imparted to the bicycle a most important element in making it the vehicle of the workman as well as of the rich. A few months' car fare will pay for a wheel, so that it has definitely ceased to be a luxury, and the workman who never could have dreamed of owning a horse, can possess without extravagance a bicycle, which will surpass the ordinary horse in speed.

POSSIBILITIES OF BEET SUGAR INDUSTRIES.

We derive the following from the Sugar Beet:

The total area devoted to beets for the seven beet sugar factories in the United States (this includes the small output of Virginia) was, in 1893-94, 19,647 acres, from which were obtained 195,895 tons beets and 45,191,296 pounds sugar, corresponding to a yield of 2,300 pounds sugar per acre, and an average of 230·7 pounds per ton of beets worked on an average extraction of 11·5 per cent. The average yield of beets per acre was 9·9 tons. Accepting these figures as a basis of calculation for the requirements of the Union, the consumption of sugar during 1894 was 2,024,648 tons, or 4,535,211,520 pounds. To obtain this sugar there would be needed at least 2,000,000 acres of land if the yield be 10 tons to the acre, and beets sell for $4 per ton. The money for these roots represents the enormous sum of $80,000,000 that would be put into circulation among our farming population.

If we admit that farmers receive gratuitously 50 per cent in weight of beets furnished by the residuum pulp as it leaves the process, this would be sufficient to feed not less than 2,000,000 head of cattle during the three winter months when fodders are the most expensive. If we admit two pounds increase per head and diem, then would result 400,000,000 pounds meat obtained from a product that is now receiving only a limited attention.

If the entire residuum should find utilization in the United States when the industry exits fully, there would be not less that 550,000,000 pounds meat obtained at a minimum cost.

To make this matter thoroughly clear from a farmer's standpoint, we can suppose that 10 acres of land yield 100 tons of beets, which are sold at the factory for $400. In return he gets for nothing 50 tons, or 112,000 pounds, residuum pulp. We may admit that the ration consists of about 100 pounds pulp (combined with other products) per diem for 100 days; the consumption per head would be 10,000 pounds pulp, or sufficient for 11 beeves. If the rate of increase is 2 pounds per head per diem, during the time of feeding, the total increase is 2,200 pounds. If the farmer clears 4 cents per pound on his meat he has 88 additional dollars that his land yields him. The resulting manure from this feeding is an item of considerable importance, not to be overlooked.

According to Willett & Gray, the entire consumption of sugar in the United States during 1894 was 2,024,648 tons, i. e., 265,500 tons domestic cane sugar, 20.000 tons domestic beet sugar, 300 tons sorghum sugar, 5,000 tons maple sugar, 15,000 tons domestic manufactured molasses sugar, or 305,800 tons of home-made product, to which must be added 1,554,528 tons of foreign cane sugar, 159,796 tons foreign beet sugar, and 14,524 tons foreign refined sugar, or a total for foreign product of 1,718,848 tons.

Experiments in feeding inferior and superior beets to sheep have shown that there are many advantages to be gained by using roots of high saccharine percentage.

In the manufacture of alcohol, either from beets or beet molasses, there is always a residuum which may be used for the manufacture of potassa, or as a fertilizer. The product left over is known is vinasse, and contains about 12·8 per cent potassa, 3·7 nitrogen, 0·1 per cent phosphoric acid, and 0·1 per cent lime. For beet soils this may be used in quantities corresponding to 7 tons to the acre.

From the official data respecting the sugar campaign for 1893-94 in Germany, we glean some interesting figures; 405 factories were working, and there were 966,200 acres planted in beets. The total weight of beets worked at factories was 10,644,300 tons, giving an average per factory of about 26,000 tons. The average sugar campaign was only 78 days. The total sugar production was 1,319,000 tons, corresponding to an extraction of 12·36 per cent. If we include the sugar extracted from molasses, the extraction becomes nearly 13 per cent. The exportation of home-made sugars was 728,000 tons. The consumption of sugar remains about the same from year to year, and is nearly 600,000 tons.

The returns from an acre of beets in Germany are $40, while from wheat and other cereals only $20.

The total area devoted to beets in the empire during 1893-94 was 966,000 acres. The average yield of beets to the acre was nearly 11 tons. To produce 100 pounds

sugar (with the product from molasses) required 806 pounds beets.

In molasses distillation the sugar is changed into glucose, then into alcohol and carbonic acid; and there is a final residuum, which may be used as a fertilizer or for potassa manufacture.

If Congress would pass a bill allowing residuum beet molasses to be distilled free of taxation, it would in a measure compensate for the withdrawal of bounty on sugar. If this distilling of molasses is carried on in connection with sugar making, it may be said that the profits thereon would go considerably toward the cost of working beets into sugar. At present we may admit that $2.50 to $3 represents the labor and interest on plant per ton of beets worked into sugar. From a ton of beets there remains nearly 100 pounds molasses, from which may be exhausted 3 gallons of pure alcohol. The sale of it, even at $2 a gallon, would leave a margin of profit certainly not less than $2.

One acre of beets at Ames, Nebraska, may be said to cost as follows from data of practical experience on the field:

Manuring $2.20, plowing $2, seed $2, seeding $0·30, harrowing $0·50, rolling $0·31, 1st hoeing $1.44, bunching $2.12, thinning $3.72, 2d hoeing $5.25, 3d hoeing $4.81, 4th hoeing $2.91, cultivating $1.82, sundry expenses, time-keeping, killing bugs, etc., $0·77, giving a total cost for "laying by" of $30.16. To this sum must be added $4 harvesting, $2 plowing out, $2.13 hauling and loading, or a total cost of $38 29. As the yield was 10 tons to the acre, the beets cost the farmer, even under the most careful cultivation, $3.83. If the yield had been as during 1893, then the cost per ton would have been only $2.56.

Some interesting information respecting the working of the Norfolk beet sugar factory is published in the News: "Out of 27,551 tons of beets raised, the company manufactured 5,556,100 pounds fine granulated sugar. To make this, 443 car loads coal were consumed, 225 car loads lime rock, and 33 car loads coke. During the three months the machinery was in operation 2,400 gallons of oil and 1,000 pounds grease were used to keep the machinery in running order; . . . 300 men were employed."

In a speech by Senator Charles F. Manderson, of Nebraska, he says:

"Ten acres of land in Nebraska, Kansas, or Dakota devoted to the cultivation of wheat, corn, or potatoes, would lead to starvation rather than life. But in Nebraska, from same acreage, 220 tons of beets were sold at $4.05 per ton, amounting to $901. The total expenditure was $287.20, leaving a net profit of $61.30 per acre.

"This is a peculiar crop. It cannot be raised in a slovenly fashion. It means work; it means intelligent, painstaking labor. It requires a much higher order of intelligence to grow beets than it does for wheat or corn. Every acre planted in beets means twenty days labor for one man. If 2,000,000 acres of land are needed to supply this country with sugar, it follows that 40,000,000 days' labor could thus be given to the laborers of the United States. It would also mean the transportation of 26,000,000 pounds freight for the industry."

The Beautiful Star Figure in Gemini.

In the early evening sky in the west now [May 23] may be seen one of the wonders of astronomy. Three of the visible six planets of our system are bunched in the constellation Gemini.

Begin with big blazing Venus; thence down westward is Jupiter, of diminished and diminishing glory as he approaches his conjunction with the sun. Above Venus and to the left, farther away from her than Jupiter is, is the red planet Mars, also nearing his conjunction, and greatly diminished from his normal splendor. Above these three are the fixed stars Castor and Pollux in the heads of the Twins. The five make the figure of a dipper with the handle hung down; and of the five Castor and Pollux are the only ones whose places on the blue vault are permanent.

There is not among all the stars a more beautiful figure than this. Apparently as permanent as any of them, it is really as evanescent as the morning dew. Never seen before, except perhaps in eternal ages past, it will never appear again except perhaps in ages yet to come. Its memory will be preserved in the annals of astronomy as one of the wonders of 1895. Let us name it the Planetary Dipper, or the Dipper of Venus.

Observe the nightly changes in this figure. It will distort, dissolve, and its component parts soon fade and disappear in the twilight of the eastward traveling sun. At the last of June the sun will have advanced to Gemini, to near where Jupiter is now.

Another of the visible six planets is up in the early evening now, eastward, about the beginning of Libra, and near the feet of Virgo; Cancer, Leo, and Virgo of the zodiac alone intervening between it and its friends in Gemini. It is Saturn, the ringed planet, twice as far outward from us as is Jupiter, and almost in fact the outermost visible planet; for Uranus, next outside of him, is hard for an amateur to identify even with the aid of a telescope. The next and last outside, Neptune, is not visible at all except through a telescope.

But one other planet is now to be accounted for, fleet Mercury, occasionally visible low down in the west or the east flitting past the sun on his little orbit, always white, bright, and pretty.—R. W. Musser, Ashville, N. C., Citizen.

Photo Hints.

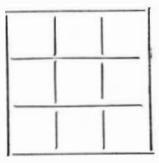
RICHARD PENLAKE.

This does not pretend to be an article which devotes itself entirely to one given subject. It is a mixture; it embraces simple rules of composition and simple methods of manipulation whereby certain effects can be obtained, and divers other little points which may prove of value to those just starting on the sea of photography, as well as those who are within sight of port.

We will suppose that the camera has been purchased and the artist is ready and eager for the fray. Every one knows how easy photography appears to be to those who have not mastered the art. You simply take off the cap, or pull the string, put the plate in developing salts, and in the words of the song, "There's a picture for you." But, alas for young hopes! there generally is no picture at all. If development has been satisfactory and exposure correct, there are the hundred and one rocks of lighting, composition, etc., upon which the poor amateur may be cast away.

The simplest branch of study is landscape. Some are contented to take landscapes haphazard as they find them, while others walk about and select a point of view most likely to produce a pleasing picture. A building or some like structure which has sufficient pictorial element in its composition should be included, but a great fault is that of trying to get too much on one plate. Pictures should not appear crowded.

Never take a view with the sun directly opposite the camera, for if this is done the plate will be hopelessly fogged and consequently rendered useless. The sun should occupy a position over one of the shoulders, and the artist should stand to obtain as much side light as possible. In this manner a harmonious blending of light and shade will be obtained, whereas if the sun were shining directly on the subject the result would lack contrast and be void of pluck and brilliancy. The chief mass of a picture should rarely occupy the center, but should have a position a little to one side. A good plan is to mark the focusing screen in the manner shown in the diagram. Nine squares



will thus be formed. The center square is the weakest point, and the points where the two lines intersect are the strongest. The horizon line should rarely, if ever, run across the exact center of the plate, but should be about one-third from the top or bottom, the upper for views taken from a height, the lower for ordinary landscapes. There are, however, exceptions to this rule.

For the sake of variety a building should never be taken "full on," but at an angle. Plant the camera slightly at one side, much better effects are obtained. Be careful not to have any prominent object, other than the principal one, to distract the attention. The interest should be centered on the principal object.

Never stand in the middle of a street when photographing it, but slightly on one side. It looks better. As often as possible select an interesting foreground, as a bad one spoils an otherwise good picture. H. P. Robinson, one of our celebrated landscape photographers, says:

"In the selection of a view great attention should be paid to the foreground. . . . The foreground is of so much importance, that I do not hesitate to say that if a view is not well fitted in this respect, it can never be an effective picture. A landscape photograph seems to require a good foreground more than any other kind of picture." It is a matter for wonder, since a photographer is deprived of the use of color in his work, that he does not turn his attention with greater earnestness to design and arrangement. Some do so and with good effect.

We were shown in these pages a short time ago what great changes could be effected in the way of cutting and mounting. Much good work is undoubtedly sacrificed by an inch too much at top or bottom, on one or the other side. Many subjects that spread over the full area of the plate are tame, uninteresting, and may be improved by cutting down. The difficulties of judging the proportions best suited to the subject are great, and require careful thought and consideration. How charming some of those long, narrow pictures are, which, if printed full size, would be pictorially worthless.

Be careful when focusing to get the minutest details. If the view be a church, focus the clock or leaded windows, if a house, the window curtains or bricks, in a portrait, the eyes.

Many amateurs make a start by attempting portraiture. This is unwise, as successful landscape work should be mastered before attempting this difficult branch. To accomplish portraiture equal in style to a professional, special lenses, various arrangements of light and shade, besides many years of apprenticeship, are necessary. A few hints will, however, enable a beginner to turn out passable work.

When taking a vignette, or bust portrait, always get the mouth in the center of the plate; by observing this rule, you will have the satisfaction of knowing the head is in a proper position on the plate, and not slipping off at the top or bottom. A vignette should not be taken before a background composed of a brick wall or leaves. The result gives a very curious patchy effect. Good makeshift backgrounds may be made of brown paper, or a blanket, that commonly known as the "workhouse" pattern; at a pinch, a newspaper can be placed a short distance behind the sitter. The reading matter will, of course, be considerably out of focus, thus producing a gray effect in the finished print. Those who require a really serviceable article should buy a plain cloth washable background, costing about three shillings. Always bear in mind that one side of the face is better looking than the other, usually the left side, except in the case of left-handed people, when the right side generally takes best. Carefully observe this when taking what is known as the "three-quarter" face.

When taking a "full face," notice which way the nose bends, as no nose is really straight, and pose accordingly. Let the sitter be at ease and secure as much individuality as possible. Have the camera on a level with the face. If the lens points downward the forehead is exaggerated, if upward, the chin. Use the longest focus lens possible, as a wide angle lens distorts portraits fearfully.

When taking full or three-quarter length portraits, don't mix them; let them be either one or the other. Many are taken with the feet cut off just at or above the ankles. In which of the two poses should these be classed? A proper three-quarter length should be taken to the knees, the top line marked on the screen (as mentioned at the beginning of the article) running across the eyes. For a full length portrait allow a little foreground, so as to give the figure something to stand on.

Figure studies and genre work should be encouraged. This particular branch necessitates extra skill, but the results amply repay for extra time and trouble. —Junior Photographer.

American Association for the Advancement of Science.

For five years in succession efforts have been made to secure the annual meeting of the A. A. A. S., and its numerous affiliated societies, at San Francisco, or some other point on the Pacific coast. The most alluring offers have been made by the Calfornians, and it was confidently hoped that they could this year be available. The difficulty is to obtain proper concessions from the railroad companies. Hence the meeting for 1895 will be in some Eastern city, and Springfield, Mass., is now announced as the favored place.

The official time will be from August 26 to September 6 inclusive. The first general public session will be held on Thursday, August 29. Friday, Monday, Tuesday and Wednesday will be wholly given up to scientific discussions. Saturday will be devoted to excursions that have been planned for visiting points of interest in the vicinity.

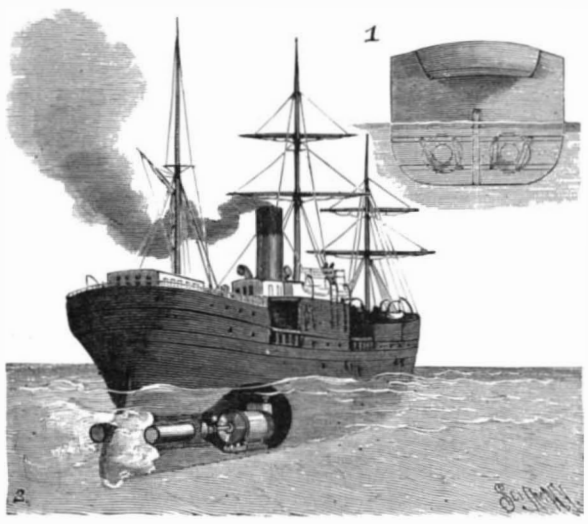
The hotel headquarters will be at the Worthy. The president's address will be given in Court Square Theater; other evening addresses and receptions will be in the City Hall. The general sessions and section meetings will be in the Y. M. C. A. Hall. Other buildings are also at the disposal of the association, and everything will be done by the citizens of Springfield to make the convention successful.

Further information can be had from Prof. F. W. Putnam, the permanent secretary, Salem, Mass., or from Prof. William Webster, local secretary, Springfield, Mass. A preliminary pamphlet can be had on application, describing excursions, giving hotel rates and other useful particulars.

We have long had slag paint and pavement, but the latest is a slag brick chimney. According to L'Industrie this plan was adopted by the Courrieres and Ortricourt companies, and their example is followed by the works of Arbel and Douai. The latter establishment planned a chimney 164 feet high and to weigh but 379 gross tons, about half the weight of a brick chimney of the same dimensions. A special cement was to be used which would bind together the blocks composing the chimney so firmly as to require no chain or iron band for strengthening. This is an interesting application of a cheap industrial by-product, which, should the experiments prove a success, will be appreciated by metallurgists.

