stroke of piston, 24 inches; steam ports, 24 by 1½ inches; circular exhaust ports, the same. Piston valve. The diameter of the driving wheels is 6 feet 6 inches; truck wheels, 3 feet; length driving springs, center to center of hangers, 4 feet; steel boilers, 251 tubes of two inch diameter; length of tubes over the tube plates, 11 feet 10 inches; inside length of fire box, 107 1/16 inches; inside width of fire box, 33⅞ inches; diameter of dome, 31½ inches; height, 22 inches; working steam pressure, 180 pounds; grate surface, 24¾ square feet; total heating surface, 1,693 square feet; heating surface of the tubes, 1,544 square feet; height from top of rails to top of smokestack, 14 feet 10¾ inches.

Planet Notes for February.

Mercury will be "evening star" during February. During the first half of the month he will be close to the sun, but in the latter part will be visible to the naked eye for a short time after sunset. He will be at greatest elongation, east from the sun 18°, on the evening of February 25. His greatest brilliancy will be attained on the evening of February 21. Mercury will be 10° due south from Venus at 9 h. 41 m. P. M. February 8, central time.

Venus will be visible as evening planet for but a few days in February. On the 16th, at 3 h. 4 m. A. M., she will be at inferior conjunction, *i. e.*, between the earth and sun. Venus will be in conjunction with the crescent moon, 11° north of the latter, at 3 h. 3 m. P. M. February 6.

Mars will be visible in the southeast after 4 h. A. M., but at too low an altitude for good observations in our latitude.

Jupiter will be at quadrature, 90° east from the sun, February 11, at 1 h. 52 m. A. M. He will be in excellent position for observation during the early part of the night. Jupiter will be in conjunction with the moon, 4° 24′ north of the latter, February 13 at 3 h. 16 m. A. M.

Saturn may be observed after midnight. Look toward the southeast in the constellation Virgo, about 5° northeast from the star Spica. The rings of the planet are easily seen with quite a small telescope. They are now turned at an angle of 14° to the line of sight, so that with telescopes of moderate power the divisions may be seen. Saturn's apparent motion among the stars during February will be westward. He will be in conjunction with the moon, 4° north, at 8 h. 2 m. P. M. February 23.

Uranus rises about midnight, and is in position for observation from 3 to 6 A. M. He is in the constellation Libra, about 1° 45. east and 26′ south of the star *α*. Uranus will be at quadrature, 90° west from the sun, February 3 at 7 h. 4 m. P. M. He will be stationary in right ascension February 18, and after that will move slowly westward. He will be in conjunction with the moon, 3° 36 north, at 9 h. 58 m. A. M. February 25.

Neptune will be at quadrature, 90° east from the sun, February 29, at 2 h. 36 m. A. M. He will be in good position for observation during February. He is almost stationary in Taurus, a little more than one-third of the way on a straight line from *z* to *ε* Tauri. There is no star of equal brightness, *i. e.*, 8th magnitude, within a radius of 1°.—*Astronomy and Astro-Physics.*

Deep Sea Depths.

In a recent number of the *Popular Science Monthly* G. W. Littlehales gives the following as the latest reliable result of the sounding of the different oceans:

	Latitude. Deg.	Min.	Longitude. Deg.	Min.	Depth in Fathoms.
North Atlantic ocean	19	39 N.	66	26 W.	4,561
South Atlantic ocean	19	55 S.	24	50 W.	3,284
North sea (Skagerack)	58	12 N.	9	30 E.	442
Baltic sea	58	37 N.	18	30 E.	233
Mediter anean sea	35	45 N.	21	46 E.	2,405
Black sea	42	55 N.	33	18 E.	1,431
Caribbean sea	19	0 N.	81	10 W.	3,427
Indian ocean	11	22 S.	116	50 E.	3,393
North Pacific ocean	44	55 N.	152	26 E.	4,855
South Pacific ocean	24	37 S.	175	08 W.	4,428
Behring sea	54	30 N.	175	32 W.	2,146
Sea of Japan	38	30 N.	135	0 E.	1,640
China sea	17	15 N.	118	50 E.	2,350
Sulu sea	8	32 N.	121	55 E.	2,549
Celebes sea	4	16 N.	124	02 E.	2,794
Banda sea	5	24 S.	130	37 E.	2,799
Flores sea	7	43 S.	120	26 E.	2,799
Arctic ocean	78	05 N.	2	30 W.	2,469
Antarctic ocean	62	26 S.	95	44 E.	1,975

A Long Siphon.

