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**Notes and Queries.**

**HINTS TO CORRESPONDENTS.**

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(8760) J. A. D. asks: What kind of a composition can I use to build a castle for fish aquarium, that I will not have to bake as the potter does? It should be white or light stone color. Aquarium cement is too dark, and it does not dry without litharge in it, and Portland cement does not hold for so small an object. I have used plaster Paris for a castle and soaked it in melted paraffin, but it softens in a short time under water. The composition must not contain lead or other poisonous substance. A. Following are two formulæ for a non-poisonous aquarium cement: 1. Melt together over a gentle heat 3 parts of linseed oil, 4 parts of tar, and 16 parts of resin; if not sufficiently firm, keep simmering for a short time. Use warm. This, of course, would be dark-colored. 2. Take 8 ounces of a solution of good glue and 1 ounce of Venice turpentine and boll together, stirring until mixture is complete. The joints after cementing should be held together for several days to secure the best result.

(8761) F. C. P. asks: 1. What is the specific gravity of acetylene gas? A. The specific gravity of acetylene gas, referred to hydrogen as unit, is 13; referred to air as unit, it is 0.92. 2. What is the specific gravity of illuminating gas? A. No definite specific gravity can be given for illuminating gas on account of its variability; whether coal gas or water gas, how largely carbonized, etc. In general, its specific gravity will be between 0.5 and 0.6, referred to air as the unit. 3. If a cylinder of aluminum, 60 feet long, 10 feet diameter, 1/2 inch thick, be exhausted of air, would it float in the surrounding air, or what would happen? A. As the weight of such a cylinder of aluminum is 3,433 pounds, and the volume of air it displaces weighs only 380.7 pounds, it would not float in the air. In order that an object may float in liquids or gases, it must weigh less than the weight of the volume of fluid it displaces. 4. How much is a cubic foot? A. A cubic foot is the equivalent of 6.23 English Imperial gallons, or 7.48 ordinary Winchester gallons.

(8762) H. P. A. asks: 1. What is the mean spherical candle power of a 1,200 candle power arc lamp (direct current), and what part is utilized in lighting the street or radiated below the horizontal? A. Foster, Pocket Book, gives an empirical formula for determining mean spherical candle power approximately, as half the horizontal candle power plus one-fourth the maximum candle power. Thus a lamp which gave 1,240 candles as a maximum, gave 240 in a horizontal direction. Its mean spherical candle power was 385, the rule giving 370 or very nearly the same result. You will find several papers in the transactions of the American Institute of Electrical Engineers on this difficult subject. 2. What is the wattage required for the above lamp? A. Such a lamp may take 300 or a little more watts. 3. How does an inclosed arc compare with an open arc for efficiency? A. The inclosed arc is preferred to the open arc principally because it costs less to operate. It runs 100 to 120 hours on one trimming. A single lamp can be cut out of circuit without disturbing others. If ordinary open arcs are used, two must be turned off together. The light of the inclosed arc is more evenly diffused than that of the open arc. They consume less current than the open arc. 4. What is the wattage required for a 25 candle power incandescent lamp used on a direct current series line? A. An incandescent lamp is usually made 2 1/2 to 3 1/2 watts per candle. 5. In the July 26 SCIENTIFIC AMERICAN, I find that the cables of the new East River Bridge are made up of 37 strands arranged in a hexagonal cross-sectional form, five strands lying on each side of the hexagon. Now, my query is, How are the 37 strands arranged to form a hexagon with five strands on a side? A. As to the shaping of the cables of the new East River Bridge, we beg to refer you to the engineers. Address Engineers' office, New East River Bridge, Brooklyn, New York.

(8763) E. L. T. writes: I have several paper-bound books which I would like to  
(Continued on page 440)

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cover with cloth, but cannot find any paste which is just the thing. Can you suggest something? It should attach cloth to paper securely, be somewhat flexible when done and dry quickly. A. Bookbinders generally use ordinary flour paste for covering board or paper with cloth. It is best made by stirring up the flour with a small amount of cold water, and then running it into hot water to which a little alum has been added, stirring until smoothly swelled. If this be not found strong enough, make a little starch paste in same manner and add some Venice turpentine.

(8764) A. M. says: If you take 2 drachms of sugar of lead, dissolve in 1/2 pint of water, then take 6 drachms of hyposulphite of soda, dissolve in 1/2 pint of water, then mix the two solutions, you will get a precipitate. Now what I want to know is, What is the precipitate and what is the solution I want to use? Does it contain lead enough to be injurious to the human system? A. Sugar of lead (lead acetate) and hyposulphite of soda (thiosulphate of soda) react with the formation of lead thiosulphate and sodium acetate. If the sugar of lead and hypo be taken in molecular ratios, that is, 379 parts of crystallized lead acetate to 248 parts of crystallized hypo, there will be an almost complete precipitation of lead thiosulphate; this precipitate is at first white, but it turns black by standing or by warming, owing to its conversion into lead sulphide. By using a larger amount of hypo, the precipitate of lead thiosulphate at first formed will redissolve as a double sodium lead thiosulphate. These reactions should all be conducted with the cold solutions; heating will always cause blackening. The amount of lead that will remain in solution will depend upon the greater or less excess of hypo used. It is always a risky thing to introduce lead into the human system; its effect is cumulative.