A CYLINDRICAL PROPELLER.

Two propellers are preferably employed, according to this improvement, one at each side of the keel, the propeller having the same weight as the water to be displaced, and being forced outward by steam power and returned by the pressure of the water in its rear. A patent has been issued for the invention to Mr. Lorenzo Julia y Puig, a captain in the Spanish merchant marine, of Barcelona, Spain. The propeller is a hollow cylinder, moving in a stuffing box through openings at each side of, and so as not to interfere with, the rudder, the major portion of the propeller when in its inner position being exposed and accessible from the

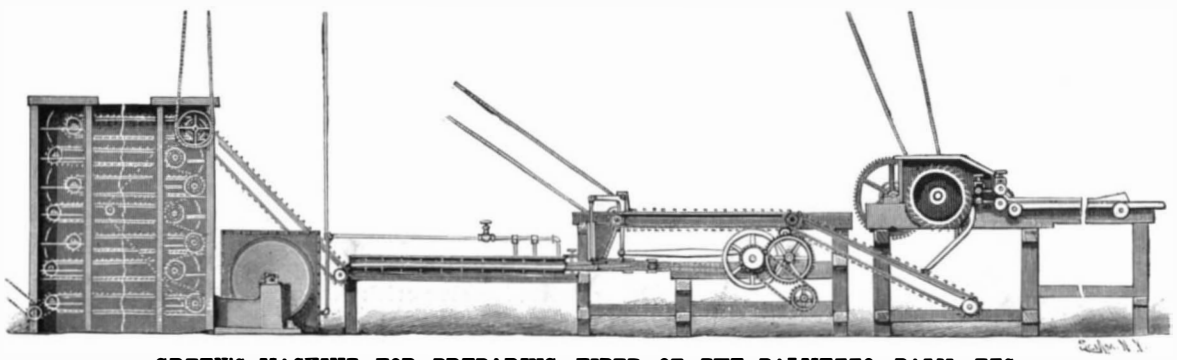


PUIG'S PROPELLER.

interior of the vessel. In front of each stuffing box is a steam cylinder, the piston head and propeller being connected by a rod, and steam being admitted only to the front of the piston head to force the propeller outward. The small figure represents the vessel's hull fitted with strengthening plates or bars to receive the propeller. The propeller is designed to have a very easy motion, with no tendency either to rise or lower, thus reducing the friction to a minimum, and all of the propelling mechanism is so located as to be readily accessible in case repairs are needed.

A CONTINUOUS PROCESS FIBER MACHINE.

To convert into commercial fiber or excelsior the leaves and stems of palmetto and palm trees and similar growths, by a continuous process, the machine shown in the accompanying illustration has been invented by Mr. Charles A. Green, and is being introduced by Mr. Eugene C. Dearborn, of Cocoanut Grove, Biscayne Bay, Fla. It is designed that the crude leaves fed into the machine from the feed table at the right shall emerge in the form of marketable fiber, shredded, crimped, and ready for use, the refuse material being discarded during the process. The leaves are first passed between adjustable crushing rolls, being straightened out by guides and novel devices being provided to prevent clogging, and from thence, by means of clutch rolls, they are fed to a beater cylinder having inclined teeth arranged in double spiral line around the cylinder, by which the fiber is longitudinally shredded. A slatted carrier then conveys the shredded leaves over an open structure, where trash and short fiber may fall through, to a hopper, across the bottom of which slides a plunger adapted at each stroke to double a portion of the fiber and deliver it to another plunger, on which are arranged prongs adapted to crimp the fiber and deliver it to a steam box, the fiber being also subjected in the process to an adjustable squeezing pressure in its crimped position. There are several steam chambers around the steam box, and the mass of fiber is held in the box in a series of compact folds, issuing thence in the form of a web upon an elevator to be conveyed to the upper part of a drier.



GREEN'S MACHINE FOR PREPARING FIBER OF THE PALMETTO, PALM, ETC.

In the drier is a series of carriers, all driven by a single chain belt, over which the fiber is continuously conveyed until it reaches the point of discharge at the lower rear end of the machine, from which it may be delivered to any preferred style of baling apparatus. The heating of the drier is preferably accomplished by steam pipes in connection with a blower and heater, arranged as shown under the elevator belt.

Iron Notes.

At a recent meeting of the Iron and Steel Institute, London, Mr. Arthur Cooper read a paper on "Metal Mixers," as used at the Northeastern Steel Company's works. A mixer was erected of 150 tons capacity. Instead of a hydraulic cylinder fixed underneath the vessel, as at Hœrde, the plan designed by the Northeastern Steel Company for tipping provided for fixing the hydraulic cylinder overhead, the piston rod of which is attached to a crosshead coupled up to each side of the back end of the mixer by long links. This arrangement was devised because it was considered to be safer in case of a break-out than the hydraulic cylinder placed underneath.

The early experiments were so encouraging that an additional mixer was at once erected, the same in every respect as the first one, so that with two vessels the lining of one could be repaired while the other was working, and in order to save labor and time in discharging the ladles into the mixer, a small pair of engines and shafting were fixed on the wall at the back of the two vessels, by means of which, and an endless rope of spun yarn placed upon a grooved pulley on the ladle gearing, a ladle containing about fourteen tons of molten iron is tipped in less than one minute.

From the beginning of May, 1893, the whole of the molten iron used, consisting of about 2,000 tons of blast furnace iron and 1,800 to 2,000 tons of cupola iron each week, has passed through one or other of the two vessels, and the results have fully justified the company's expectations. It must not be for one moment thought that a mixer will cure all the ills which beset a steelmaker; that by its use inferior and unsuitable iron can be made into good steel at a reduced cost. Such is not by any means the case. If very gray or very common white iron be admitted, it is almost certain that several casts of inferior steel will follow. It must also be remembered that there are certain charges to be defrayed, such as royalty, labor, maintenance of plant and tools, and haulage of molten metal, which together amount to a considerable item per ton of finished product. Still, notwithstanding this, there are certain great advantages to be derived from the use of mixers, for if ordinary care be taken to exclude extremes, i. e., iron which is too gray or too white, as would be done if the iron were taken direct to the converters, very regular results can be obtained from blast furnace iron alone; but if into this is poured, at regular intervals, about equal quantities of cupola iron melted from carefully mixed pig, such as is done at the works in question, a converter metal can be maintained of an almost uniform composition, far more uniform than when the iron is used direct from the cupolas, and, provided the manganese in the iron in the mixer does not fall below one per cent, a considerable reduction in the sulphur is effected. Again, with a reserve of molten iron always available, the converting plant can be run to better advantage than when it has to depend upon the cupola or blast furnace. Lastly, by use of the methods above described, the weight of each individual charge from the mixer can be controlled within a few hundred weights with far greater certainty than is practicable when each charge is tapped separately from a blast furnace or cupola, and thus, with an almost absolutely constant weight of charge in the converter, carburizing can be effected with much greater precision.

Mr. David Evans said it was only fair to say that the first mixer capable of dealing with large quantities of metals was designed and erected by his friend the late Captain W. R. Jones, the general superintendent of Messrs. Carnegie's works. At his visit to England, in 1888, he pointed out the great advantages they were deriving at Messrs. Carnegie's works by the adoption of them. At Eston they had two metal mixers of similar design and of like capacity to those of the Northeastern, the only difference being that they used the ram below.

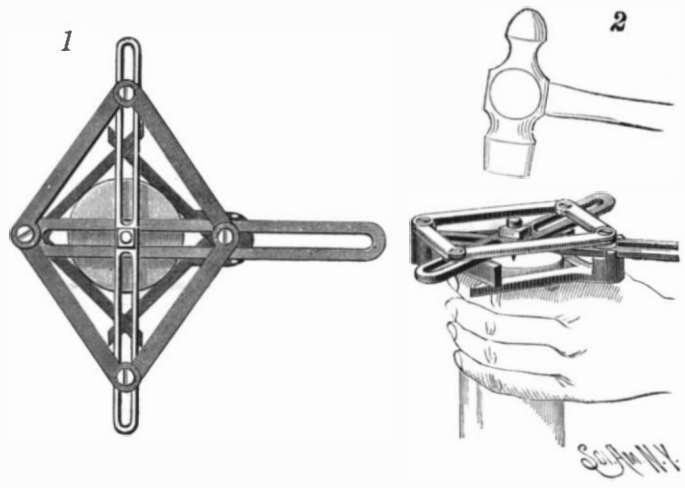
One of the greatest advantages derived from the use of the mixers was that the carbon and manganese were more uniform. There were also a large number of mixers in use on the Continent which were giving satisfactory results.

Mr. Andrew Carnegie said that at his works they were now prepared to put up a mixer containing 600 tons instead of one of 200 tons.

Mr. E. Windsor Richards explained why Mr. Carnegie wanted a large mixer. He was at Mr. Carnegie's works in October last, and saw a furnace tapped, and there were twelve ladles all in a row, and they carried 10 tons each, and he saw 120 tons put at once into these ladles. There were nine blast furnaces at the Edgar Thomson works, and the week that he was there they made 18,500 tons of iron—one of those furnaces being spiegeleisen and the other ferromanganese—so that with seven furnaces he was making 17,600 tons a week of hematite iron. It would be readily understood, therefore, that this 150 ton mixer was very much too small for Mr. Carnegie's works. Since he was there Mr. Carnegie had even put in larger furnaces than before—15 tons each. When he was there they turned out from one mill 8,000 tons of rails. He sat down in the mill and watched them working, and was perfectly satisfied that the figures he was given were correct. Another astonishing figure—they would scarcely believe it, but it was a fact nevertheless—was that during the month he was there, Mr. Carnegie made at his Edgar Thomson works and the Ducane works and the Homestead works 128,000 tons of ingots.

A DEVICE FOR CENTERING WORK.

An extremely simple device, whereby a workman may quickly and accurately mark with a punch the center in the end of any work in hand, is shown in the accompanying illustration. The improvement has been patented by Mr. Michael Kolb, of No. 143 Willis Avenue, New York City. Fig. 1 represents the device in plan view and Fig. 2 illustrates the facility with which it may be employed. As will be seen, the device consists of a longitudinal slotted bar carrying two oppositely arranged gage arms, one of which is movable, while both are adapted to peripherally engage



KOLB'S CENTERING DEVICE.

the work at opposite sides. A transverse bar carries the centering punch, and a quadrilateral link frame pivotally connected with the gage arms has a sliding connection with the transverse bar, whereby the centering punch will always be moved in the center of the gage arms.

Paper Sails.

The Marine Record says: An innovation in yachting circles is now being talked of, nothing less than sails made of compressed paper, the sheets being cemented and riveted together in such way as to form a smooth and strong seam. It appears that the first process of manufacturing consists in preparing the pulp in the regular way, to a ton of which is added 1 pound of bichromate of potash, 25 pounds of glue, 32 pounds of alum, 1½ pounds of soluble glass, and 40 pounds of prime tallow, these ingredients being thoroughly mixed with the pulp. Next, the pulp is made into sheets by regular paper-making machinery, and two sheets are pressed together with a glutinous compound between, so as to retain the pieces firmly, making the whole practically homogeneous.

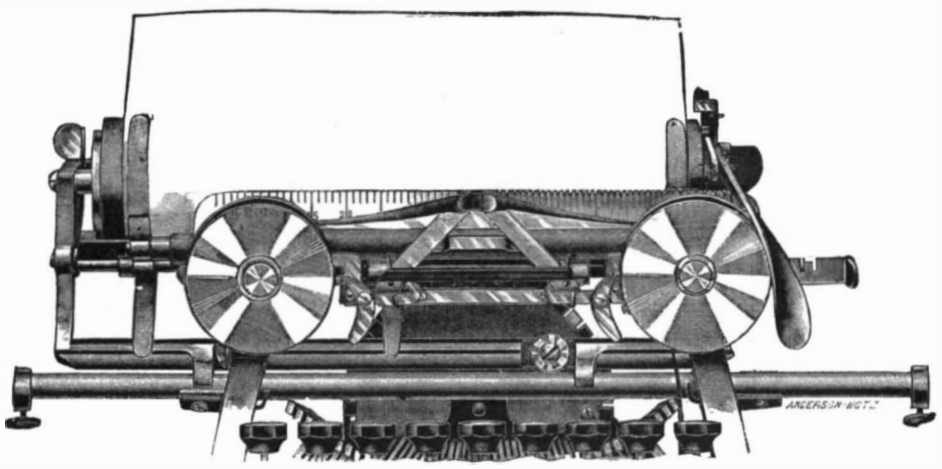
The next operation is quite important and requires a specially built machine of great power, which is used in compressing the paper from a thick, sticky sheet to a very thin, tough one. The now solid sheet is run through a bath of sulphuric acid to which 10 per cent of distilled water has been added, from which it emerges to pass between glass rollers, then through a bath of ammonia, then clear water, and finally through felt rollers, after which it is dried and polished between heated metal cylinders. The paper resulting from this process is in sheets of ordinary width and thickness of cotton duck, it is elastic, airtight, durable, light, and possessed of other needed qualifications to make it available for light sail making.

The mode of putting the sheets together is by having a split on the edges of the sheet or cloth so as to admit the edge of the other sheet. When the split is closed, cemented, and riveted or sewed, it closes completely and firmly.

THE "DAUGHERTY VISIBLE" TYPEWRITER.

We illustrate in our present issue the "Daugherty Visible" typewriter, a machine which in many ways upholds the makers' claim that it is unique. The disposition of the type with upturned faces, so that they are perfectly accessible for cleaning, the arrangement of roller and carriage by which the writing can be seen by the operator, the very characteristically soft and light touch of the keys, and the minor details which cannot be described within our limits, mark as many innovations on the mechanism of the ordinary class of typewriters.

The general appearance of the machine is shown in the two general views, in which the paper is shown in position for receiving the impression of the type. In front is the regular keyboard, comprising the letter bars, the spacing bar and upper case bars. Immediately back of the keyboard come the type bars, arranged nearly in the segment of a horizontal cylinder, thus departing from the familiar basket arrangement which has been so very much used.

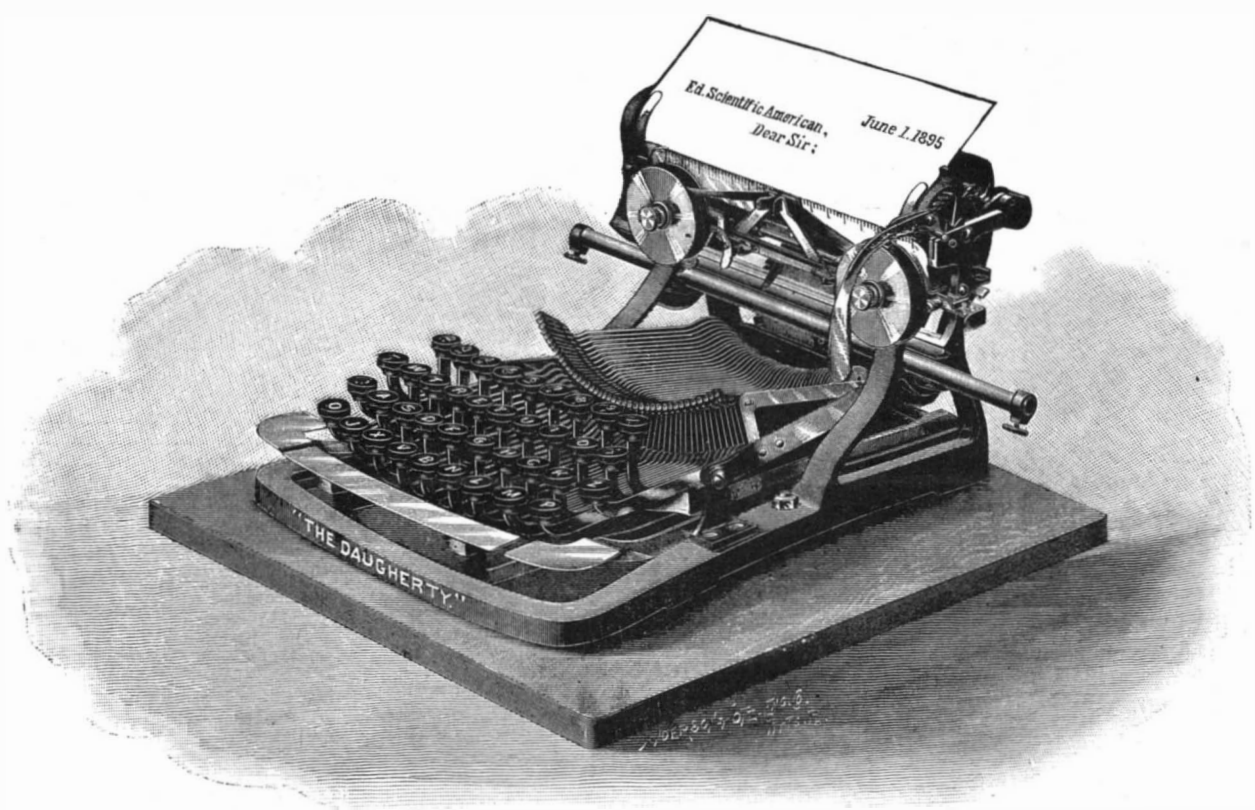


THE DAUGHERTY TYPEWRITER—FRONT VIEW OF TOP OF MACHINE.