According to *Indian Engineering*, a long siphon has lately been added to the water supply system of the Nusseerabad cantonment in India. The water is drawn from a well in the overflow channel of a lake; a weir below the well preventing any serious fluctuations in the water level in the latter. Until recently, the water has been pumped by bullocks from the well into a main leading to the cantonment. Toward the end of August this method of supply was discontinued and a siphon service put in. It is an eight-inch pipe, about four miles long, having a variation in level between its summit and the water in the well of from two to twelve feet, and a difference between its summit and the water in the service reservoir of from nine to seventeen feet.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 943.

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THE MUNICIPAL ART SOCIETY.

Some of our most able and distinguished citizens have lately formed an organization under the title of the Municipal Art Society, having for its object the promotion of a more artistic and refined taste in the embellishment and decoration of public buildings, parks, and places.

For lack of such an organization various crude devices, under the name of art, are constantly being imposed upon the city. It will be the aim of the society to look after and correct all such matters.

The society intends to expend large sums for the encouragement and realization of municipal art works, the money being secured from the annual dues, at five dollars each, of many thousands of members. This is a movement worthy of the active support and assistance of every intellignt citizen.

Expiration of the Bell Telephone Patent.

At last the long-waited date is at hand. With the expiration of this month comes the expiration of the second fundamental Bell telephone patent. Over a year ago the undulatory current passed into history. Next to disappear from life is the iron or steel diaphragm magneto-telephone, exemplified in the telephone receiver now in use. For many services this instrument can be used as a transmitter—of course far inferior to the microphone, but capable of service on short lines. The carbon transmitter is still protected to a great extent by fundamental patents of uncertain validity. Among these the Berliner patent of November 17, 1891, has become celebrated; its tenure of life is now the issue in a suit brought by the United States government for its annulling. It is hoped that the case will very soon come to a hearing. Then there is the Edison patent of May 3, 1892, of uncertain validity, owing to the English patent for the same invention, which expired before the American patent was granted. The fate of this patent will depend largely on a decision in a case now pending in which the same point is involved. The whole affair is quite complicated, and its complication appears greater when the quantity of minor patents held by the Bell Telephone corporation are considered.

The National Exhibit of Cycle Sundries and Accessories in Madison Square Garden, New York.

The recent cycle show held at the Madison Square Garden in this city during the early part of the present month was an impressive demonstration of the great development of this manufacturing interest and of the allied branches of industry. At it were shown, not only the many varieties of cycles, now for the most part built on the same general lines, but the trades tributary to the cycle world, from India rubber manufacturer, drop forger and steel ball maker to the supplier of bicycle riders' clothes and shoes, were there represented. The entire display, occupying the greater part of the floor space of the great building, and overflowing into the galleries, was most impressive and beautiful.

The bicycle exhibits were so numerous that a description of all is out of the question. For men riders the diamond frame type with long head and ball bearings throughout rules supreme. The geared ordinary, front-driving safety, and giraffe or high frame safety are the exceptions, but are only exceptions. For ladies the drop frame is made. As the fair sex seem inclined to adopt rational dress for wheeling, a modified drop frame, approximating to the diamond frame, was shown for them.

The driving gear is almost universally the sprocket and chain. It is a curious fact that while on the frame, wheels, etc., of a bicycle there will be perhaps a dozen ball bearings, using nearly a hundred steel balls, there being no plain bearing left, the chain may by itself present a hundred plain old-fashioned bearings, of the type used for centuries before modern machinery was thought of. This is now the troublesome part of the modern cycle. All attempts to improve it by roller sleeves and the like are imperfect. Another peculiar thing in this connection is that the chain is exposed to rain, dust and mud to further develop its bad qualities. The perfect chain and gear case, keeping off rain and dirt, and supplying oil *ad libitum*, seems to be still in the future.