(8765) H. F. I. asks: I have a 50-kilowatt general electric alternator which I use for incandescent lighting with primary circuit at 1,150 volts and secondary at 104 volts. I wish now to put in a few arc lamps; if I put constant potential lamps in parallel on the secondary circuits, will it make the incandescent lamps flicker? A. The ordinary series arc lamp cannot be used on constant potential mains. An arc lamp provided with a suitable resistance can be. Such lamps are furnished by lamp manufacturers, both open and inclosed arc, and are in use in very great numbers in many places. We do not think the incandescent lamps will flicker so long as they are bridged across the secondary circuit.

(8766) W. M. B. asks: Which is the more healthful underwear—pure wool or linen mesh? A. This is a matter that cannot be settled by anyone's dictum. The advocates of wool claim this to be superior, while the advocates of linen are equally insistent they are correct. In favor of wool may be said that it is the more natural body covering, as it is chemically allied to hair, in fact, the hairy covering of all animals is much alike. Also, wool gives undergarments of greater warmth; linen does not retain the body heat as well, and in this climate it is very probable that linen mesh would be pronounced too cool to wear by very many people. In favor of linen we have the fact that the linen fiber is a cellular fiber, and hence very resistant to any decomposing action; while wool is a nitrogenous fiber, and hence not as stable or resistant. Also, linen allows the perspiration of the body to pass through and evaporate more freely. It would seem as though the advantages of both kinds of undergarment are pretty evenly balanced, and that preference is really a matter of choice and comfort, not of health.

(8767) T. A. K. says: I have some selenium in the powdered or precipitated form with which I want to spread a thin coat over a plain metallic surface, after which I want to anneal the selenium and make it sensitive to light. Will you please give me detailed directions for doing same? Is there anything that will dissolve the selenium so that it can be flowed over the surface so that the solvent will evaporate and leave the selenium, which can be annealed afterward. A. There are two allotropic forms of selenium. The one is soluble in carbon bisulphide; the other is insoluble, but if it be melted and then cooled rapidly, it also becomes soluble. Both forms will dissolve in selenium chloride.

(8768) M. F. S. asks: 1. What would a barometer register in a perfect vacuum? A. A barometric perfect vacuum should correspond absolutely with the atmospheric pressure, less the elastic force of the vapor of mercury. A nearly perfect vacuum applied at the base of a barometer should register at equal levels of the mercurial surfaces. 2. When it registers at 1/2 inch is it near a perfect vacuum? A. One-half inch of barometric height is only a partial vacuum and is equal to 0.245 of a pound pressure per square inch absolute. 3. About what would a barometer register in an incandescent electric lamp globe? A. The residual volume of air in the best incandescent lamps is about 1-1,000,000 of the volume at atmospheric pressure. When charged with gas free from oxygen the vacuum may be much less. 4. Can a perfect vacuum be made? A. We understand that a perfect vacuum has not yet been accomplished. The most perfect vacuum yet claimed is 1-500,000,000 of the volume.

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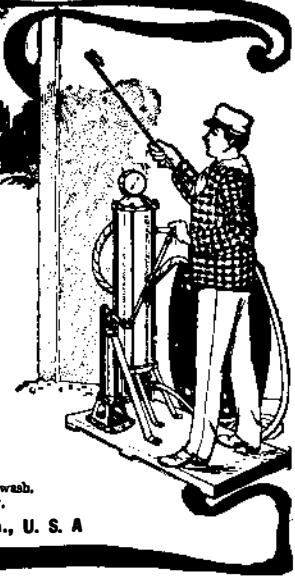
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For a period of fifty years Munn & Co. have acted as solicitors of patents, and during this period have filed more applications for patents than any other attorneys in the United States. The following extracts from letters recently received will give some idea of the manner in which the professional services of Munn & Co. have been appreciated by those who are best qualified to judge of this matter, and this evidence of satisfaction is all the more noteworthy, inasmuch as these words of commendation have been uttered without any suggestion or solicitation on our part.

I have received the patent papers for my storage battery and I assure you I am very much pleased with the treatment received from you in every particular. You were frank to point out my errors, and careful to draw out all of the little points and details which I now see the importance of and which would have been left out. If inventors knew the interest you take in their work in connection with your experience and ability, which no one questions, I am sure they would not so dread making applications for fear of errors nor be at a loss to know whom to employ.

I appreciate the thorough, business-like manner in which you transact your business, and will not fail to have a good word for Munn & Co. when an opportunity presents itself.