When depressing a key, the type bar is depressed at its back end, and the type, which occupy the ends of the bars nearest the operator, flies up and, striking the inking ribbon, imprints the letter on the paper. With each motion of the key a type is thrown against the ribbon and the ribbon is independently pressed against the paper before the type strikes it, and as the key is released, the ribbon drops back. One of the all-important points of the machine is that the writing is visible; the line being written comes just above the metal scale. The motion of the keys is somewhat peculiar. They are very flexible and the touch is very easy. The center keys move vertically up and down. The lateral keys when depressed move down and a little outward, this peculiar motion tending to give much relief to the operator.

From its construction it seems to be the acme of simplicity, as its operative parts number but 105, while in other typewriters as many as 500 or more pieces are employed. In addition to the general view we present illustrations of some of the parts. Fig. 1 of these views shows the frame of the machine with the printer roller and carriage removed as well as the keyboard and type bar. The two circular segments of wire which run across the base give the line of the letter bars, as the latter rest on these wires. In front is seen the spacing bar, extending nearly across the front, while on each side thereof are the upper case bars. The latter, when depressed, cause upper case or capital letters to be imprinted.

In the back are seen the two inking ribbon rollers, and in the center of the ribbon is the space left free for the type to strike. This space represents a species of mortise with inclined sides that direct the type to its place and secure perfect alignment. More toward the front are seen two short upright standards. Screws or pins passing through the holes in these standards hold the keyboard in place.



THE "DAUGHERTY VISIBLE" TYPEWRITER.

Fig. 2 shows the keyboard and type bars, all of which come out as shown in one part. The removal involves not the least trouble, being only the work of a minute. It is obvious that this gives great facility for cleaning or getting at any trouble that may exist.

When in the machine, the type lie exactly as shown in Fig. 2, so that their faces are exposed for cleaning. The ready accessibility of the type cannot be too strongly emphasized.

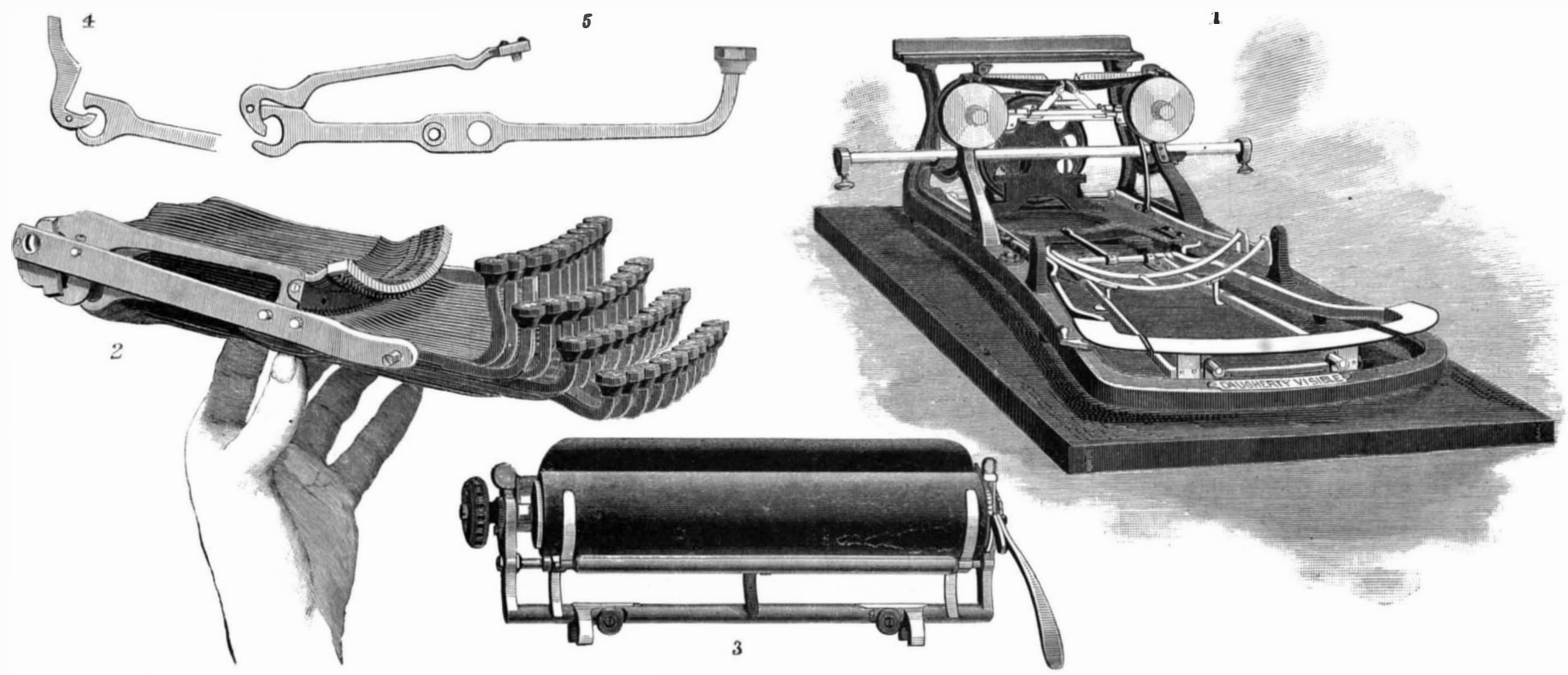
Fig. 3 shows the roller and carriage. This part also is easily removed. By simply pushing it to one side it all comes away as shown. When carriage, type and keyboard are taken out, the machine is stripped for the fullest inspection and cleaning. Fig. 1 shows how complete is the exposure of all details by the procedure described.

The operation of the type bars is peculiar and is represented in Figs. 4 and 5. The key lever pivoted not far from its center has a species of forked end; when a lever is depressed, the upper end of the fork first presses against the type bar and raises it somewhat slowly; after the type bar has reached a certain elevation, the upper point of the fork loses engagement with the type bar while the lower point catches it at a greatly reduced leverage and sends it in very rapidly against the type ribbon. In this way the desirable feature is secured that the type bar begins to rise slowly and terminates its motion at high speed.

There are many other ingenious features about the machine which cannot be well condensed within the space at our disposal. The easy removal of the entire type action is specially to be commended, as this makes it possible to remove the action in case any of the type are broken and to replace it temporarily by a new one until the old has been repaired. The same is to be said of the carriage, which is instantly removable. All the parts are interchangeable and a very slight inspection is sufficient to show that it really has no light or delicate parts to be injured by the hard service to which a typewriter is necessarily subjected.

It is obvious that where the entire writing can be seen, as in the "Daugherty Visible," great facility in executing tabular or specially spaced work is given. It is a fair assumption that any operator who has become accustomed to see the work would find it very disagreeable to work in the dark, as is done with the ordinary machine.

This new machine is being introduced by the Daugherty Typewriter Company of 21 Sixth Street, Pittsburg, Pa.



THE DAUGHERTY TYPEWRITER—PRINCIPAL PARTS.

Rhododendrons.

The Garden (London) considers the rhododendron the "queen of flowering shrubs." After naming a number of the choicest varieties, but which do not endure the winter climate well, the writer adds:

To those who may be interested in procuring a few of the very grandest varieties of hardy rhododendrons—whether old or new—in cultivation, and who do not care to wade through nurserymen's bewildering catalogues, I would suggest a trial of the following twenty kinds as almost certain to give satisfaction in their respective colors if properly planted and attended to. If the former is well done, they do not require much of the latter, beyond well watering and syringing just when they are coming into bloom. Baroness L. De Rothschild, superb conical truss, brilliant scarlet, with lighter throat; Mrs. John Penn, salmon pink edges, with waxy cream center; Helen Waterer, white center, with most brilliant scarlet edge; Kate Waterer, rose crimson, with yellow center; Lady Eleanor Cathcart, salmon pink, finely marked, very beautiful, but shy bloomer; Mrs. R. S. Holford, superb truss, salmon pink; H. W. Sargent, dark velvety crimson; James Mackintosh, rich velvety crimson, fine truss, and splendid foliage; Michael Waterer, an old favorite, bright scarlet, rather poor foliage; Marchioness of Lansdowne, light red, intense maroon blotch, very fine flower; Marie Stuart, lovely shade of rose lilac, with intense purple blotch, splendid truss and habit, flowers as beautiful as an orchid; the Queen, one of the most beautiful whites; Lady Gray Egerton, pearly white, magnificent truss; Sir T. Sebright, metallic bronzy purple, free and long bloomer; Joseph Whitworth, dark maroon, beautiful flower and foliage; Martin Hope Sutton, brilliant dark scarlet—if perfectly hardy, one of the finest in cultivation; James Marshall Brooks, scarlet, with a curious mossy bronze eye; Broughton (or Lord Palmerston), very similar, but not synonymous, grand trusses, bright pink, fine foliage; Frederick Waterer (or John Walter), different habit and foliage, but very similar flowers, bright scarlet, perfect trusses; Sigismund Rucker, rich magenta crimson, with a black intense blotch.

It would be easy to add twenty more almost as good as the foregoing, but it would be hard to name twenty better. When varieties such as those enumerated cost very little more than the ordinary ponticum, it is strange that they are not more extensively planted.

Potash Soft Soap.

Potash soft soap for engineer's lubricating purposes may be made as follows: Take 20 pounds of absolutely pure, fine, strong caustic potash, dissolve it in an iron or earthenware vessel, with 2 gallons of soft water. Add this strong lye to 9 gallons of oil, heated to about 140° F., pouring it in a small stream and stirring continually until the two are combined and smooth in appearance—about ten minutes is necessary. The mixing may be done in a wooden barrel. Wrap it up in blankets to keep in the heat that is generated by the mixture itself slowly combining and turning into soap. Put it in a warm room and leave it for three days. The result will be 120 pounds of the finest concentrated potash soft soap, pure, and free from adulteration. Any vegetable or animal oil will do. Pale seal oil for wire drawing and lubricating is the best. For ordinary washing, when made with cottonseed oil, the soap is both cheap and good, and, besides being useful for machinery purposes, produces a very superior soap for flannels and greasy or stained woolens in cold water.—Textile Industries.

New Machine Guns Wanted.

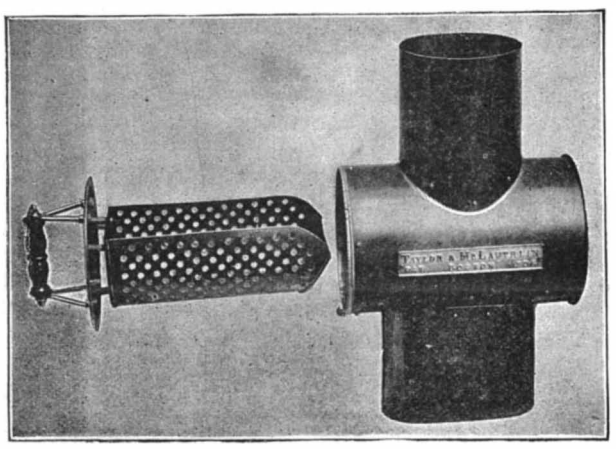
The Chief of the Bureau of Ordnance will shortly issue invitations to companies or individuals to submit machine guns of 6 millimeter caliber to a test, with a view to their adoption in the navy. It is probable that the first order of the bureau will be for 100 guns. An American invention will of course be preferred, but the best gun will be selected without reference to where it is made. Only guns using smokeless powder and jacketed bullets will be used. Ten thousand rounds of ammunition must be supplied. Great attention will be paid to the facility of dismounting and assembling the mechanism, and to the liability of the gun being injured by dust and rust. The guns will be fired for rapidity without aiming with ordinary and extreme elevations and depressions. Rapidity and accuracy of aiming will be tested by target firing at moderate ranges. Excessive pressure tests will also be made. It is expected the Driggs-Schroeder, Hotchkiss, Gatling, Gardner, Maxim and Robertson guns will enter the contest.

How to Drive Rats Away Alive.

Somebody who has tried it recommends putting pulverized potash, which soon becomes sticky when exposed to the air, in all the rat holes about the house. The special detestation of a rat is anything which will stick to his silky coat. Some persons find a mixture of equal parts of Cayenne pepper and Scotch snuff sprinkled well into the holes still more efficacious.

KITCHEN REFUSE READILY DISPOSED OF.

One of the most serious of the sanitary problems in all our large cities is that of the practical and economical disposal of garbage, or refuse and waste of the kitchen. Its removal by the local authorities is expensive and frequently the cause of much vexation and annoyance, although the necessity that it be promptly disposed of is everywhere recognized as imperative, in the interest of the public health, to which there is nothing more inimical than a quick decay of organic matter in warm weather. To obviate this difficulty and provide for the complete removal of all garbage in a most simple and inexpensive manner, is the object of the improvement represented in the accompanying illustration, and which is being introduced by the Sanitary Construction Company, of No. 113 Devonshire Street, Boston, Mass. The carbonizer consists of a horizontal cylinder about one-third larger in diameter than the stovepipe in which it is to be placed, according to convenience, in a joint or an elbow of the pipe making the connection between the stove and the chimney. It may be applied to any stove or furnace and any size of pipe. One end of the cylinder is removable, and attached thereto is a basket or scoop of somewhat reduced diameter, and with perforated sides and a tight bottom, affording free passage for the smoke and heat from the stove around the scoop and through the perforations. When this scoop or basket is filled with garbage and placed in the cylinder, the water is quickly driven off, and the residuum changed to charcoal, which burns freely when placed in the fire, affording in fact a valuable material for kindling the fire in the morning. The natural draught up the chimney prevents the escape of any odor into the rooms, and there is no odor from the chimney, as the gases from the stove thoroughly deodorize the gases escaping from the drying garbage. It is intended that the waste shall be placed in the carbonizer as it is made, so that there will be no accumulating garbage in the kitchen and no need of a garbage bucket. The device has been



A HOUSEHOLD GARBAGE CARBONIZER.

highly recommended by the chairman of the Boston Health Board and other sanitary and street cleaning officials. Many of them are in use in Boston and vicinity.

The Bordeaux Mixture.

The history of the cupreous solution popularly known as Bordeaux mixture is brief, but of much interest, more especially as it contains conclusive evidence that, as in the case of some other discoveries of great economic importance, this fungicide is the result of an accident. It is a matter of some interest to know that it was first used in the vineyards of the Medoc, not as now for the purpose of preventing or checking the ravages of fungoid diseases to which the grapevine is liable, but for the purpose of preventing the grapes being stolen. A thick paste was made with lime and sulphate of copper, and this was sprinkled upon the vines and trellises alongside the highways. There is no authentic information with regard to the length of time the practice had obtained previous to Professor Millardet visiting the region in 1882, but we know that when engaged in his investigations in the Medoc vineyards in that year, he was informed by the owners that the vines over which the paste was scattered escaped the ravages of the mildew.

Taking note of this fact, Professor Millardet, who had for several years been engaged in investigating the fungus, with a view to discover a remedy, conducted a series of experiments in 1883 with a similar preparation, and although the results were not satisfactory, he repeated them on a larger scale in 1884. These proved more encouraging, and at the end of the year the results were communicated to the Agricultural Society of the Gironde, and as the French vineyards were being seriously injured by mildew, the communication created much interest, and a considerable number of viticulturists at once instituted experiments with the mixture. Subsequently various formulas for its preparation were published, the proportion of copper sulphate recommended ranging from 13·2 pounds to 2·2 pounds to 22 gallons of water, but Professors Millardet and Gayon found in the course of their investigations in 1888 that the mixture in which the sulphate of copper was used at the rate of 2·2 pounds gave nearly, if not quite, as good results as one of much greater strength. While to the French is unquestionably due the honor of discovery of this important fungicide, the credit of extending its use as a preventive of diseases other than those of the grapevine and potato plant belongs to American investigators.