One method of doing away with the chain was shown by the League Cycle Co., of Hartford, Conn., who have substituted for the chain a bevel gear, inclosed in the tubing and in cases. This not only abolishes the chain, but affords a wheel ridable in every day clothes without any special precautions, such as trouser clips. How the frictional resistance of bevel gear and of sprocket gear will compare is uncertain. The exhibitors contrast the four pieces of their gear with the two hundred and four parts found in some chains with their sprockets.

Another wheel was built, in one sense, on the opposite principle, as the front as well as rear wheel was fitted with a sprocket and chain gear. On the front wheel it operated by pumping the handle bars up and down, thus adding the power of the arms to that of the legs. This was shown by Mr. H. J. Bauer, of Elizabeth, N. J.

Several examples of changeable gear were exhibited.

Some of these could be operated while riding, enabling the gear of the wheel to be instantly changed from high to low or *vice versa*.

Steel balls, as exhibited by two firms, the Simonds Rolling Machine Company, of Fitchburg, Mass., and the Cleveland Machine Screw Company, deserve special mention. The first named company had their Chicago exhibit of balls, ranging in size from a diameter of nine inches to one two-hundredth inch. They also showed steel projectiles and many other articles rolled by their process. The Cleveland Company, formerly the Grant Antifriction Ball Company, had a most interesting exhibit, including balls of large and small diameter. They turn the balls from the bar or rod cold, hammer forge the larger ones, and grind, harden, and temper by special methods.

A great variety of pneumatic tires were shown. The plain "hose pipe" tire is the favorite with many, while the laced inner tube tire is still used in great quantities. These are cemented to the rim. Mechanically fastened tires with quickly detachable outer cases were the feature of this portion of the show. It is clear from their variety, and from the persistence of the two earlier types mentioned above, that there is room for invention here.

An odd and ingenious application of the bicycle motion was due to the Hanson & Van Winkle Company, of Newark, N. J. They show a saddle post with treadle gear mounted on a fixed standard, working a plating dynamo. Thus a repairer can take his bicycle exercise in his shop and plate his goods at the same time.

The Garvin Machine Company, of this city, exhibit a full line of machinery, designed for the manufacture of cycles and cycle parts. It includes drill presses, milling machines, screw machines, roll thread machine for spokes, a wheel truing machine and others, indicative of the development of the cycle industry.

Among the cycles proper may noted the exhibits of such firms as the Pope Manufacturing Company, who had their pavilion from the Chicago Exposition erected, and filled with a beautiful exhibit, and the Overman Wheel Company, who had an equally impressive display. The latter firm showed in operation an ingenious machine for determining and marking on an indicator card the relative resiliency of pneumatic tires. The John P. Lovell Arms Company, of Boston, Mass., and the Remington Arms Company, of this city, had beautiful exhibits of wheels. The Eagle Bicycle Manufacturing Company, of Torrington, Conn., exhibited wheels with cold swaged tubing and aluminum rims on the wheels. The New Mail wheel was shown by William Read & Sons, Boston, Mass. The Warwick Cycle Manufacturing Company, of Springfield, Mass., and the Monarch Cycle Company, of Chicago, also deserve mention. The MacIntosh-Huntington Company, of Cleveland, Ohio, not only had regular type wheels, but also front drivers, both safety and geared ordinary.

Chains, different kinds of tubing, including aluminum tubes, lamps, bells and saddles, among the latter air-inflated or pneumatic saddles, shown by the Parsons & Muller Manufacturing Company, of New York, and drop forgings are examples of the things other than wheels presented at the show. Whether it be taken as a popular or as a trade exhibit, the affair was a great success.

Dr. Klumpke.