We are pleased to note that you have been successful in obtaining our patent, and we again thank you for the interest you have shown and for the able manner in which you have conducted our case.

Permit me to thank you for your care in looking after my interest in the case while pending, coupled with your great courtesy in all of our correspondence. I also receive a copy of the SCIENTIFIC AMERICAN. It affords me pleasure to say that I have been a reader of this valuable paper for many years and expect to continue during life.

I thank you very much for the mention made of my invention in the SCIENTIFIC AMERICAN, and I think this ought to bring it before the manufacturing public in pretty good shape, and I hope I may see my way clear to placing a standing advertisement with you in the near future.

Permit me to thank you for your promptness and accuracy, by which you so earnestly endeavored to protect my interest. I trust that I may have not the privilege alone, but the pleasure of other business relations with you.

Both Mr. Orr and myself are very much pleased over the prompt manner you have looked after this matter for us. I shall be pleased to recommend you to clients who may be interested in patent applications.

We thank you for the diligent manner in which you have prosecuted our claim, and its successful termination.

I beg to express my appreciation of your successful efforts in securing for me claims that are so broad and fundamental in their character.

We are greatly pleased with the service which you have rendered us and wish to thank you for your promptness and honorable dealing throughout.

Am well pleased with the way that you carried through the full number of claims, thereby getting for me a good, strong patent, and you can feel assured of getting my patronage in the future should I decide to have any other patents.

Please accept our thanks for your masterly treatment of our case, and the perfection of your work.

We were most agreeably surprised to learn that you had secured such broad claims in spite of the action of the Patent Commissioner. We wish to say that in every case you have conducted for us the results have been greater than we anticipated.

This makes the fifth Letters Patent that have been granted to me through you during the past year. I wish to thank you for your promptness and the careful attention which you gave to my business.

I thank you kindly for your promptness and honesty, which I appreciate highly. Let me give you my best thanks for the masterly way in which you procured for me my patent, as you got me more concessions than I ever hoped for, and for this there will be only one Patent Agency for me and that is MUNN & CO. As far as in my power I will recommend you to one and all that have any aspirations for patents.

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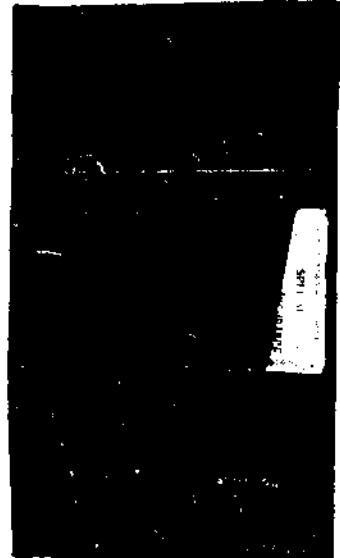
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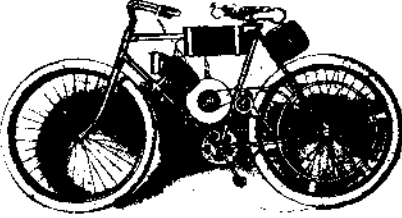


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**Engineering Notes.**

The British Admiralty are carrying out numerous experiments at Devonport with a view to ascertaining the most suitable means of preventing torpedo craft from "jumping" obstacles placed across a harbor entrance as a defense against torpedo attack. The obstacles for the purpose of the experiments will comprise steel hawsers, nets, and balks of timber. A torpedo boat with powerful engines and a strongly-built hull has been specially selected for the tests.

The new steam pilot boat "New Jersey," built for the New York, New Jersey and Sandy Hook Pilot's Association, had her trial trip November 12. The run was made from the whistling buoy to the Sandy Hook lightship, 4 1/4 miles, and she covered the distance in 16 minutes. The New Jersey is equipped with electric lights that are operated from the pilot house. She is constructed of oak, and her cabins are finished in white enamel, with mahogany trimmings. She has fore-and-aft compound engines, and her builders guarantee a speed of eleven knots. The "New Jersey," when on station, will carry twenty pilots and will cruise off shore. Her crew consists of a captain, one mate, two engineers, three oilers, four firemen, one boatkeeper, and four deckboys. Capt. Hennessey has command. She will put three sailing vessels out of the service. Her dimensions are 135 feet over all, 125 feet keel, 28 feet beam, 17.6 feet deep, and 13.6 feet draught.

The directors of the Nord, Ouest, and Orleans railway companies of France, and representatives of Belgian, Dutch, German, Austrian, and English roads recently met at Paris, in order to make arrangements for a through-train service from Paris to Pekin. It was shown at this meeting that the trip could be made by way of St. Petersburg and Siberia in eighteen or nineteen days, while the sea route, either by the Suez Canal or the Atlantic and Vancouver, requires from thirty-two to thirty-three days. All that seems necessary at present is an arrangement of time-table connections and the selection of cities in which through tickets may be purchased. It is said that through tickets will be delivered at both Havre and Cherbourg, and trans-Atlantic companies will be able to state before boats leave New York whether or not connection will be made with through trains to the Orient. The same arrangement will be made for the daily service between Southampton and Paris. It was also decided at the recent meeting to form a combination with the trans-American railroads and trans-Pacific lines, so that round-trip tickets from New York to Pekin could be sold at the former city, with the privilege of going by the Pacific and returning by the trans-Siberian route, or *vice versa*. The time required from New York by either route is about the same.