The use of Bordeaux mixture has extended in America at a very rapid rate, and although it has not been found a panacea for all the fungoid diseases of plants, it has proved of great value, as shown in the Bulletin prepared by Mr. Fairchild, assistant pathologist of the U. S. Department of Agriculture, in checking a considerable number of them. The more important of the diseases that may be prevented or checked by its judicious use include the downy mildew of the grapevine, the pear, cherry, and plum leaf blights, the apple and pear scab, the peach leaf blister, the quince spot, the chrysanthemum leaf spot, the black rot of the potato, and the well known potato disease. There are some other diseases for which Bordeaux mixture will probably prove an effectual remedy, but those mentioned are sufficient to indicate that its utility is by no means limited to preventing the attacks of the destructive Phytophthora infestans.—The Gardeners' Magazine.

The Iron Trade Situation.

The present situation of the iron and steel industries of the world is one of more or less suspended animation and unstable equilibrium. All countries alike are looking forward to a great improvement on the existing condition of things.

England must be content in the future to share the outside markets of the world with Germany, Belgium, the United States, and, to a less extent, other iron-producing countries, including probably Spain, Austria, and Russia.

It may now be said that there is no iron-making country that is not prepared to place a surplus of its produce, actual or possible, on outside markets. The following statement shows approximately the existing resources of the chief metallurgical countries for the production of pig iron and steel:

	Pig iron. Tons.	Steel. Tons.
The United States	14,000,000	7,500,000
Great Britain	9,000,000	5,000,000
Germany	6,500,000	4,000,000
Belgium	1,000,000	950,000
France	2,600,000	1,000,000
Russia	1,000,000	600,000
Austria-Hungary	1,000,000	650,000
Sweden	750,000	500,000
Spain	400,000	200,000
Italy	60,000	130,000
Canada	150,000	75,000
Totals	36,460,000	20,605,000

When we consider that the greatest quantity of pig iron hitherto produced in any one year has been about 25,000,000 tons, and that the largest output of steel in a single year has been about 12,000,000 tons, it is clear that there is a considerable margin available for meeting any possible increase of demand, and that there is little or no chance of such increase of demand leading to a material increase of the realized prices of either commodity. If a large demand springs up in the United States, and prices become inflated there in consequence, Europe will step in with unlimited supplies, while conversely, if the demand comes from outside markets, Europe and America will fight with the utmost vigor to secure and hold the field.

As matters stand at the present time, it is astonishing how nearly the chief iron-producing countries of the world come to one another in the matter of prices. Between the United States, England, and Germany there is not, at the moment, a difference of more than 10 per cent in the current prices of ordinary descriptions of iron and steel. In other words, it comes to this, that prices are tending to a virtual equality in all the chief countries of the world, except for special products, more or less indigenous to the different countries concerned.

All this is, or should be, a source of satisfaction and of protection to the outside markets, which for that reason should have the less hesitation in taking up new enterprises calling for large supplies of iron and steel. When the United States began to import steel rails from England, and for many years afterward, they had to pay from £10 to £15 per ton for them. To-day the same country is prepared to supply steel rails to outside markets for less than £4 per ton at works.

Manufacturers can hardly, in view of the facts just stated, look for any very large increase of price. They may, of course, secure much more remunerative rates than those current for the last year or two. If they had not this prospect to look forward to, it would hardly be worth the while of the majority to continue in the business. But where supplies can be drawn from such a great variety of sources, the profits that were formerly easy become virtually impossible.—Iron and Coal Trades Review, London.

The Paris International Exhibition of 1900.

The general plan of the next Paris Exhibition may now be regarded as practically complete, and it is possible to fill in some of the details that we have omitted in our former notices. The classification and allotment committees have fixed the locations of each group, and have also decided on the amount of space that shall be given to them; the methods of facilitating the circulation of the public within and around the Exhibition grounds have been decided on in principle, and after a few more questions of detail have been determined on, the complete project for this stupendous scheme, the cost of which is estimated at about 100,000,000 francs, or £4,000,000 sterling, will be submitted to the approval of the Chambers. The area inclosed by the boundary of the Exhibition will be about 270 acres, and of this 100 acres will be covered by buildings of all kinds. The actual size of the inclosure will therefore be less than half that of the Chicago World's Fair, which is very fortunate both for visitors and exhibitors; on the other hand, the covered area will be considerably larger, and a far greater outlay is contemplated than at Chicago; the public may, therefore, anticipate a more satisfactory result, both as regards the artistic effect of the Exhibition and their own comfort and convenience. We have already explained that it is intended to destroy the Palais de l'Industrie; this work will not be so simple as might be supposed, as it must be carried out with due consideration for the numerous uses to which the building is put. One half will be first demolished —that facing the Seine. By this means a sufficient area will be cleared for the commencement of the great avenue which is to connect the Champs Elysees with the bridge of the Esplanade des Invalides, and for the erection of the new palace which is to stand on the right side of this avenue. The other half of the Palais de l'Industrie will be preserved for two years longer, during which time it will be used for the various exhibitions now held there. At the end of two years the new palace will be completed, and the various expositions can be accommodated, setting the other half of the Palais de l'Industrie free for demolition. Afterward a second permanent palace will be erected on the new avenue, and these, which will form prominent features of the exhibition, will remain as monuments after its close. The Palais des Champs Elysees, on the right of the avenue, will contain the exhibits of modern art; on the opposite side will be the building devoted to retrospective art. The former of these buildings will have two entrances through rotundas, and giving access, on the one hand, to the Champs Elysees and on the other to the avenue, which will be known as the Avenue de l'Esplanade des Invalides: it will form a vast rectangle with a central gallery and two wings, but the side nearest the Seine will be open, and will, in fact, constitute a small park that will be enriched with the choice trees and shrubs so numerous in the Champs Elysees, and which will have to be displaced to a large extent in the alterations that will be unavoidable. In the other wing of the building there will be a great covered court, which, after the close of the exhibition, can be utilized for horse and similar shows.

It need hardly be said that practically all the trees in the Champs Elysees will be preserved, though, of course, many of them will have to be shifted, and the landscape gardening very possibly improved thereby. In one of the most picturesque locations in the park will be erected the pavilion of the government Sevres factory, where processes, as well as manufactured articles, will be shown. The Esplanade des Invalides, which forms a part of the exhibition, will be connected with the Champs Elysees by a bridge that will be a good example of modern engineering practice. It will be of steel, 360 ft. long and 328 ft. wide; on this extensive platform galleries will be erected and flower beds laid out. On the Esplanade there will be a series of magnificent structures bordering on the main avenue, and continuing the perspective commenced by the Fine Arts palaces on the Champs Elysees. In this part of the exhibition there will be the buildings devoted to the groups of education and teaching, the appliances and processes connected with literature, arts and sciences, as well as with the decoration of buildings and with furniture. On the esplanade all the trees will be preserved, though possibly rearranged, and there will be many small pavilions, scattered about this part of the exhibition, devoted to the practical exhibition of processes associated with the industrial arts—bronze, ceramics, crystal and glass, the working of precious metals, jewelry, horology, leather work, etc. The further end of the esplanade will be covered with buildings, and conspicuous among them will be a great portal placed immediately on the axis of the central avenue, the bridge, and the avenue on the Champs Elysees.

We have already referred to the important role it is intended that the Seine shall play in this forthcoming exhibition. It is proposed that not only shall the wide, sloping banks on each side of the river be utilized, but that promenades shall be arranged on the water level. On the right bank of the Seine there will be first a series of historical reconstructions, followed by the Pavilion of the Ville de Paris and the buildings of the Horticultural Section, for which there will be at least 20 acres covered. At the back and parallel with the river, on the road known as the Cours-la-Reine, will be a long range of miscellaneous buildings—kiosks, cafés, restaurants, etc. Opposite the Trocadero there will be erected the Congress Hall, which no doubt must be of very large proportions, seeing that congresses on every possible subject have become inseparable attendants on universal exhibitions. On the opposite side of the river, pavilions will be erected for the service of certain special foreign exhibits, and near the Pont de Jena is to be placed the very important structure devoted to naval and military exhibits, while close by will be the pavilion of ocean and internal navigation exhibits. Much care will be given so to arrange this water front of the exhibition that it shall be one of the most attractive centers, and as during the evenings all the business river traffic will be suspended, the position will be admirably adapted for the numerous night fetes that will form a special feature of the exhibition. For the accommodation of visitors passing from one side of the Seine to the other, there will be two new bridges, in addition to the Pont de Jena and the Pont de l'Esplanade des Invalides. As we have already stated, the ample space on the Trocadero grounds will be chiefly devoted to colonial exhibits, which it will be remembered occupied so brilliantly the Esplanade des Invalides in 1889. Here will be assembled pavilions containing colonial produce, mission exhibits, native villages, bazars, reproductions of famous buildings, etc. Complete as no doubt this part of the exhibition will be, it is difficult to understand that it can be more perfect than the similar display in 1889. As regards the Champ de Mars, it is not the intention to erect here the long series of buildings more or less similar, such as formed the chief features of the last two great French Exhibitions. The buildings of the Beaux Arts and of the Arts Retrospectifs are to remain, as well as the Machinery Hall. Between these, and on each side of the Champ de Mars, there will be erected long ranges of buildings extending down to the Seine; these buildings are not to be uniform in design or in size; the highest and most important will adjoin the Machinery Hall, and they will gradually decrease in size toward the Seine, where they will be relatively small. It is expected that this arrangement will possess many advantages, among others those of an improved perspective, and of showing at a glance the comparative importance of the groups to which the buildings are devoted. Near the Seine the smallest groups will be placed, or, at all events, those which do not occupy much space, and this system of graduation is to be extended toward the Machinery Hall until the buildings are sufficiently large to receive exhibits of the most bulky nature. It should be mentioned that this long range of pavilions is to be connected by two galleries, one on the ground level and the other on the first floor. It is to be regretted that the Machinery Hall of 1889 is to be preserved, yet it is doubtful whether it would be possible to devise a finer interior for the special purpose for which it was designed. It will, however, be much altered by the creation of a vast salle des fetes in the center, while the ungraceful exterior will be completely masked by the range of miscellaneous pavilions to which we have just referred.

We are glad to see that there appears no evidence of a vainglorious desire to make a record at the 1900 Exhibition with size of buildings; on the contrary, a leading idea seems to be to reduce the dimensions as far as possible and increase the number of structures.

There must be exceptions, of course, in this, such as in the two permanent buildings that are to replace the Palais de l'Industrie, and in the Electricity Building that will form the main architectural feature on the Champ de Mars. But, as a rule, it would seem that beauty rather than size, and true taste rather than ostentation, will be two of the leading characteristics of the exhibition buildings of 1900.—Engineering.

Bleaching Cotton.

Cotton is never bleached in the unmanufactured condition, but in the manufactured state is frequently subjected to the process. As yarn, it is first "boiled out" with very dilute caustic soda, to remove the oil or gum, then washed or not, as desired, then immersed for one or two hours in a clear bath of bleaching powder, then washed to remove excess of bleaching liquor, and finally passed through a very weak bath of sulphuric or hydrochloric acid. When in the condition of warps (which may be 1,200 yards in length), it is subjected to the same treatment, except that special machines are required for the handling of threads of such great length. In the form of woven fabrics peculiar apparatus and special care and skill are required, and great ingenuity is displayed in the mechanico-chemical part of the operation. Two systems are in use, which are known respectively as the high pressure and low pressure systems. The essential difference between these lies in the length of time the goods are subjected to the boiling. In both, also, the operation is divided into two stages. The first, in which the cleaning of the goods is effected, consists in boiling with lime or soda, followed with a weak acid (termed a "sour"), then with soap and soda, followed by a wash. The second is the bleaching proper, in which the goods are brought, for a definite length of time, in contact with the actual bleaching agent, followed by a wash, and a passage through very dilute sulphuric acid, after which the goods are allowed to lie in heaps for a time, then well washed, and dried over revolving cans heated by steam. Modifications of the above processes have appeared from time to time. A notable one was that of Messrs. Mather & Thompson, and is admirably suited for warps and piece goods. The important feature in this process resides in the use of carbonic acid gas, by which hypochlorous acid is liberated, which, in turn, effects the whitening of the fabrics. The previous remarks cover the essential points governing the bleaching of cotton, and the same principles, with only slight alterations, are applied to the bleaching of linen and jute.—Industrial Record.

Incubation Period of Diseases.

The Clinical Socicty of London, wishing to establish a period of incubation for various diseases, instituted a series of investigations with the following results:

Diphtheria.—In this disease the incubation period does not as a rule exceed four days and is more often two days. It may also extend to five, six and seven days. The infection may take place at any time in the course of the disease. Mild cases may spread it.

Typhoid Fever.—This may vary within wide limits twelve to fourteen days, but not infrequently it is less. As the disease is usually introduced into the system by food and drink, it is not carried from one person to another, but several may get it from the same source. Contaminated water and milk is the usual cause.

Epidemic Influenza or "Grippe."—The shortest incubation period in this disease is from a few hours to three or four days. It generally strikes suddenly and without warning. A patient may carry infection throughout the whole course of the disease.

Measles.—The incubation period of measles is usually short. It is counted from the date of the eruption, which decides the disease.

Mumps.—The incubation period of mumps is rather long, from one to two weeks, and the chances of infection diminish daily.

Rubeola, Rotheln, or German Measles.—This has a long incubation period, like ordinary measles, and its infectivity diminishes in a day or two after the rash disappears.

Variola or Smallpox.—The incubation period of this disease is from one to three days.

Varicella, or chickenpox, has a period of incubation slightly longer than variola.

Asia and North America.

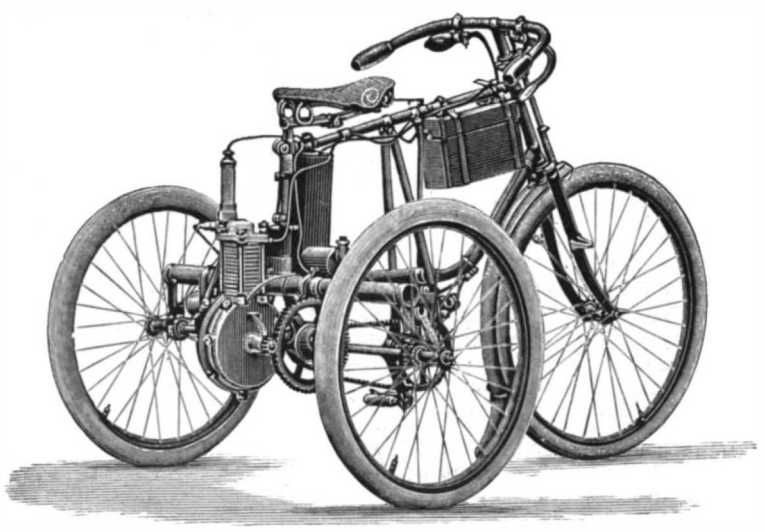
I would suggest a thorough exploration of the intercontinental tract which on the North Pacific unites North America with Asia—the Aleutian Islands and Peninsula, the Behring Sea and Strait, and the Peninsula of Kamtchatka. Where two continents approach one another so closely and give evidence of having been united at seemingly no very ancient date; where a connecting land bridge could not but most effectually influence the distribution of life, human, animal, and vegetable, upon two hemispheres—there, manifestly, the harvest of exploration must be great, for bound in with the research are problems of deep significance, touching alike the sciences of geology or physical geography, ethnology, geology and botany. We ask ourselves the questions: If North America and Asia were united, when and how did the separation take place? What heterostatic condition existing between the land and the water permitted of the incursion of the sea or the dropping of the land? To what extent was the union complete, and what were the initiatory steps that prefaced the fall? What were the nature and extent of the animal and vegetable migrations of which the connecting land mass permitted, and which way did they influence the present distribution of life upon the globe? It what way was the distribution of races effected or determined by that connecting bridge? Plainly enough the breadth of these questions indicates how vast is the field that is to be covered by the answer; and while it may be difficult to obtain these answers, they are surely locked up with the rocks that form the continental border lands, the islands that dot the sea, and the submerged bottom land of the ocean. And when they will have been obtained, they will constitute some of the worthiest contributions to geographical science the records of which adorn the pages of discovery. It is almost incredible that with so much promise in the exploration of this region so little should have been accomplished. Easy of access, and well within the resource of a moderately equipped expedition, the region should long since have attracted to it an army of scientists.—Prof. Angelo Heilprin.

A PETROLEUM TRICYCLE.

The petroleum tricycle, which we illustrate, was designed by MM. De Dion and Bouton, the well-known builders of automobile carriages, and weighs, when fully equipped, 88 pounds. The general appearance of the vehicle is like that of the ordinary tricycle. In addition to the motor, there are pedals for actuating the machine through the medium of sprocket wheels and a chain. The tricycle is started, after mounting, by giving the pedals a few turns until the motor begins to operate, the pedals then cease to be used, and the rider need only steer the machine. In climbing hills, the pedals are sometimes used as an auxiliary force. This combination of mechanical and human power permits of the rider enjoying the pleasures of locomotion without the aid of the motor or to economize the combustible when necessary. The motor is not complicated. It is actuated by the explosion of a mixture of air and the vapor of the petroleum. The explosion is effected by means of electricity. The motor is one-third of a horse power, the shaft making 800 turns per minute. With the aid of the motor and pedals it is possible to attain a speed of eighteen miles an hour. The carbureter has been dispensed with, its place being taken by a small pump, which is actuated slowly by the motor and thus utilizes the petroleum drop by drop. The clumsy and heavy water jacket has also been eliminated, the cylinder being cooled by contact with the air.