Mlle. Klumpke, who has just gained the degree of Doctor in Mathematical Sciences at the Sorbonne, is the first lady who has obtained that distinction. The full title of her thesis was "Contribution à l'étude des anneaux de Saturne," and the following is a translation by *Nature* from *La Nature* of the complimentary terms in which M. Darboux addressed the gifted authoress in granting her the degree:

"You have occupied yourself with one of the most interesting questions in astronomy. The great names of Galileo, Huyghens, Cassini, and Laplace, without speaking of those of my illustrious colleagues and friends, are connected with the history of each of the great advances in the attractive but difficult theory of the rings of Saturn. Your work is not a slight contribution to the subject, and it places you in an honorable position among the ladies who have devoted themselves to the study of mathematics. During last century Mlle. Marie Agnesi gave us a work on the differential and integral calculus. Since then Sophia Germain, as remarkable for her literary and philosophic talent as for her mathematical faculties, was held in esteem by the great geometers who honored our country at the beginning of this century. And but a few years ago the Academy of Sciences, on the report of a commission in which I had the honor to take part, awarded one of its best prizes to Mdme. Kowalewska, placing her name by the side of those of Euler and Lagrange in the history of discoveries relating to the theory of the movement of a solid body around a fixed point. In your turn you have entered upon your career. We know that for some years you have devoted yourself with great zeal and success to investigations connected with the star chart. Your thesis, which you have prepared according to our course of higher mathematics, with an assiduity that we could not ignore, is the first that a lady has presented and successfully sustained before our Faculty to obtain the degree of Doctor of Mathematical Sciences. You have worked in a deserving manner, and the Faculty has unanimously decided to declare you worthy of the grade of Doctor."

Results of the Copyright Law.

The new international copyright law has been in operation over two years, and in some respects it is possible to judge of its operation within that time. Mr. G. Haven Putnam, who is well informed on this subject, treats it briefly in the January *Forum*, as it affects American and foreign authors, American readers and American publishers. American authors have been disappointed in its results. They have not obtained the English returns which they expected from the protection of their works by an English copyright, and though the sales of their books in foreign countries are on the increase, they are hardly yet what might be expected. On the other hand, English authors have been also disappointed in the sale of their books in America. The demand for English fiction has greatly fallen off, and the result is that the English have not gained at all what they expected when they could control their own books. In neither case has the international copyright law done for authors what it was hoped that it might do. They are not much better off than they were before. But there has been eliminated from the book publishing trade a great deal of fiction which was worthless in itself, and for which there was no legitimate demand. American readers have not been deluged with cheap fiction.—*Boston Herald.*

It might also be added American readers have not enjoyed the benefit of so many cheap editions of high class works of every description.

Promoting Ingenuity.

It may not be generally known, says the *Railway Review*, that Messrs. Denny grant to the workmen in their shipbuilding yard at Dumbarton a sum of money for suggestions for the improvement in plant, etc., likely to facilitate or cheapen production. During the year past 57 new improvements have been considered, and of this number 38 have been successful, 15 rejected, and 4 postponed. The total sum expended during the year was $720; of this sum $480 was paid in ordinary awards and $240 in premiums. The number of awards and the amount of money expended are not only much greater than those of last year, but are the third highest in any year since the scheme was started. Fully two-thirds of the total number of claims received were successful, as against an average of 52 per cent for the fourteen years the scheme has been in operation. The workmen in the iron department have this year succeeded for the first time in sending in more claims than those of any other department, while the electrical department has been successful above all others, considering the number of workmen connected with the branch. Since the introduction of the scheme, 602 claims have been received, 313 being successful and 289 rejected. The total sum expended is $7,400, of which $5,170 was paid in awards and $2,230 paid in premiums. The sum of $4,840 has been gained by eighteen claimants.

How to Cultivate the Body.*

The ancient Greeks gave the important subject of physical culture very careful attention, and were rigid in exacting for their youth a gymnastic training. Even the girls of Sparta were expected to be good gymnasts, and no young woman could marry unless she was proficient in various exercises. Consequently the bodies of both sexes were healthy and beautifully developed. Their minds were also highly developed, but not at the expense of the body, as is generally the case nowadays. Grecian philosophers and physicians believed that the mind could not possibly be in a healthy state unless the body was in perfect health, and acted accordingly. It would be well if with us it was compulsory for parents to give their offspring a course of physical training.

General physical exercise is the kind required for boys and girls, and it is essential that judicious systematic training be pursued. This can be had only at public or private schools where physical culture is obligatory, or at well conducted gymnasiums, where there is a system for training the body in a rational way. Many people think that a gymnasium is a place for sporting men. This is a mistake. Clergymen, doctors, students, clerks, governesses, and society people frequent respectable gynasiums. The gymnasium of to-day is a very different place from that of fifty years ago. Formerly the aim of the gymnast was to turn out men who could lift heavy weights and court death on the flying trapeze. Nowadays all this is changed: physical training is carried on in a scientific manner; men of ability have made physical culture a profession, and their object is to make pupils healthy, strong and graceful. Most modern gymnasiums have appliances for the cultivation of every part of the body, and able instructors and physicians in attendance.