A further important step toward the realization of the late Cecil Rhodes' great transcontinental railroad across Africa, linking Cairo with Cape Town, has been completed by the opening of the track between Bulawayo and Salisbury via Gwelo, a distance of 300 miles. By the completion of this section 2,000 miles of track of the Colonial gage is open to through traffic from Cape Town to Beira. The South African war somewhat retarded the progress of the work, as it was not possible to forward the material northward from Cape Town, so that work had to be suspended at the Bulawayo end of the section. However, other portions of the route were proceeded with meanwhile. As this section is now open to traffic, it will appreciably facilitate the progress of the through Cape to Cairo road, as it will now be possible to forward the constructional material from the landing quays from the Cape Colony and Beira ports direct to the railroad head. The Cape to Cairo track is laid for eighty miles north of Bulawayo in the direction of the Victoria Falls. It is anticipated that the

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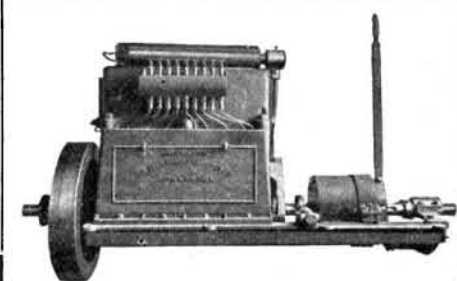
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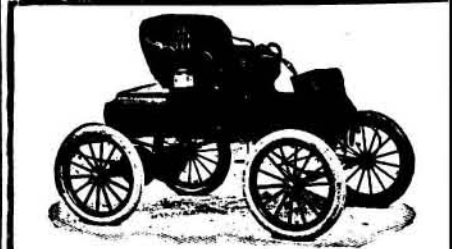
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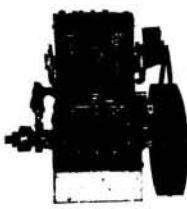
road being laid will reach the Wankie coal field region by the beginning of 1903.

The Russian government has completed the surveys for the railroad from Odessa via Nicolaieff and Kherson to Jankoi, on the Sevastopol road, with a branch of about thirty miles to Ochakof. Although this road is principally of strategical value, it will be highly beneficial to the commercial development of the region by opening up a large tract of grain-producing country that has hitherto been severely handicapped owing to the lack of railroad communication. The dredging of the Ochakof bar and estuary of the River Boug—work forming a portion of the general scheme—has been completed. The fairway between the commercial port at Nicolaieff and the sea is now 25 feet deep by 350 feet wide at the bottom, and as it is now buoyed, will be officially thrown open to navigation. By the completion of this dredging nearly all the steamers that visit the Black Sea will be able to load cargoes at Nicolaieff, so that the latter port will become a powerful rival to Odessa in the grain-exporting trade.

Experiments have been carried out on a railroad near Frankfort with a device to prevent collisions, with conspicuous success. The invention consists of a small apparatus fitted to the locomotive, which gives visible and audible signals if another locomotive is approaching on the same line of rails, or if a switch is misplaced, while in addition it also renders telephonic communication between locomotives possible. For the purpose of the experiments two locomotives were started for the same point on the same line of rails. When they were a certain distance apart, the apparatus on each locomotive gave signals to the engineers, who were then able to enter into communication.

Some time ago the SCIENTIFIC AMERICAN described the Tehuantepec Railroad scheme, by which President Diaz hopes to divert the commerce of the Atlantic and Pacific oceans across this narrow part of Mexico. The plan has received still another setback. Dispatches from Salina Cruz, the Pacific terminus of the road, tell of a terrific series of earthquakes and tidal waves which wrecked the harbor improvements at that point and have involved a loss of half a million dollars. Although President Diaz still firmly believes in the feasibility of his scheme, capitalists will probably shrink from investing their money in a region which is likely at any time to be destroyed by a volcanic eruption. The ruined road was built and thrown open to traffic in 1885, after seventeen years of alternate failures and renewed attempts to complete it.