A small satchel resembling a photographic camera is fixed to the frame in front. This satchel carries a dry battery which will run the exploder for one hundred hours. It is connected with a spark coil by means of insulated cord. The rider can stop the motor instantly by cutting off the current with a switch.

MM. De Dion and Bouton propose to apply their system to the propulsion of a bicycle and hope to realize the greatest possible speed of individual locomotion from it. For our engravings and the foregoing particulars we are indebted to L'Illustration.



A PETROLEUM TRICYCLE.

THE NEW ATLANTIC STEAMER ST. LOUIS.

The new steamer St. Louis, of the American Line, has had her sea trial, which proved highly successful, and is now doubtless speeding on her first voyage across the Atlantic, her day of sailing from New York being June 5. On her recent trial at sea she is reported to have reached a maximum speed of 22·75 knots, which gives promise of satisfactory performance for her business trips.

The St. Louis is the first of a number of vessels authorized to be built under the special act of Congress of 1892, designed to encourage the building of American steam vessels, and also to provide cruisers for the government in the event of the sudden outbreak of hostilities. A sister ship, the St. Paul, was recently launched from the yards of Cramp & Company, Philadelphia, and will soon take her place with the St. Louis, on the line between New York and Southampton. Four magnificent boats, the Paris, New York, St. Louis, and St. Paul, will then be in service, and four better ships it would be difficult to find.

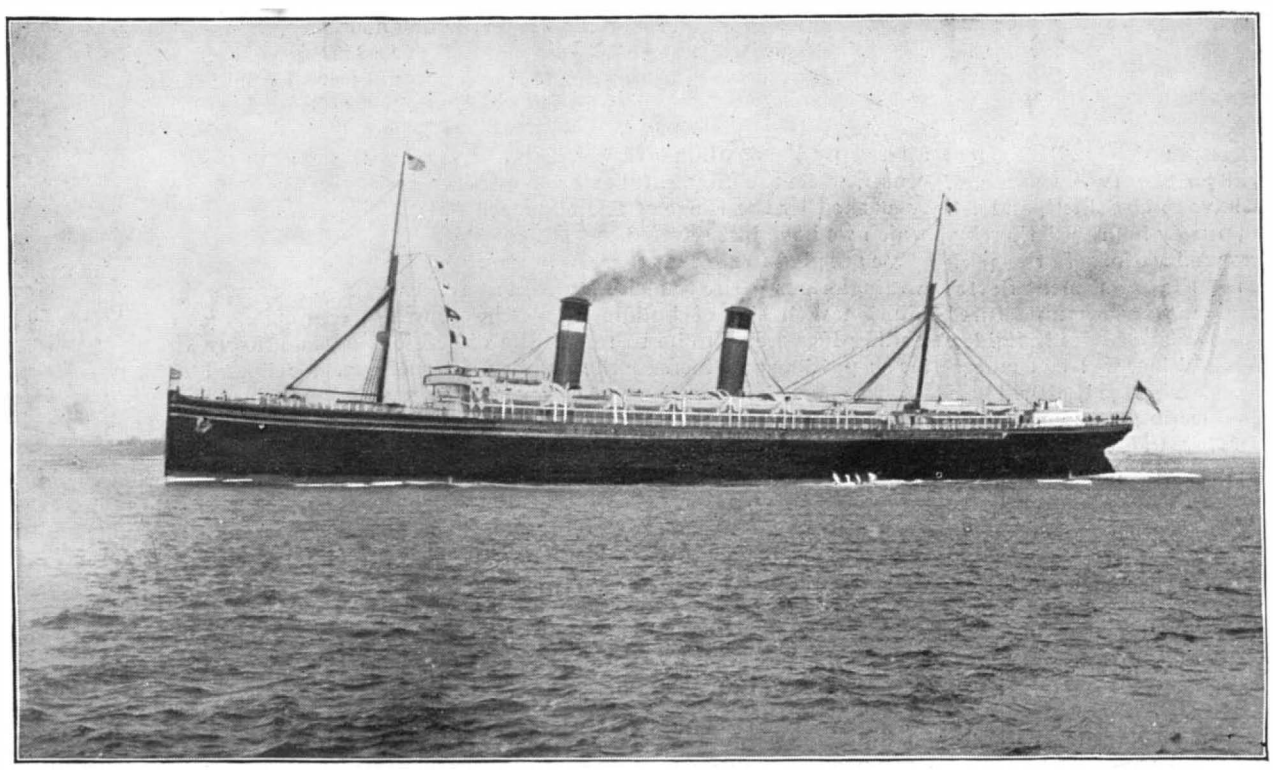
The St. Louis is 554 feet long over all and 536 feet on the load water line, with an extreme beam of 63 feet, and draws 26 feet of water, her gross register being 11,000 tons. She has six decks and nine water-tight compartments, without any openings or doors in the intervening bulkheads. Her hull is of steel, the plating being three-quarters of an inch thick, and the frames and beams channel-shaped. The engines are quadruple expansion, designed to afford 20,000 horse power, the four cylinders being 36, 50, 71, and 100 inches in diameter respectively, and the stroke being 60 inches. There are six steel double-end boilers, each 20 feet long and 15 feet 7½ inches in diameter, and designed to furnish steam at 200 pounds pressure. The vessel has twin screws and the hull is built out to support the shaft bearings.

Of her building and equipment, Mr. Charles H. Cramp says: "No foreign materials entered into the construction of the hull. It is of American model and design, of American material, and has been built by American skill and muscle. The existing tariff law gave us the privilege of importing, free of duty, all plates, tees, beams, angles, wire rope and composition metal that might be needed in her construction. But we did not take advantage of the law. On the contrary, we placed every order with American rolling mills, forges and foundries."

Her interior furnishings are said to exceed in cost and beauty anything of the sort afloat. There are accommodations for 350 passengers in the first cabin, 250 in the second cabin, and 900 in the steerage. The arrangements of berths and saloons and the fittings and decorations embody American ideas of comfort, and differ from the prevailing styles in European-built steamships.

In recognition of the courtesy of the American Line in the bestowal of the name St. Louis on the first transatlantic steamship of American material and workmanship, the citizens of St. Louis have presented to the beautiful steamship finely bound libraries for the first and second cabins. The citizens of St. Louis have also given ten ornamental glass windows for the first cabin library room, and a full set of flags, including the American ensign and the house flag in silk, and a burgee bearing the name St. Louis.

Our engraving is from a photograph of the St. Louis taken specially for the SCIENTIFIC AMERICAN, and shows the vessel steaming up the bay of New York on her way to her pier at Fulton Street.



THE NEW ATLANTIC STEAMER ST. LOUIS.

Diarrhea and Earth Temperatures.

The close relationship between rise of diarrheal mortality and rise of earth temperature is strikingly shown by Dr. Priestley in his report for the past year for the borough of Leicester. Dr. Priestley studied carefully the death roll from diarrhea in those weeks wherein the temperature at 4 feet below the surface reached or exceeded 56 degrees Fah. with the view of ascertaining whether the height of the thermometer had any causal relationship with the disease. By a comparison of data at one and another portion of the year he has found fresh prima facie evidence that a very close relationship of the sort in question does exist. Thus, allowing a period of fourteen days to elapse between the date of attack and death, seven days for average duration of fatal cases, and seven days for notification from the registrar of deaths, Dr. Priestley shows that the 4 foot thermometer having reached and passed 56 degrees Fah., on July 2, the deaths began to rise considerably a fortnight later, and continued high so long as the thermometer registered above that temperature, but that immediately the thermometer dropped below the figure so, too, the deaths from diarrhea fell and continued to fall until the disease ceased to appear in the death records. —British Medical Journal.

Interesting Archæological Discoveries.

According to a note in the London Times, the excavations by the American School at the Heraion of Argos, under the direction of Professor Waldstein, which were resumed this spring, have been very successful. Two hundred and fifty men have been employed on the work. Besides the two temples and five other buildings previously discovered, a large and well-preserved colonnade 45 meters long has now been found, 25 feet below the surface south of the second temple. The discoveries include parts of metopes, two marble heads of the best Greek period, a hundred objects in bronze and gold, gems, vases and terra cottas of the Homeric period, as well as numerous scarabs and several Mycenean tombs with Argive inscriptions on bronze, probably of a religious character. The excavations, which are now in the fourth season, will be completed this year. They rival the French excavations at Delphi in magnitude and importance, representing all the periods of Greek life from prehistoric to Roman epochs.

The New Navy Rifle.

The new navy rifle is the invention of J. P. Lee, of Connecticut, and was recommended by the Small Arms Board after many experiments. By many the new gun is believed to be superior to the Krag-Jorgensen rifle which is now supplied to the army. The navy rifle is lighter, thus enabling the sailor to carry 50 more rounds of ammunition than the soldier, and gives a flatter trajectory. The rapidity of fire is very great, five aimed shots being fired in three seconds. The total weight of the gun with straps is 8¼ pounds, which enables the sailor to carry 200 rounds of ammunition. The barrel is 27 inches long, the trigger is at all times under control and there is no danger of accidental fire, while the magazine clip is the lightest in use. The fire is very accurate at 2,000 yards, while at 5,000 yards the bullet would pierce two or three men in a row. It would penetrate the body of a man at a distance of 6,000 yards. The barrel is made of nickel steel, which is now so largely used in armor plates. The results of the test of new Lee gun have been so satisfactory that it is expected that the national guard may adopt it in some States.

THE total output of new cars during the past five months is estimated by the Railroad Gazette to have exceeded that of the entire year 1894 by 5,000. The total number contracted for is 22,030; these figures are for freight cars only. The passenger cars ordered amount to 72, with contracts for 13 more to be given out shortly. This represents an investment of over $10,000,000. The decrease in the cost of cars to the railroad companies has been very considerable in the last few years.

THE share of land falling to each inhabitant of the globe in the event of a partition might be set down at twenty-three and a half acres.

TERRIFIC POWER OF NITRO-GLYCERINE.

We are indebted to Mr. William C. Siebold, Jr., our valued correspondent at Fort Wayne, Ind., for the photograph from which the accompanying engraving was made, showing the effect upon a roadway where a recent explosion of nitro-glycerine took place. The scene of the explosion was near the city of Bluffton, Ind. Our photo was made three hours after the explosion. The Fort Wayne Sentinel gives the following particulars:

Early on the morning of April 26 William Ulmer, a young man eighteen years old and unmarried, a driver for the Empire Glycerine Company, which is furnishing nitro-glycerine for the companies engaged in sinking oil wells in the Montpelier field, 14 miles distant, started from the mills in a two-horse wagon to take 720 quarts, about 1,200 pounds, of nitro-glycerine to the Montpelier fields.

About 9 A. M., when two miles southeast of the city of Bluffton, near the Powell farm, his wagon struck the root of a tree and upset and the explosion of the nitro-glycerine immediately followed, carrying death and destruction in its wake and creating a scene of horror which it is impossible to correctly describe.

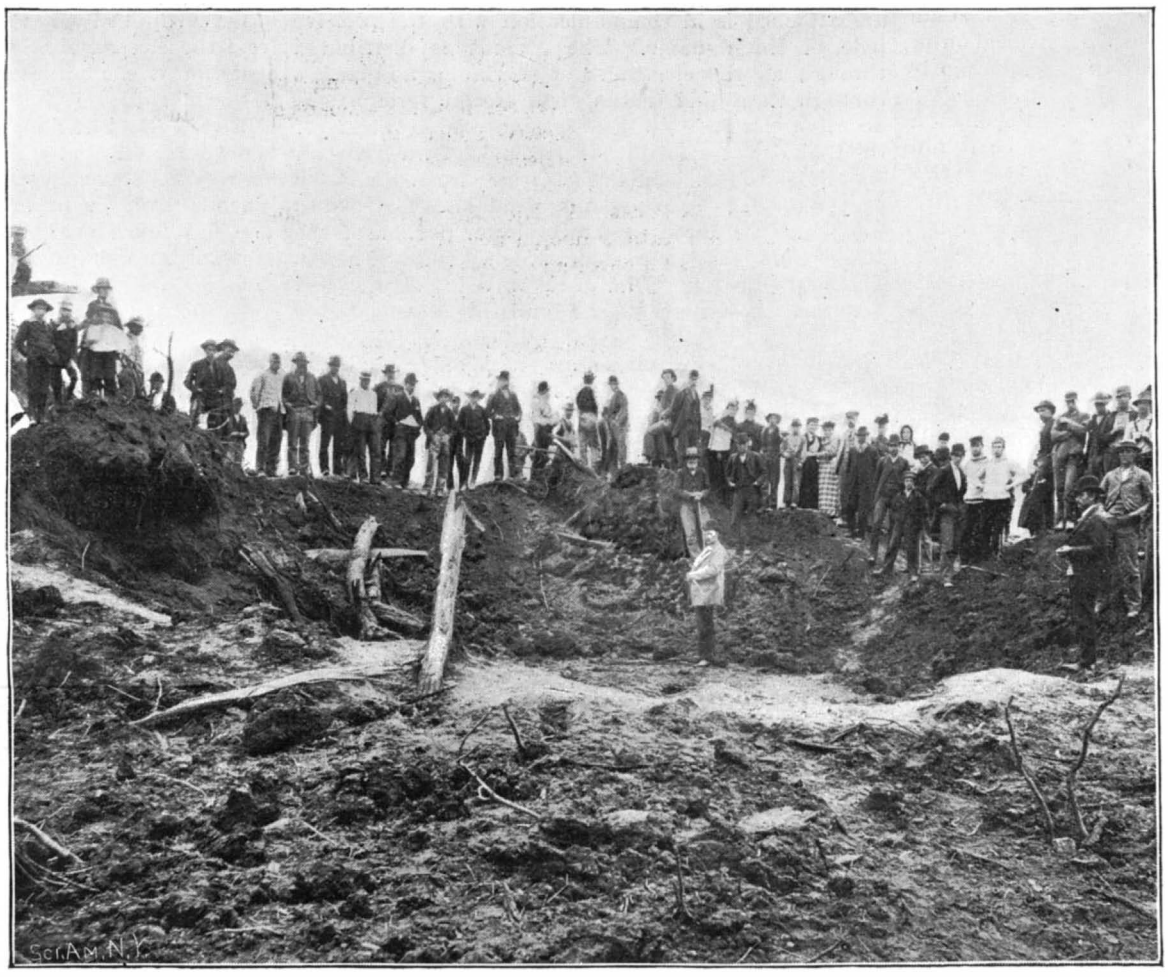
The wagon, the driver, and the horses were blown to atoms, and when the people living in the neigh borhood arrived at the place where the explosion occurred not a trace of either of them could be discovered, they having been torn into a thousand pieces and carried miles away.

Several large trees in the vicinity were torn up by the roots and carried many feet away, and the window glass in the houses for two miles around was broken by the force of the explosion, which made a hole in the ground 15 feet deep, 60 feet across the top, and 35 feet at the bottom.

All that was found of Ulmer, the driver, was a part of his clothing, and this was nearly a mile away from the spot where he met his death. Pieces of the horses were also found at about the same distance from the spot, as were also parts of the demolished wagon.

The force of the explosion was plainly felt in this city, although Bluffton is twenty-five miles away, by the rattle of windows in the houses, and many persons thought it was due to an earthquake shock. The same shock was also felt in many towns for miles around Bluffton.

Cattle were killed in fields around the scene of the explosion and many runaways of frightened horses occurred at Bluffton.



A WAGON LOAD OF NITRO-GLYCERINE EXPLODES.

THE VICTORIA REGIA IN NEW JERSEY.