I advise all young and middle-aged men and women to spend an hour daily in earnest systematic physical exercise. The best plan is to enter a gymnasium where some system is employed. There are several systems of physical training—the Swedish, the German, the English, and the so-called American. The Swedish and the German are considered by competent judges to be the best. The teachers of the German system claim that it is the best because it aims at general physical culture, and that it keeps the mind as well as the body in a wholesome activity. This system was founded by Jahn in 1810. It embraces three departments, school gymnastics, popular gymnastics and military gymnastics. The founder's aim was to make the youth of Prussia strong and courageous to defend their country when needed, and from his idea the present German system of gymnastics has grown. The Swedish system was devised by Ling at the commencement of this century, and has been improved by his followers, who assert that it aims at an harmonious relation of body to mind, and that it is the best for the development of the fundamental functions. It is a system of voluntary movements arranged and executed with care. The movements comprise leg movements, which increase circulation and regulate the action of the heart; back and chest movements, which strengthen and expand the lower part of the chest; heave movements, which strengthen the arms and the upper part of the chest; shoulder movements, to pull the shoulders back; respiratory movements, balance movements, abdominal exercises, etc. The English system of free athletic exercises has been tried with great success in France. No doubt it has a wonderful influence on the moral and social qualities of the young. The so-called American system is a mixture of the German and Swedish systems. Our teachers of physical culture take the best ideas from all systems, and find that the combination works well.

I do not advocate any particular system. My aim is to suggest practical means whereby the body can be cultivated. The Swedish, German, English, and American systems are all good, and either, judiciously followed, will bring about the desired result. Gymnastics should be directed toward promoting the healthy activity of the organs that make blood, to correcting defects, and to the perfection of the human figure. The most helpful movements are also the most beautiful. The Greeks cultivated the body as no other nation has done, with this result. In training, one should begin slowly and build up the weak parts first; then exercise should be taken so as to bring nearly all the muscles into action at the same time. This stimulates the action of the heart and lungs, besides increasing the circulation and respiration. Many muscles of the body, from lack of use, waste away. The technical term for this wasting is atrophy, and to avoid it every muscle in the body should be exercised regularly. Light, quick exercise is the best. Heavy dumb-bells or pulley-weights should not be used. One hour's vigorous exercise daily is all that is needed, and should always be followed by a tepid bath. Avoid everything that throws extra strain upon the heart, and aim at the correction of errors of nutrition.

All who can possibly enter a gymnasium should do so, for public gymnasiums are now so conducted that by following the directions of the instructors it is almost impossible to exercise in such a way as will be detrimental to health; but those who are unable or unwilling to do this can by simple means build up and improve the body at home. For strengthening and developing the legs nothing can be better than walking. A simple but most useful exercise, which all can practice, is that of breathing. When the breathing capacity is increased, the general health is improved. For the breathing exercise, throw the head up, the shoulders back, and the chest out; inflate the lungs through the nose until full; then exhale quickly until the lungs are empty, and finish with long-drawn inspirations. This should be done, if possible, out of doors. For strengthening and developing the upper part of the body a pair of light dumb-bells is all that is needed. Physical exercise should be taken regularly and continued through life. It is a remedy against many of the diseases prevalent at the present time. I urge all who desire strength, health, and beauty to take plenty of outdoor exercise in addition to the home or gymnasium exercises. Outdoor exercises help to the development of the respiratory organs.

*Wilton Tournier in *Lippincott's Magazine.*

Artificial Ice.

The Massachusetts State Board of Health concludes, from investigations of artificial ice, that artificial processes of freezing concentrate the impurities of the water in the inner core or the portion last frozen, that the impurities are least if distilled water is used, that the number of bacteria in artificial ice is insignificant, under the prevailing methods of manufacture, and that the amount of zinc found in ice is insufficient to cause injury from its use.