A new type of propeller for ocean steamships has been invented by Count Rudolph von Westphale, of Vienna. In this new design the four blades that usually run out from the boss at the end of the shaft are substituted in straight and flattened supports by blades that are attached to their ends. The propelling blades have their outer ends at the same general angle of the screws, while the inner ends, instead of coming together at the center of the boss, meet at the outer extremity of the boss, where they are held in position by a circular band. The wheel practically has eight propeller blades. The outer blades are only half the width of the ordinary blade, and six inches shorter than the regulation wheel on the port shaft. Practical tests with this new propeller have been carried out on the North German Lloyd steamer "Frankfort," and it was found that in the revolutions of the two types of screws the new propeller made 68 revolutions per minute as compared with 70 revolutions of the ordinary propeller, though the speed was the same in each instance. The main objects claimed for this new propeller are less vibration, and greater economy in coal consumption and steam power than are possible with the present type of propeller.



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Treasury made the above statement instead  
of a private corporation, and yet the private  
corporation in this instance may be just as cap-  
able and just as reliable as the Secretary of the  
Treasury. We know we have the greatest prop-  
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of cities, and our difficulty is not to convince  
you, but to get the chance of presenting the  
fact to you.  
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couple will come close to making them indepen-  
dent in their old age; \$500 invested by a young  
man or a young woman will, in our opinion, pay  
them five times better than any life insurance  
they can possibly take out, and this \$500 can be  
invested at  
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long, it will be interesting, and you will  
see a astonishing facts about New York and its  
marvellous growth that will interest you. You  
don't object to getting this, do you? All right,  
sit down, right now, not to-morrow—to-mor-  
row" ruined Napoleon—to-day, now, this min-  
ute. A penny of ink, a postal card, a minute's  
time may bring you a fortune. Isn't it worth  
the while?  
Remember, our offer also carries a free deed  
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year from Nov. 1, 1912, a free round-trip to New  
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highest class of park-like improvements free,  
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**Electrical Notes.**

The Northern California Power Com-  
pany, which furnishes power to a great  
variety of industries in one of the most  
prosperous sections of California, has re-  
cently installed a 4,000 horse power gen-  
erating plant at the Cow Creek station,  
which is situated in the high Sierras and  
is typical of the many transmission plants  
which have recently been installed in  
California. The ultimate capacity of the  
station will be 8,000 horse power when  
the demand for power reaches this  
amount. The company has already in-  
stalled 3,000 horse power at another gen-  
erating station, known as the Battle  
Creek station, thus making the present  
total capacity of the company's electrical  
installation 7,000 horse power. Among  
the industries supplied with power by  
this company are ore-smelters, the city  
waterworks at Red Bluff and Redding, and  
the operation of large air compressors at  
the Mount Copper Company's mine at  
Iron Mountain. For lighting current is  
also furnished to the cities of Redding,  
Red Bluff and Willows, and the towns of  
Keswick, Cottonwood, Anderson, Corning  
and Vina. These towns lie along the Sac-  
ramento River and are located in one of  
the most fertile valleys in California.  
Irrigation is necessary on most of the  
land in this valley, and electrically-driven  
centrifugal pumps are employed to raise  
the water to the irrigating ditches. This  
cheap method of placing in the hands of  
the farmer the ability to obtain water  
away from streams and creeks has made  
him independent of the great water com-  
panies, and has rendered it possible to  
develop large areas of land which would  
otherwise be practically desert wastes.  
Many thousands of motors are already in  
operation in California driving pumps for  
irrigation work, and immense develop-  
ments are yet to ensue from this appli-  
cation of electric power. The apparatus  
which the Northern California Power  
Company has recently installed in its Cow  
Creek station consists of two 1,500-kilo-  
watt, three-phase, Westinghouse alterna-  
tors, which will be driven by impact  
waterwheels supplied with water under a  
head of approximately 900 feet.

Electric traction is especially active in  
Italy at the present time. One of the  
most important electric railroads, the  
Milan-Varese system, has recently com-  
pleted an important branch from Varese  
to Porto Cerisio, and the tests which have  
been made on the line from Gallarete  
to the last named point proved quite satis-  
factory. The grades are considerable over  
the new branch and in many places reach  
as high as 20 per cent. The electric loco-  
motives, however, have no difficulty in  
making the trip at a speed of 35 miles an  
hour, which could not be reached before  
by the steam locomotives. The train  
makes the run from Porto Cerisio to  
Varese, or 8.4 miles, in 17 minutes in  
spite of the grades and sharp curves. The  
Milan system, which has already been de-  
scribed, contains a line from Milan to  
Gallarete, 24 miles, and from this point  
are three branches to Porto Cerisio,  
Laveno and Arona, of 20, 15.6 and 18.6  
miles respectively. Trains have been  
running from Milan as far as Varese, or  
35.4 miles, for some time past, but it is  
only recently that the line has been ex-  
tended to Porto Cerisio, 8.4 miles, making  
the total distance 43.8 miles. The work  
on the other branches has not yet been  
completed. On this road motor cars and  
trailers are used, and trains are gener-  
ally made up of two motor cars and two  
trailers. An electric locomotive is also  
used for freight and postal cars and sev-  
eral new locomotives are to be built. At  
last accounts there were 32 trains run-  
ning over the Milan-Varese section, among  
which were 7 direct trains which made  
but one stop between the terminals and  
cover the 44 miles in 53 minutes. In  
view of the success of the recent tests  
and the completion of the new branch,  
the project for electric traction from  
Naples to Rome, which has been discussed  
for some time, is being actively taken  
up. Besides this, there will be several  
*(Continued on page 424)*