It has been supposed to be difficult to grow this remarkable plant in this climate, owing to the warm temperature required. But Mr. S. C. Nash, of Clifton, N. J., has admirably succeeded. A recent number of the Garden, London, gives an engraving, which we copy, made from a photograph sent by Mr. Nash to our cotemporary, together with the following particulars:

This specimen had twenty leaves in different stages of growth above water, a fine flower, and two buds. The seed was started in the greenhouse early in March. The plant was moved to the outdoor pond about the middle of May, from which time till July 4 it had the protection of a sash. The sash and frame were then removed. The first flower opened July 14, and was followed by thirty others in succession, the last one opening October 4. Four flowers were permitted to mature seed, yielding respectively 188, 458, 293, and 569 large, plump, heavy seeds. Unfortunately, three of the young leaves were injured by a severe thunderstorm which passed over this district a few days before the picture was made. The nature of the damage shows plainly on the edges of the leaves. Many of the leaves were 6 feet in diameter, with rims 6 inches high. Will this plant compare favorably with good specimens grown under glass in England? I have often stood on leaves to satisfy doubting visitors. The heaviest person I ever photographed on an unsupported leaf weighed 174 pounds; add weight of rack (9 pounds) made of laths, and placed on the top of the leaf to distribute the pressure and protect the web of the leaf from the sharp shoe heels. The total weight was in that case 183 pounds. I vouch for the absolute accuracy of these statements.

I have nearly all the varieties of Nymphæas, or have had them, both hardy and tender. Some I have discarded as not worth bothering with. The only one that proved too much for me was N. sphærocarpa (the Swedish pink lily). I have paid as high as 32s. for a small root of this species or variety, but though I have tried several times, I have not succeeded as yet.

Nelumbium speciosum does grandly here out of doors. A neighbor of mine planted one tuber of this in a natural pond (about 1¼ acres extent) in 1892. I visited this pond last year in August, and do not hesitate to say there were more than 1,000 blooms and buds in sight. At my request he cut the largest leaf we could see. The stem measured 10 feet 6 inches in length and the leaf 42 inches in breadth. This was, by 6 inches, larger than any leaf I had previously measured. In my opinion the N. speciosum bears the handsomest flower that grows, everything considered. S. C. NASH.

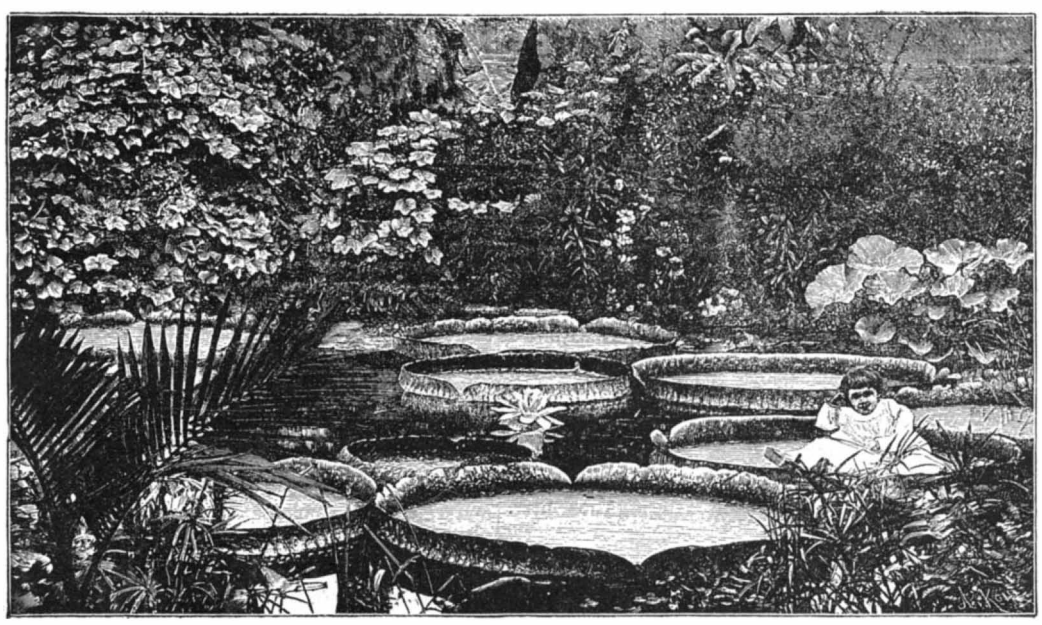
Clifton, N. J.

Mr. Nash also sent photographs to the Gardeners' Chronicle, one of which was reproduced in fine style. The Chronicle says:

"It shows what may be done in the open air by an enthusiast. The pond in which the Victoria is growing is heated by hot water pipes in connection with an ordinary greenhouse boiler. The temperature of the water is kept up to between 75° and 85°. Toward the end of the season the water often falls to 65° or even 60° without injury to the plant.

"It was in the year 1851 that Messrs. Weeks, who then owned the nursery in the King's Road, Chelsea, now in the possession of Mr. William Bull, succeeded in flowering the Victoria regia in the open air; the first flower opened on April 16. On July 12 of the same year, it is recorded that the plant had been in bloom for three weeks, sixteen blossoms having been expanded in that period. Gold fish multiplied so abundantly in the tank that it was calculated that the sale of these fish would eventually nearly cover the cost of the experiment!

"The Victoria always attracts attention from the singularity and noble appearance of its foliage, but there are many of the Nymphæas of nearly equal beauty that might be grown under like conditions, such as the very large blue Nymphæa gigantea, the Cape N. scutifolia, the purplish N. zanzibarensis, the primrose yellow N. amazonum, the white lotus and its rose-colored varieties, and a large number of others. Other aquatics, such as Limnocharis, Pontederia, Pistia, Sagittaria, might be grown in the same way. Most of these may be grown from seed or, as in the case of Nymphæas, from tubers, which may be kept through the winter in bottles, a slight amount of moisture only being maintained. It is not given to every one to utilize hot water pipes as Mr. Nash has done, but they need not repine on that account, as few things are more beautiful than our ordinary water lilies, and especially the new varieties introduced by M. Latour Marliac. The tubers may be planted in mounds, or sunk in baskets of loam, enriched with decayed manure, and cased over with pebbles for the purpose of maintaining the earth in the baskets. Full exposure to the sun is essential. Mr. Nash has reason to be proud of his water garden, and the photographs taken by himself show that, as well as his garden, he cultivates photography with success."



THE VICTORIA REGIA IN NEW JERSEY.

GLASS BRICKS.—Some glass bricks of the system Falconier were exhibited from the glass works, Adlerhutten, in Penzig, Silesia, at a recent meeting of the Vereins zur beforderung des Gartenbaues in Berlin. These bricks are intended to be used in constructing the walls of plant houses and winter gardens, and they are made out of blown glass, and closed under 500° of heat. They possess internally a hollow of about one-third of their entire contents, which, being filled with rarefied air, acts as a non-conductor of heat. They are joined together with cement, by which a rigidity is obtained which points to the possibility of their being employed as roofing in semicircular form, without any use being made of iron as a supporting structure. In houses built of this material, there must be many advantages not obtainable by other modes of construction with other materials, including greater economy in heating. No windows are necessary, although, for the purpose of enabling a person to look outside, these fittings might be supplied.

A CARP taken out of the water may be kept alive for over twelve hours by a piece of bread soaked in brandy placed in its mouth.

Correspondence.

The Ambulance Bicycle.

To the Editor of the SCIENTIFIC AMERICAN:

Under the caption of "A New Use for the Bicycle," in your issue of 25 ult., credit is given for its introduction and invention as an ambulance to a Dr. Honig, of Berlin. This seems to be an error, for the first ambulance bicycle, with litter, splints, and medical outfit, was designed and invented nearly two years ago by the Medical Director of the Naval Hospital at Chelsea, Mass., and application was made to the Pope Manufacturing Company, of Boston, to introduce it into that city. G.

Chime Whistles on Passenger Engines.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of May 18, 1895, appears a short article on this subject. In this article the principal reason for urging the use of gong whistles on passenger locomotives has been entirely overlooked. To the traveler it is a very common sight to see the waiting passengers come pouring from the waiting room on hearing the whistle of a coming locomotive, which, to their discomfort, is only an incoming freight. The passengers may repeat this a few times before hearing the proper whistle, which must also be inquired after or investigated.

I have learned to distinguish the whistle of the passenger locomotives which concern me most, and although I may be several blocks from the depot I know just how much to quicken my pace if I desire to meet them. It is to be hoped that other roads will lose no time in profiting by the good example set by the Pennsylvania Railroad. L. C. MANN.

Electricity in the Bleaching of Textile Fibers.

BY LOUIS J. MATOS, CHEMICAL ENGINEER.

Of all the many and varied uses to which the electric current is put, there is none of more interest to the textile chemist than its application to bleaching. It should be explained at the outset that electricity per se is totally devoid of any bleaching properties, and that the textile chemist simply avails himself of the property of the electric current to effect certain chemical decompositions, which he is able to utilize advantageously in his art.

The earliest attempts to use electricity for this purpose are somewhat clouded in obscurity, but it is certain that the credit for the first commercially available results are due to Mr. Eugene Hermite, the inventor of the process I am about to describe in detail.

The bleaching liquor employed in this process is produced by the action of the electric current upon an aqueous solution of a metallic chloride. The one found to be most desirable, owing to its greater economical value, is that of magnesium, although the chloride of calcium or of aluminum may be used with the same result. As will be readily understood, upon passing a current through such a liquid, there occurs a simultaneous decomposition of the chloride present and the water. The result of this electrolytic action is the simultaneous liberation, at the positive pole, of chlorine and oxygen. These two gases—in the nascent state—unite at the positive pole, with the production of an unstable compound possessing, to a very great degree, effective decolorizing properties. Simultaneously also, at the negative pole, the action of the current liberates magnesium, and as the magnesium instantly decomposes an equivalent of water, we obtain, as products of this reaction, hydrogen and oxide of magnesium.

Now, if we add to the electrolyzed solution, or bleach bath, some vegetable fiber—for example, digested and washed wood pulp—the natural coloring matter of the fiber is destroyed by the highly oxidizing power of the chlorine-oxygen compound previously mentioned, and the chlorine, which is now set free, immediately unites with the hydrogen, forming hydrochloric acid, and this, in turn, in the presence of the magnesium oxide, dissolves that substance, re-forming the original salt in solution. After the pulp has become sufficiently bleached, the liquor is drained off, run back into the decomposing or electrolyzing vat, and, after the addition of a small quantity of fresh magnesic chloride, it is ready for another operation, on passing the current. The pulp only requires to be washed, as is ordinarily done at the present time in the common bleaching powder process, and then ready for conversion into paper.

Thus we see that but two elements are consumed in the operation—electricity and the coloring matter of the substance to be bleached.

The electrolyzer, which is the most important piece of apparatus in the plant, consists of a vat or tank, of galvanized iron, provided with a tube of zinc, perforated with holes, in order to facilitate the circulation of the liquors. The negative electrodes are made of zinc in the shape of disks, and are secured to horizontal shafts, which, by proper gearing, are caused slowly to revolve. Between each pair of these disks are placed the positive electrodes, each of which consists of an ebonite frame, holding, with the necessary firmness, a net or perforated strip of platinum. Each of these pieces of platinum is soldered by its upper edge to a piece of lead and is completely isolated. Every frame of the positive poles communicates by means of a piece of lead to a bar of copper which traverses the electrolyzer.

The bar of copper to which the positive electrodes are attached is in communication with the positive pole of the dynamo. The current is distributed through all the electrodes of platinum, and passes through the liquid to the disks of zinc forming the negative electrodes, which are connected by means of the tank or vat with the negative pole of the dynamo.

In order to maintain the negative electrodes at the proper distance apart, ebonite blades are fastened to the positive electrodes. At the lower portion of the box or tank is a gate or door, which permits of access to the apparatus for cleaning; a valve is also provided for drawing off the liquor, should this become necessary.

When several electrolyzers are employed in a battery, the negative pole of one is connected to the positive pole of the next in the series, and so on to the last one.

The current strength ordinarily employed in the electrolyzer is from 1 to 1·2 amperes, and with a corresponding electro-motive force of 5 volts. Instruments for measuring the strength of the current are placed in the circuit, and give at any moment a record of the force utilized.

The electrolyzers require no special attention. About once in every month the apparatus is thoroughly cleansed with water applied by means of a rubber hose through the door previously mentioned; it is not necessary to dismantle it for the purpose. The wear of the electrodes, in consequence, is very slight.

The conductors, which join the electrolyzers and which bring the current from the dynamo, are made of bars of commercially pure copper; the cross sectional area of these bars varies with the distance between the dynamo and the electrolyzer.

It is always advisable to locate the dynamo and the electrolyzer as close to each other as possible.

The Dynamo.—For this work a very strong type of machine is required, and it should be so constructed as to be capable of yielding its maximum duty—running day and night.

The Bleaching.—Bearing in mind the remark previously made respecting the peculiar action of chlorine upon animal fibers, it will be understood that the electrolytic process is inapplicable to them. We will confine our remarks, in consequence, to the bleaching of vegetable fibers, in connection with which much has already been accomplished with the process, and where there is still room for important improvements.

The fiber of most importance is, of course, cotton, and of this I shall speak first.

Cotton occurs in the form of a silky hair, which, when examined under the microscope, is revealed to us as a flattened tube, more or less twisted, and of a pearly white color. It consists almost wholly of cellulose, with certain admixtures natural to it, such as moisture, several coloring matters—collectively termed "endochrome" oils—and a certain amount of inorganic salts. The quantities of these admixed substances peculiar to cotton are small, but, in the processes of converting the crude fiber into a manufactured product, certain other substances are added, such as oils, fats, starches, sizes, mineral matters, etc., all of which must be removed before the goods can be properly bleached. To do this it is necessary to subject the goods to a preliminary boiling or scouring.

Electrolytic Bleaching of Slubbing.—In this state, cotton is difficult to bleach, owing to the mechanical obstacles, nevertheless it is done, and with remarkable success. Preliminary scouring is out of the question, and the electrolyzed solution is allowed to act directly on the material. The contained waxy matters, and those which are insoluble, are not acted upon by the solution, but the latter causes a decomposition of the coloring matter, which is converted into carbonic acid. The pectic acid is changed into a soluble pectate of magnesia, and the remaining mineral matters are dissolved. The greatest difficulty encountered is in causing the liquid to penetrate evenly into every part of the slubbing, but this is overcome by the use of pressure.

The length of time required for the immersion varies according to the color of the cotton treated, to the degree of white desired, and also to the amount of chlorine and oxygen contained in the solution. Compared with the old method of immersion in the chloride of lime solution, the time can be very greatly prolonged without injury to the fibers. After bleaching, the cotton is removed, and carefully washed with water slightly acidulated with sulphuric acid; this is followed with a rinse, the excess of water is removed, and the stuff is finally dried in the ordinary way.

Electrolytic Bleaching of Cotton on Cops and Bobbins.—Some difficulty is experienced in successfully bleaching yarn that is wound upon tubes or spools, owing to the resistance offered by the threads when superposed, but, by employing the conditions advised for the bleaching of slubbing, the difficulty is overcome. The cotton is acted upon by the bleach liquor of suitable strength, and, owing to the rapid action of the solution, the fibers are bleached during the ingress of the liquid.

Electrolytic Bleaching of Yarn and Cloth.—These offer the fewest obstacles. Yarn is bleached in a series of tanks supplied with the solution of constant strength from the electrolyzer. Cloth is similarly treated, except that it can be passed through the bath in a continuous form.

Electrolytic Bleaching of Linen and Hemp.—These fibers differ very much from cotton in the amount and nature of the extraneous matters which they contain. Linen is made from the fibrous part of the flax plant. The flax fibers are bound together by a cement like substance, which must be removed in order to isolate the individual fibers. The removal of this substance constitutes the very important process of "retting," of which several methods are carried on. The oldest and perhaps the best known is the retting by fermentation, which is a kind of rotting of the ligneous matter. After this is removed, the subsequent operations of bleaching and dyeing are in order. It has been found that if these fibers are subjected to the action of the electric current in the bleach tank, the oxygen, which is given up very readily, oxidizes the constituents of the vegetable cement, converting them into resinous bodies, and thereupon at once proceeds to exercise its bleaching powers. When the fibers have assumed a yellowish or reddish color, the oxidation is finished, further treatment in the electrolytic bath is stopped, the material is removed and subjected to the action of boiling caustic or carbonated alkalies, either with or without pressure. This boiling operation effects the more or less complete removal of these resinous bodies, and leaves the fiber in a very clean and free condition, ready for further treatment. To bleach, all that is now necessary is to subject the fibers to a simple passage through the electrolytic solution, when a white of extreme brilliancy is obtained, and a silky feel is imparted to the fibers, which can be obtained by no other process, if the fibers have been retted in the ordinary manner.

Electrolytic Bleaching of Linen Threads.—Threads made of electrically retted fibers are of great purity, containing, besides cellulose, the natural coloring matter, and the residues of the vegatable cement, and, from what has preceded, it is easily seen that the bleaching of yarns is devoid of any difficulty. In comparison with the ordinary bleaching powder process, that of Hermite has the decided advantage that the liberated gases, which do the bleaching, do not, as is the case in the old method, act injuriously upon the fibers. A modification of cellulose—termed "oxy-cellulose"—is formed in the old process, which is responsible for a considerable loss of fiber.

Electrolytic Bleaching of Jute.—This fibrous substance is one of a group closely allied to linen, but it has been quite impossible to bleach it on account of its feeble resistance to oxidizing agents. By way of comparison, I will describe the method generally in use, at the present time, for bleaching this substance:

The goods are scoured in a bath containing half of one per cent of silicate of soda, and kept at a fair heat; next they are washed and passed through a bath of sodium hypochlorite, containing about one per cent of available chlorine; then well washed, passed through a weak bath of hydrochloric acid, and washed again. The bleaching by the Hermite process, which resembles that for linen, consists in the preliminary removal of the cutose and vasculose (vegetable cement) by conversion into resinous bodies, and the extraction of these by treatment with soda or other alkali. The actual bleaching is done by means of the electrolyzed solution, worked in a tank, in the same manner as with the ordinary chloride of lime process.—Textile Industries.

The Pottery Tree.

One of the most peculiar vegetable products of Brazil is the Moquilea utilis, or pottery tree. This tree attains a height of 100 feet, and has a very slender trunk, which seldom much exceeds a foot in diameter at the base. The wood is exceedingly hard, and contains a very large amount of silica, but not so much as does the bark, which is largely employed as a source of silica for the manufacture of pottery. In preparing the bark for the potter's use, it is first burned, and the residue is then pulverized and mixed with clay in the proper proportion. With an equal quantity of the two ingredients, a superior quality of earthenware is produced. This is very durable, and is capable of withstanding any amount of heat. The natives employ it for all kinds of culinary purposes. When fresh the bark cuts like soft sandstone, and the presence of the silex may be readily ascertained by grinding a piece of the bark between the teeth. When dry it is generally brittle, though sometimes difficult to break. After being burned it cannot, if of good quality, be broken up between the fingers, a mortar and pestle being required to crush it.

Our Country's Progress as Seen by a Foreigner.

The English statistician, Michael G. Mulhall, publishes, in the June number of the North American Review, an article on "The Power and Wealth of the United States." Mr. Mulhall's conclusion is that:

"If we take a survey of mankind in ancient or modern times as regards the physical, mechanical, and intellectual force of nations, we find nothing to compare with the United States in this present year of 1895, and that the United States possess by far the greatest productive power in the world."

Mr. Mulhall shows that the absolute effective force of the American people is now more than three times what it was in 1860, and that the United States possess almost as much energy as Great Britain, Germany and France collectively, and that the ratio falling to each American is more than what two Englishmen or Germans have at their disposal. He points out, by a careful comparison between the conditions in these different countries, that an ordinary farm hand in the United States raises as much grain as three in England, four in France, five in Germany, or six in Austria. One man in America can produce as much flour as will feed 250, whereas in Europe one man feeds only thirty persons.

Mr. Mulhall calls special attention to the fact that the intellectual power of the great republic is in harmony with the industrial and mechanical, eighty-seven per cent of the total population over ten years of age being able to read and write.

"It may be fearlessly asserted," says he, "that in the history of the human race no nation ever before possessed 41,000,000 instructed citizens."

The post office returns are appealed to by Mr. Mulhall in support of this part of his statement, these showing that, in the number of letters per inhabitant yearly, the United States are much ahead of all other nations.

According to the figures of Mr. Mulhall the average annual increment of the United States from 1821 to 1890 was nine hundred and one millions of dollars, and he adds that "the new wealth added during a single generation—that is, in the period of thirty years between 1860 and 1890—was no less than forty-nine milliards of dollars, which is one milliard more than the total wealth of Great Britain."

Classifying the whole wealth of the Union under the two heads, urban and rural, Mr. Mulhall finds that rural or agricultural wealth has only quadrupled in forty years, while urban wealth has multiplied sixteen-fold. Before 1860 the accumulation of wealth for each rural worker was greater than that corresponding to persons of the urban classes; but the farming interests suffered severely by reason of the civil war, and since then the accumulation of wealth among urban workers has been greatly more than that among rural workers, a fact which Mr. Mulhall thinks explains the influx of population into towns and cities.

In a series of figures Mr. Mulhall shows that the "rise in wealth and increase in wages came almost hand in hand." In dealing with the development of farm values, he makes the following statement:

"If the United States had no urban population or industries whatever, the advance of agricultural interests would be enough to claim the admiration of mankind, for it has no parallel in history."

The Almaden Quicksilver Mines in Spain.

The complete statement of the work done at the Almaden quicksilver mine for the year 1894, as given by the Revista Minera, is important and of much interest. During the year there was excavated at Almaden 6,680 cubic meters of ore, and only 561 cubic meters of barren rock had to be taken out. Most of the mineral was obtained in the crosscuts and galleries on the 12th level, and it was on this level that most of the stoping has been done during the year. The permanent work required the construction of 8,309 cubic meters of masonry in the various galleries and chambers. In weight the extraction for the year amounted to 19,428 metric tons of ore and 1,828 tons of barren rock.

In the furnaces of the Almaden during the year 1894 there were 18,744 tons of ore treated, which produced altogether 44,521 flasks of quicksilver, representing a total weight of 1,535,988 kilos. of quicksilver, the average yield of the mineral treated having been 8·19 per cent. This shows an improvement over the preceding year, when the yield was only 7·82 per cent. The furnaces were run for seven months of the year, having been shut down through the hot season, from May to September inclusive. The highest yield reported was 8,059 flasks, in December, and the lowest 2,912 flasks, in October.

A NAUTICAL BICYCLE.

La Ilustracion Española y Americana describes a new boat invented by Don Ramon Barea, of Madrid, which is said to pass over the water with ease and rapidity. This machine is composed of two cases of steel, which serve as floats and are connected by cross bars. In the space between the two, and near the stern, is a paddle wheel operated by pedals something like a bicycle.

This nautical bicycle weighs about 100 pounds. Its construction will be readily understood by a glance at our engraving. The machine was lately tried with much success. Mr. Barea demonstrated the facility with which he was able to pass over the water on his machine. The vessel is steered by a small rudder at the stern. The speed which can be obtained is about six miles per hour. The apparatus is well spoken of in Paris. It may be used upon lakes and rivers with success.

Examples of aquatic contrivances, something like the above, have heretofore been published in the SCIENTIFIC AMERICAN. In our numbers for November 8, 1890, and February 14, 1885, illustrations will be found.

A NAUTICAL BICYCLE.

Egyptological.

The tomb of Senmut, the famous architect of the temple of Queen Hatasu, has just been discovered by Mr. Newberry, of the Fund, and Professor Steindorff at Gurneh, consisting of three chambers elaborately decorated.

Professor Petrie announces that he has discovered the graves and remains of a hitherto unknown race on the soil of Egypt, and that his work the past season produces results "filling the greatest blank in Egyptian history." He claims for them a period between the fourth and twelfth dynasties. This, if true, dispels the notion, at first conveyed, that he had found evidences of a prehistoric race. He thinks the race a cross between the Libyans and the Amorites. They used metal and flint, and the variety of fineness of their pottery is surprising. Further and established evidences of this remarkable discovery, between Ballas and Negada, will be welcomed by the anthropological world.

Professor Adolf Erman, Ph.D., has just accepted the position of vice-president of the Egypt Exploration Fund for Germany.

The Ashmolean Museum, at Oxford, has been enriched by the chief results of the excavations last year at Coptos by Mr. Petrie, which he considers to have yielded prehistoric fragments of archaic sculpture and terra cotta. Among the sculptures are the colossal head of a bird, a lion's head, and the head of the god Minz, the rest of whose statue is en route. We cannot assert these remains to be prehistoric, but may indulge the fond belief that they belong to Egypt's mythic era.

Captain H. G. Lyons, R.E., of the Fund, has presented the same museum with stelæ of the twelfth dynasty, found on the site of the temple at Wady Halfa, and with two hieratic stelæ from the village of Mut in the Dakhla oasis, which refer to the artesian wells in that district and the water supply.

The value of the Archæological Survey department of the Egypt Exploration Fund, whose chief mission is the recording of important inscriptions, which are being constantly obliterated, is well illustrated in a letter from Professor Sayce. At El-Kab, near an ancient well and under the cliff, he found a platform of rock which had been cut for the foundations of a chapel of some size. Here he discovered many texts relating to the Old Empire, including one of special value, as it gave the names of two temples built on the spot in the period of Pepi of the sixth dynasty. One of them was named Kenb-set (Corner of the Mountain). The texts are so numerous that weeks of labor would be required to transcribe them.

At Esneh, the recently found paintings in two subterranean Coptic churches, Dr. Sayce says, are already nearly destroyed by the fanatical Arabs. Of the few still untouched paintings, he writes that "one representing the Virgin and Child is especially good, though it will probably have been destroyed by the Mohammedan iconoclasts before this letter reaches England."—W. C. W., Boston Commonwealth.

Ampere's Induction Experiment.

At a recent meeting of the Physical Society, Prof. S. P. Thompson read a note on "A Neglected Experiment of Ampere."

Ampere, in 1822, made an experiment which, if it had been properly followed up, must have led to the discovery of the induction of electric currents nearly ten years before the publication of Faraday's results. While attempting to discover the presence of an electric current in a conductor placed in the neighborhood of another conductor in which an electric current was flowing, Ampere made the following experiment: A coil of insulated copper strip was fixed with its plane vertical, and a copper ring was suspended by a fine metal wire so as to be concentric with the coil and to lie in the same plane. A bar magnet was so placed that if an electric current was induced in the suspended ring, a deflection would be produced. No such deflection, however, was observed.

In 1822, in conjunction with De la Rive, Ampere repeated this experiment, using, in place of the bar magnet, a powerful horse shoe magnet. He describes the result in the following words: "The closed circuit under the influence of the current in the coil, but without any connection with this latter, was attracted and repelled alternately by the magnet, and this experiment would, consequently, leave no doubt as to the production of currents of electricity by induction if one had not suspected the presence of a small quantity of iron in the copper of which the ring was formed." This closing remark shows that they were looking for a permanent deflection. When, however, Faraday's results were published in 1831, Ampere, after again describing the experiment made in 1822 by himself and De la Rive, says: "As soon as we connected a battery to the terminals of the conductor, the ring was attracted or repelled by the magnet, according to the pole that was within the ring, which showed the existence of an electric current produced by the influence of the current in the conducting wire."

The Spider's Web.

The spider is so well supplied with the silky thread with which it makes its web that an experimenter once drew out of the body of a single specimen 3,480 yards of the thread—a length but little short of two miles. A fabric woven of spider's thread is more glossy than that from the silkworm's product, and is of a beautiful golden color.

American and Russian Petroleum.

The recent sensational rise in the value of American crude and refined petroleum, and the causes to which it may be attributed, are readily accounted for, and a study of the relative positions of the American and the Russian industry shows that the present revolution in the petroleum market may soon be accentuated by the replacement of a large proportion of the American oil by the Russian product. The Americans possess the advantage of having been first in the field, and of producing an oil which yields on distillation nearly twice as much illuminating oil as does that of Russia, and, furthermore, of producing a type of oil which is better adapted for burning in the ordinary lamp than that of any other country. It is true that the oil of Ohio is an inferior quality, owing to the presence of an excess of sulphur compounds, and that it yields only about as much lamp oil or kerosene as that of Russia, but at present it is not of great importance as regards the European markets, and American oil may be considered to be almost entirely derived from the States of Pennsylvania, New York, and Western Virginia.

The American industry, dating only from 1859, has hitherto grown year by year under the skilled guidance by which it has been fostered, and until within the last two years or so has shown no indication of diminution of supply; but it is now becoming evident that the depletion of the oil lands which Mr. Carll, Professor Leslie, and other American geologists years ago asserted would before long result in a large decrease of supply, is beginning to show its effects. The older fields are rapidly falling off in their supply, while, although new areas of more or less importance are constantly being opened up, the amount of untested territory is rapidly becoming less, and the prospect of a renewal of the enormous supply of the past is ever becoming smaller.

If we glance at the statistics showing the stocks held of late in America, we find that at the end of 1892 there was in the crude oil tanks no less than 17,395,389 barrels of 42 American gallons; that this fell, by the end of 1893, to 12,111,183 barrels, and was, at the close of 1894, 6,336,777 barrels; and that, on March 1 last, it was only 4,908,776 barrels—and this in the face of a demand which shows no sign of diminution, and of a supply which is inadequate and constantly decreasing. It is, of course, certain that the increased activity in the sinking of new wells, which is now in progress, will result in a large increase in production; but this can only be at enhanced cost, and must bring ever nearer the time when the American oil industry shall become of secondary importance, and ultimately of only historical interest.

When we study the position of the Russian industry, we find that it possesses entirely different features. Although of great antiquity, its commercial importance only dates from 1872, when the monopoly of Prince Meerzoeff was abolished, and only within the last few years has it become a dangerous antagonist of the United States. The production shows no diminution, and, so far as appears at present, can be almost indefinitely increased at small cost, whenever occasion demands. The wells are shallow, usually about a fourth of the depth of those of Pennsylvania, and entirely dwarf the latter in output. Wells which are considered rich in America would not be worth sinking in the Baku district, which at present constitutes almost the entire producing area of Russia. From the fact that the Apsheron peninsula, on which the Baku fields stand, possesses an area of oil-containing land estimated at 1,200 square miles, and that only about 7 or 8 square miles is at present under the drill, we can readily realize how important a factor the Russian oil forms in the present position of affairs, and how probable it is that the Russians will soon take the leading position in the oil markets of the world. Furthermore, there are enormous tracts of country in the Caucasus and elsewhere in the Russian empire which, although scarcely tested, have given indications of richness even exceeding that of Baku, and showing a potential wealth of oil capable of supplying the world for ages to come. Wells drilled in the Grosnaia field to the north of Baku and in Gouria—Georgia—between the Black Sea and the Caspian, have given the most encouraging results, and both these fields, and also that of the Crimea, are more favorably situated for transporting the oil than Baku.

The conditions under which the oil occurs in Russia and America are very different. In the former it is found in strata of the Tertiary period, usually a formation resembling a quicksand, and at depths of only a few hundred feet; while in the latter it occurs at great depths in the older compact sandstones and limestones of the Carboniferous, Devonian, and Silurian periods. The oil of Russia consists of a class of hydrocarbons known as naphthenes, and belonging to the "benzene" group, while the American oil is mainly composed of paraffins. It is to this difference in composition that the great variation between the products from these oils is due, for whereas the American oil yields a very large proportion—about 70 per cent—of illuminating oil exactly suited for combustion in our ordinary lamps, the Russian oil produces far less of such oil and a larger proportion of the high class lubricating oil for which that country is famous. The Russian illuminating oil also requires to be burned in a modified form of lamp with a more perfect draught, to overcome its tendency to produce a smoky flame. Hence, before the Russian oil can obtain a powerful position in the English market, the Kumberg or any other of the lamps which are employed in Russia must become naturalized among us, and, although that is a somewhat difficult operation with such a conservative people as we are, it is practically certain to result in the near future from the greater cheapness which Russian oil will now show as compared with that of America.—The Engineer, London.

Hematite Mining in Greece.

A new hematite mine at Marathon, in the village of Grammatico, Greece, was opened last year. The ore is carried down by a railway for about five miles to Limonia Bay, where there is a jetty on the west side 200 feet in length, by means of which 1,000 tons daily can easily be loaded. Proper appliances have been provided for mooring the vessels. The anchorage is considered quite safe, as it is well sheltered. The mine has been leased for twenty years by several French capitalists. The actual output is 6,000 tons monthly, but if necessary the quantity can be increased to 15,000 tons. The ore is of an excellent quality, and contains 56 to 58 per cent iron, 3·80 to 4 per cent manganese, and 1·60 to 2 per cent only of silica, but whenever the several lodes are found in contact with some small veins of yellow ocher, the presence of a very slight percentage of arsenic is found by analysis, but this seldom happens.

Spirit for Incandescent Lighting.

The problem of employing spirits for lighting on a new principle similar to the incandescent gas light has, it is stated, been solved with great success by a Berlin firm. Experiments have just been carried out in presence of the Prussian Ministers Herren Berlepsch, Miquel, and Hammerstein, which are reported to have been completely satisfactory. If this news is confirmed it is likely to prove of enormous importance to the German spirit industry, which has recently been in extremis.

RECENTLY PATENTED INVENTIONS.

Electrical.

TELEPHONE CALL.—Frederick J. Troll, Washington, D. C. This invention relates to a call in which the revolving armature is rotated by a flexible metal tape on a drum, the tape when drawn out revolving the armature in one direction, and the tape being rewound by the tension of a coiled spring. By an improved construction and arrangement of parts the motion is transmitted to the armature direct, and the armature is made to ring a call by both the forward and backward movement of its oscillation, the armature being also cut out when the call is not in use. The call box is very simple and not liable to be damaged by inexperienced operators.