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satisfied customers in all parts of the country, testi-  
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branches such as Velletri-Terracina and others in the south of Italy. The extensive system which is contemplated will take a large plant, this being estimated at 40,000 horse power, of which the Naples-Rome system alone will require 25,000. A number of hydraulic plants are to be erected to supply the roads, and these will use the falls of the Liri and the Volturno, as well as the Anione, the Pescara and several other streams.

When a small E.M.F. is applied to an ozonizer, no ozone is formed, but as the E.M.F. is increased, ozone begins to form at a certain point, and a further rise of E.M.F. causes a very rapid increase in the amount of ozone formed. When the E.M.F. is high, the power of the current to produce ozone is proportional to the square of the potential difference which exists between the armatures. As this law is not applicable until a certain E.M.F. is reached (which depends on the size of the apparatus), Mr. A. Chassy, in a recent paper, introduces the idea of a dielectric inertia to explain the irregularity.

The value of waterfalls has greatly increased since the electrical era, says the Mining and Scientific Press. Time was when a cataract was valuable only for scenic purposes, but now it is useful as well as ornamental. Niagara is worth one thousand million dollars more as a source of electrical power than merely as a sight. California waterfalls are increasing in value in a commensurate degree. Snoqualmie Falls, in Washington, has enhanced in value 5,000 per cent in the last few years.

The city of Bombay, India, is to be equipped with an extensive system of electric traction and lighting, while another scheme for operating a stretch of railroad is to be carried out. Water is to generate the necessary power for both projects. For these purposes two huge water-power plants are to be constructed. The machinery for supplying the electricity to work the railroad is to be installed on the Doodh Sagar River, about 300 miles north of Bombay, at a waterfall which is about 2,500 feet in height. It is anticipated that with the projected machinery for this installation 50,000 horse power will be generated—available throughout the year—sufficient to operate some sixty miles of track. The power for lighting and working the street railroads of Bombay is to be transmitted from Neral, about forty miles distant from the city.

A comprehensive scheme of electric traction is to be installed upon the roads of the foreign settlement of Shanghai. Competition for the construction contract was very keen between American and British firms, but the order for the equipment has been placed with two English houses. Work is to be commenced immediately. The present contract comprises the construction of nine and a half miles of double track, and eight miles of single track, the necessary equipment and cars. The work is to be completed by the end of 1904, and the cost is estimated at \$3,500,000. The Shanghai Municipal Council reserves the right to take over the roads at the end of twenty-one years on specified terms.

A system of electric heating has been adopted in the cars of the electric railway to Versailles. In each car of the central corridor class, ten heaters are placed on the floor between the seats, so that they act as foot-warmers. The heaters are of the Parvillée type, in which the resistance consists of a mixture of metallic powder, quartz, kaolin, and a flux, and are connected five in series—being supplied from the third rail at 550 to 600 volts. At 110 volts each takes one ampere, and the total power for each carriage, which seats forty passengers, is therefore 1,100 watts. Assuming a cost of 15 centimes per kilowatt hour, it follows that the expense of sixteen hours' use will be 2.64 francs. The mean temperature obtained at the surface of the heaters is 70 deg. when the external temperature is 0 deg.



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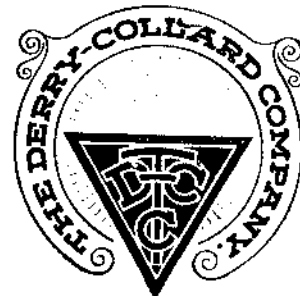
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to its readers is seldom determinable, for the reason that, beyond an occasional letter of praise from "an old subscriber" or "an admirer"—who is influenced by some particular article that coincides with his own views—editors and publishers rarely receive any commendation for their work.

It is rarer still that such commendation takes tangible shape or extends beyond mere words, and therefore the periodical that can draw forth from intelligent people a substantial acknowledgment of its value must be conceded to have a very strong hold upon its readers. The following are extracts from letters from prominent Members of Congress who are readers of the **SCIENTIFIC AMERICAN**:

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The following are a few comments received by the Editor from subscribers when renewing their subscriptions. These letters were entirely unsolicited on our part, and are valued as showing the appreciation of readers from various sections of the country, both young and old.

I have been a reader of the **SCIENTIFIC AMERICAN** for twenty-seven years, and every issue is just as new and interesting to me as the first copy was when I was a young man.  
J. L. Painter, Bellevue, O.

A long story short is this: My son, eleven years, over one year ago could not be interested in his school work. We had tried every means. Just why I cannot say, one year ago I ordered the **SCIENTIFIC AMERICAN** in his name. He was interested, became studious and did so well his teacher called to ascertain what was the reason. I thought I could not afford the paper for the coming year, and my son has earned the money and wishes to have his **SCIENTIFIC AMERICAN** continued another year.  
G. B. Hoyer, Elgin, Ill.

I have taken the **SCIENTIFIC AMERICAN** for fifty years, ever since it was first started. I intend taking it while I live. I am only eighty years old now, and may live some years longer in this healthy climate.  
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I cannot do without your paper, having had it for 40 years.  
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W. M. King, Germantown, Philadelphia, Pa.

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T. L. Charman, Oregon City, Oregon.

I have nearly complete volumes of the **SCIENTIFIC AMERICAN** for some thirty-five years, and consider myself a life member.  
T. J. Howe, Owatonna, Minn.

I have subscribed for your paper over forty-eight years, and have not missed a copy, and would not be without it.  
F. M. Wiser, New Haven, Conn.

Pres. Angell, of the University of Michigan, when questioning students in an important examination, said, "I would trust any boy anywhere that reads the **SCIENTIFIC AMERICAN**."

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John Kerstein, Clarson, Iowa.

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A. C. Winch, Saxonville, Mass.

I have taken the **SCIENTIFIC AMERICAN** for the last twenty-five years, and have every issue to date. I would not think of doing without it. It is the best paper published in the world.  
L. G. Murray, Converse, Ind.

I have taken your interesting and valuable paper for more than twenty-five years, and probably shall continue as long as I live, and I wish that every young man could be a constant reader of it.  
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**Science Notes.**

A. Winkelmann states that as a result of his experiments on the diffusion of hydrogen with platinum, he finds that the rate of diffusion increases after the platinum has been treated for some time. It is proved that this is not due to expulsion of occluded air, but to the crystalline structure assumed by the metal. When the platinum has passed into this state, it persists therein. The diffusion of hydrogen through red-hot platinum is not proportional to the pressure of the gas, but it is probable that the diffusion is accompanied by a dissociation of the molecules, and only the atoms of hydrogen pass through metal. The results agree with the formula obtained in previous experiments. The present experiments were made with a platinum tube 19 cm. long, 1 mm. in diameter, and 0.1 mm. thick in the walls. The metal was heated electrically.

A writer evidently versed in the practical manufacture of mantles contributes to a contemporary the information that the chemicals in 1,000 mantles cost \$17.50; the fabric prepared, \$13; the shaping, \$14; coating, \$3.75; boxing, labeling and packing, \$3.75; profit, and selling expenses, \$6; total, \$60. Or the manufacturer cannot sell a reliable mantle for less than 6 cents apiece.

It has been found that when photographic dry plates are cut with a diamond on the side opposite the film, and then developed, the film turns dark along the edge of the plate to the breadth of a few millimeters. The film always develops first on the side next the glass. This effect has been traced to a momentary fluorescence along the line traced by the diamond, the radiation penetrating the plate.

The formation in the gold fields of South Africa is peculiar. The gold is in reefs. According to the Mining and Scientific Press, these reefs are massive and made up of coarse granite conglomerate and sandstone, with here and there large or small cement seams. The gold is not in the quartz or sandstone, but in the cement. The streaks which carry the gold are from 6 inches to 60 feet in width, and almost invariably widen with depth. When the outcropping is first discovered it looks like a vertical vein, but soon flattens out on depth. The mining there is more like coal than gold mining anywhere else. Shafts are nearly all 16 x 8 or 16 x 6.

During the progress of some excavations in Alexandria, Egypt, the workmen came across several huge blocks of masonry, some as much as three yards square. The remains of the entablature of a large edifice, which probably consisted of two stories, were also found. Some of the blocks bear quarry marks difficult to decipher. These masonry blocks, which have been examined by experts on the spot, are believed to be the ruins of the ancient theater of Alexandria described by Strabo. The discoveries are to be carefully investigated by expert Egyptologists to ascertain their exact origin and the era to which they belong.

The so-called gutta-percha tree which has been grown experimentally in the island of Zanzibar appears to be of doubtful economic value, as the latex obtained from it loses its plastic character after a few months, and becomes friable.

A series of experiments has been made by Schaible to determine the effect of diminished air-pressure on the growth and germination of plants. The apparatus used is fully described and illustrated and details of numerous experiments are given. The results arrived at were that, as compared with similar plants grown under normal barometric pressure, those under the diminished pressure—in most cases about one-quarter atmospheric pressure—was employed—(1) grow more rapidly; (2) germinate more slowly; and (3) excrete drops of water from their leaf surface.