BOILER LOW WATER INDICATOR.—Charles D. Tisdale, Boston, Mass. According to this invention an auxiliary connecting piece is inserted between the lower end of the water gage and the water gage cock, the intermediate piece having contact wires extending up into the tube, and a float within the tube being adapted to form an electrical connection between the contact wires. The device can be applied to a boiler by removing the glass water gage tube and replacing it with a tube having the auxiliary connecting piece, the tube and attachments being made to replace the ordinary water gage tube. The alarm may, with this improvement, be given in the boiler room or at any desired distant point.

Mining, Etc.

REDUCING GOLD AND SILVER ORES.—John C. Garvin, Denver, Col. This inventor has devised a simple apparatus for rapid and economical work, in which the firebrick stack has a central shaft, alongside of which are ore-drying chambers connected by upwardly slanting apertures with outer gas chambers, there being in the central shaft opposite inclined shelves of tile, and the ore dropping from one shelf to the other, the central shaft being used for chloridizing and roasting and the outer chambers for making sulphuric acid. Below the central shaft is a roasting chamber with cone-shaped hearth on a revolving disk, and this chamber is connected with the fire box, the pulverized ore, mixed with chloride of sodium or salt, being kept upon the hearth until it is desulphurized, chloridized, and roasted.

Mechanical.

COTTON GIN AND WOOL BURRER.—Samuel L. Johnston, Boston, Mass. This machine belongs to the class known as roller gins, but it has a reciprocating stripping mechanism supported and held to operate in a more effective, rapid, and uniform manner. It also has a vibrating receiver and separator mechanism which receives the material from the hopper and delivers it to the roller and stripper, and also serves to clear the seed and dirt therefrom as it feeds. The machine likewise has other features designed to increase its capacity and improve the quality of the cotton and wool treated.

MACHINE FOR MAKING DRESS SHIELDS.—Emil Barsuck, College Point, N. Y. For pressing and forming a flexible material into dress shields in a simple and inexpensive manner, this inventor has devised an arrangement of a male and female die, each provided with a heating chamber, and one of the dies being adapted for vertical reciprocating movement, while the other die has means for moving it bodily in a horizontal direction into and out of position to be engaged by the first die. Several shields are thus formed at one pressing operation, the dies remaining long enough in contact to firmly shape the material, after which the pressed material is cut transversely to form the individual shields.

Agricultural.

CORN HARVESTER AND HUSKER.—Gustave Leblanc, Mead, Neb. This is a machine for field use, gathering the ears from one or more rows of standing corn and conveying them to husking devices, from which they are conveyed by an elevator to a wagon, the husks being discharged on the ground. The machine may be drawn or pushed forward by a team at the front or rear, as found most convenient, and all the driving mechanism is actuated from the axle. The machine is designed to be durable, inexpensive to build, and simple in its operation.

Miscellaneous.

TACHOMETER.—James Donnan, Ballaghaut, India. This is a distance measuring instrument comprising a pivoted telescope on one of the trunnions of which is clamped an arm adjacent to a scale, there being mounted on and adapted to move along the arm a lengthening bar having an index adapted to traverse the scale. The instrument is designed to enable the user to readily read off the horizontal distance of any point to about three thousand feet from the point of observation, through the rise and fall of this point relative to the point of observation, and also the bearing of this line from the magnetic north, or the horizontal angle subtended between any two lines which meet at the instrument.

LIBRARY STACK.—Dean A. Beckwith, New York City. The front and rear posts of this stack are provided with lugs connected by plates which form the supports for the shelves, each of the latter having depending flanges adapted to drop into position between the supporting posts, whereby the shelves cannot slip or be displaced, although they may be conveniently removed when desired. The construction is simple and durable, and a stack thus made presents a neat appearance.

WHEEL TIRE.—Samuel A. Smith, McKinney, Texas. According to this improvement the two ends of a wheel tire are connected in a very inexpensive and simple manner by a novel arrangement of a lug and screw, the lug forming practically a part of the felly, and the connection between the tire ends being firmly made, while the tire may readily be tightened at any time by simply turning a nut.

VEHICLE SAFETY DRIVING REIN HITCH.—Isaac A. Stewart, De Land, Fla. In a casing to be attached to the wagon body is held a rotatable roller or drum within which is a retracting spring, while on the drum are two oppositely wound cords, one connected with the driving reins and the other with a wheel of the vehicle. When the cords are properly connected and the horse moves, a gradually increasing tension is put on the cords by the rotation of the wheel to check the animal, the tension being relaxed if the animal backs.

SEWER VALVE.—William Godfrey, Saugatuck, Conn. This valve is formed of two halves, an inlet and an outlet section, bolted together, the inlet extension having an inclined extension with beveled edge forming a seat for a hinged inclined valve, and the outlet section at its mouth being larger than the body of the inlet section. The bottom of the outlet section is sharply curved or bent down to form an offset or drop, affording a clear space under the lower edge of the valve for the passage of sewage, insuring the positive working of the valve and preventing any clogging which may obstruct its closing.

BOTTLE STOPPER.—James F. Martin, New York City. This stopper has two independent valve seats, to be secured at a suitable distance apart in the neck of a bottle, and two ball valves having forked stems each projecting through the central opening of its seat, the forks being bent outwardly at their ends to engage the under side of the valve seat. The stopper is designed to permit the ready pouring out of the contents of a bottle, but prevents refilling, thus making it impossible to adulterate or sophisticate the liquid originally placed in the bottle.

SOAP HOLDER.—Frank H. Milligan, High Lane, England. To allow the draining off of water from toilet and other bar soap after use, this inventor provides a holder consisting of a plate or disk from whose opposite sides project studs, between which are apertures, the outer studs being longer than the inner ones, and thus forming a central depression to receive the soap. The holder may be placed in a suitable dish if desired or directly on the slab of a washstand.

FRUIT JAR CLAMP.—Henry C. Dilworth, East Orange, N. J. Fitting over the top of the fruit jar, according to this improvement, is a clamping piece to which is secured a spring, a cam lever carried by the clamping piece being adapted to engage the spring. The device may be adjusted to form a water tight seal, with the fastening yielding to permit the escape of any steam or gas which may be generated, or it may be adjusted so as to bind the cap rigidly and hermetically seal the jar.

SKATE.—Henry D. Carryl, New York City. This skate is made to be readily and firmly attached to shoes having long or short heels. It has a runner of the ordinary form, to which is secured a sole plate having a narrow portion connecting the heel and ball foot rests, and on the narrow portion is an eccentric dog which engages the forward side of the heel and clamps the narrow part of the sole plate. The improvement is designed to cheapen the manufacture, and to simplify and facilitate the clamping of the skate upon the foot.

SPRINKLER.—William L. Van Horn and Martin Yount, Norfolk, Neb. For the sprinkling of lawns and planted beds, these inventors have devised a sprinkler to be placed at any desired point, and which has a revolving section through which the water may be delivered through the sides, or downwardly or upwardly, in the latter case falling in drops to imitate rain.

DESIGN FOR A RING HOLDER.—Adolph Sametz, New York City. This design comprises a series of elongated V-shaped tongue-like figures on a rectangular board, the edges of which display a lace work ornamentation.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each, Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

LEE'S CONDENSED CYCLOPEDIA. A comprehensive digest of the world's knowledge in history, biography, geography, philosophy and science. By Prof. C. M. Stevens. Chicago: Laird & Lee. Pp. 384. Price, library style, 50 cents; leather, full gilt, $1.

NYSTROM'S POCKET BOOK OF MECHANICS AND ENGINEERING. Revised, corrected and greatly enlarged, with addition of original matter. By William Dennis Marks. Twenty-first edition, further revised and corrected by Robert Grimshaw. Philadelphia: J. B. Lippincott Company. 1895. Pp. 675. Price $3.50.

We welcome the twenty-first edition of this book, which has had a wide popularity, this twenty-first edition only emphasizing its utility to the engineering profession.

MECHANICS. An elementary text book, theoretical and practical, for colleges and schools. Dynamics. By R. T. Glazebrook. Cambridge: At the University Press. 1895. Pp. ix, 256. Price $1.25.

This excellent little work, one of the Cambridge Natural Science Manuals, in the Physical Series, is based on the idea of having the student make his own experiments. This it does without in the least impairing the thoroughness of the work, which is a genuine scientific treatise and by no means an intermediate manual. Nothing is clearer than the fact that a thorough knowledge of mechanics is the greater part of the foundation of physics, or, at least, represents the greater portion of the work that is to be done in acquiring a comprehension of the science. The experiments are somewhat in the line of the Harvard entrance examination work, but are far superior in type, a superiority, perhaps, partly due to the somewhat more advanced treatment of the subject employed. It will be understood, moreover, that they do

not go outside of mechanics. The description of Hicks' ballistic balance, with a "comparison of masses," is particularly to be noted as an example of the treatment given the subject by the author.

POPULAR ESSAYS UPON THE CARE OF THE TEETH AND MOUTH. By Victor C. Bell. Published by the author. 1894. Pp. 103. Price $1.25.

It really seems to us as if this book were one which might have considerable utility. It treats of the general sensible care of the teeth, home remedies, and an excellent chapter is given in conclusion on "quackery," which is really an appeal for good work, and as such must be recommended. The book has no index, but, perhaps on account of its shortness, it hardly needs one.

TELEGRAPHIST'S GUIDE TO THE NEW EXAMINATIONS IN TECHNICAL TELEGRAPHY. Together with an appendix dealing with dry and secondary cells, universal battery system, direct reading battery instrument, duplex (bridge method), new system of morning testing, fast speed repeaters, etc. By James Bell, A.I.E.E., Certified Teacher City and Guilds of London Institute. London: Electricity. Pp. 101. Price 60 cents.

PRACTICAL TELEGRAPHY. By F. E. Wessels. A book for self-instruction. 1895. Pp. 24. Price 50 cents.

The Locomotive, a monthly publication of the Hartford Steam Boiler Inspection and Insurance Company, has just completed its 15th volume. Its inspectors' reports of examinations of boilers, with the defects found therein, and its notes on boiler explosions, render this little work an especially valuable one to engineers, when it is remembered that the boiler inspections number as many as from ten to twelve thousand per month. In 122,893 boilers examined last year, 597 were condemned, and dangerous defects were found in 12,390. As might be looked for in such a publication, it contains much valuable information on boiler construction and preservation.

SCIENTIFIC AMERICAN

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JUNE, 1895.—(No. 116.)

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(6543) D. T. W. asks: What is the velocity of electricity, as in telegraphy? A. It depends on the delicacy of the receiving instrument and on the capacity of the line. It is fair to assume that the first faint and imperceptible disturbance goes with the speed of light (about 186,000 miles per second), but considerable time may elapse before.

(6544) Machinist, Memphis, writes: If an eccentric on an ordinary stationary engine is chucked in the lathe, got dead true on the outside, turned off ⅛ or ¼ of an inch and the straps bored out to suit, will it change the throw of the valve or not? A. The size of the eccentric does not control the throw of the valve. The amount of eccentricity only is considered, whether it be a pin or a large disk.

(6545) C. A. M., Cal., writes: In laying a pipe line 40 miles long, using 2 inch and 3 inch pipe, which is the most practical method in laying the line, using 20 miles of each? Which will make the most friction, the 2 inch pipe at the pump end and the 3 inch at the outlet, or the 3 inch at the pump end and the 2 inch at the outlet? The pump will lift the oil 200 feet for the first half mile, then it will have a fall of 1,500 feet for 39½ miles. A. The 3 inch pipe should be laid at the pump end of the line. This will relieve the friction on the rising end of the siphon from the work of the pump, and allow the best condition for gravity flow on the long leg of the siphon. This will relieve the work of the pump to a small extent and yield the largest possible delivery at the discharge end.

(6546) B. H. T. asks: 1. Why does not more surface of plate give more current in cell? Text book says that the only difference size of cell makes is difference in internal resistance. A. It does give more current. Lowering the resistance implies at a constant voltage the development of more current. 2. What makes telegraph or telephone wire sing? A. The action of wind upon them, on the principle of the Æolian harp. —Governments have done considerable in the way of affording State support to colleges and universities. As a rule, anything in the nature of a substantial support received by any individual in pure science is derived from a connection with one of these institutions. There have been some government prizes, but these are of comparatively little importance.

(6547) W. H. K. asks: Which will run the easier, a 26 inch or a 28 inch bicycle, both geared to 60 inch, weight carried the same, over ordinary roads? A. It is hard to answer this question authoritatively. We should decidedly incline to recommend the larger wheel. The larger sprocket on the rear wheel counts as an advantage, and for even gear the larger sprocket will go on the larger wheel.

(6548) D. R. W. asks: What is the best known (solid) non-conductor of sound? A. Indiarubber is about as good as any.

(6549) H. A. asks how to clean and make smooth the outside of an upright boiler, and what kind of paint is used to paint boilers, and make them shine? A. The boiler can be rubbed smooth with a piece of pumice stone and water, then painted with black japan varnish, or, what is more commonly used, coal tar varnish.

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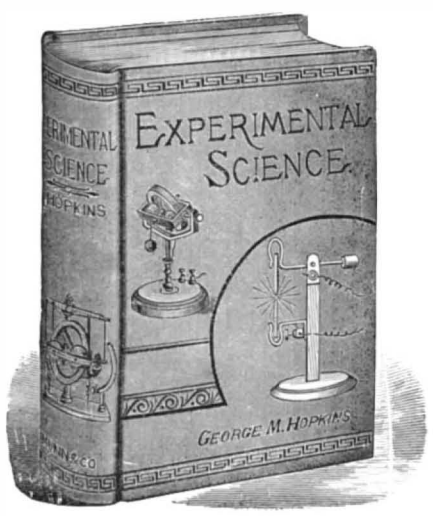

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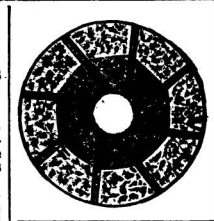

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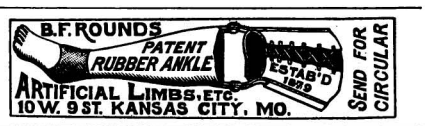

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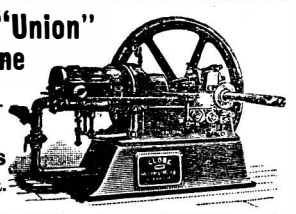

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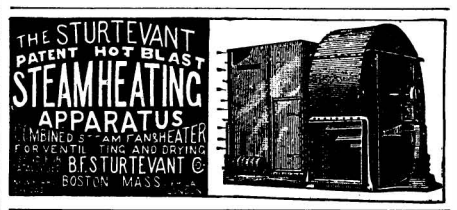

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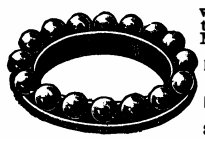

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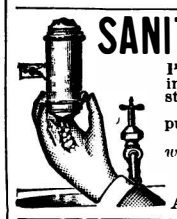

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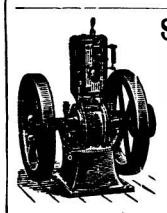

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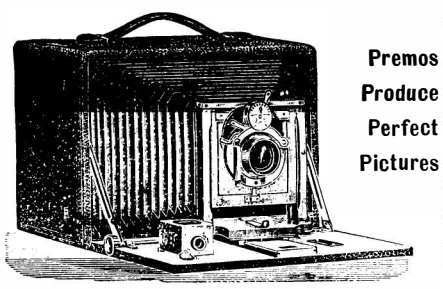

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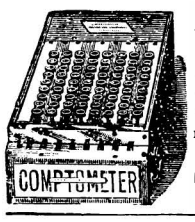

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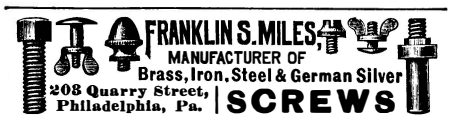

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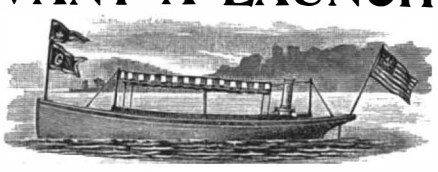

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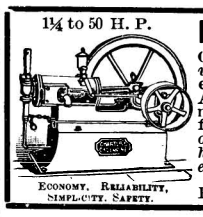

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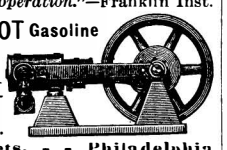

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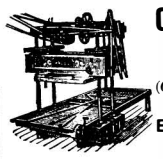

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