Prof. Exner, founder and director of the Technological Museum of Vienna, re-

(Continued on page 426)

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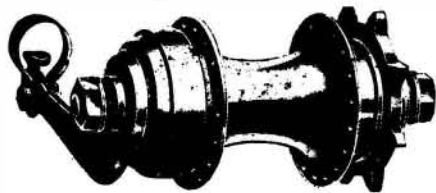


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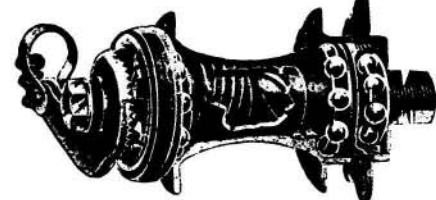
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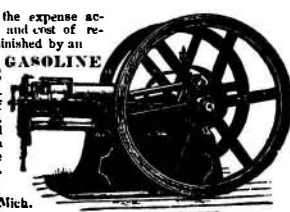
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cently declared that the five million technical experts of all grades throughout the world had too small a share in law making and the administration of the various states. He maintained that technical knowledge was of such importance as to warrant the creation of politically independent technical departments in every country.

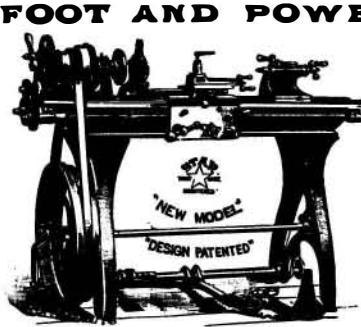
Dr. Oliver P. Hay of the American Museum of Natural History has found the humerus or upper wing-bone of a great auk's wing among a number of bones and shells sent to the Museum for examination by the State Geologist of Indiana. The bird has been extinct since 1844. The most remarkable thing about the discovery is that the bone was dug from a mound at Ormond on the south coast of Florida. The north coast of Massachusetts is generally supposed to have been the most southern point the bird ever reached.

Some interesting experiments in the interest of science have recently been undertaken at the Turin Physiological Institute, with the object of ascertaining the proportion of carbonic oxide necessary in the air to destroy human life. Signor Teodoros Scribante of Turin placed himself unreservedly in the hands of Prof. Mosse for the purpose of the investigation. On three successive occasions Signor Scribante was confined in a hermetically-sealed iron chamber, the air of which was mixed first with 1-333 of carbonic acid, then with 1-285, and lastly with 1-233. At the third experiment the courageous patient ceased to breathe, and was found to be in a cataleptic state, from which he was restored only by means of oxygen.

The London County Council has been carrying out for several months interesting experiments for the purpose of ascertaining the degree of effect different gaseous and liquid disinfectants exercised upon microbes. Various materials, including cloth, unvarnished wood, linen, and wall paper, all of which in ordinary practice often require to be disinfected, were experimented upon. As regards fluid disinfectants, it was found that corrosive sublimate, one part in one thousand, with 24 hours' exposure, destroyed all microbes, including the spores of anthrax and the tubercle bacilli; carbolic acid in five per cent solution, with 24 hours' exposure, failed to destroy anthrax spores, but was efficacious in all others. One teaspoonful of Condy's fluid to a pint of water, with 24 hours' exposure, gave a negative result; when used in five times that strength it was still practically of no value. Bleaching powder, generally speaking, only destroyed the less resistant forms of microbes, though in the case of anthrax spores on paper and on linen it was more effective than carbolic acid. The typhoid bacillus was killed by all disinfectants used, except Condy's fluid and bleaching powder. The diphtheria bacillus was killed by formalin and sulphur dioxide. Anthrax spores were only destroyed with certainty by the perchloride of mercury, the other disinfectants either failing occasionally or being uncertain. For tubercle bacilli carbolic acid and perchloride of mercury were the only disinfectants efficacious on each occasion, and it is especially deserving of notice that neither formalin nor sulphur dioxide was efficacious for wood or cloth infected with this bacillus.

According to the *Lancet*, evidence is accruing that the practice of adding artificial coloring matter to milk is increasing. Samples are commonly met with thus colored to give them a rich but false creamy aspect. The natural color of milk bears no relation necessarily to the amount of cream present. It is very desirable that this practice should be stopped. We believe that annatto is the dye commonly employed and it is fortunate that it is harmless, though that fact does not justify the device. Certain coal-tar dyes have, however, been detected in milk and among them methyl-orange, or, in chemical nomenclature, the sodium salt of dimethylaniline-azobenzene sulphonic acid.

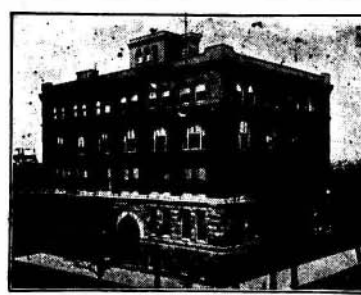
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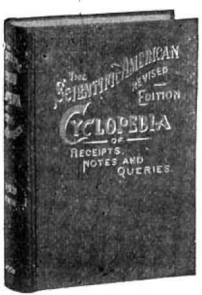
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