[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1894, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXI.—No. 19. ESTABLISHED 1845.

NEW YORK, NOVEMBER 10, 1894.

HERMAN LUDWIG FERDINAND VON HELMHOLTZ.

life, which yielded a record almost unsurpassed of the "gymnasium" or elementary school. When sevenwork in physiology, anatomy and physics, Von Helmholtz died. The combination which he possessed of the Frederick William school, taking up the study of mathematical and experimental talents of the highest order, backed by a medical education, placed much of his work in the intermediate regions between physiology and physics, gave his investigations a peculiarly practical value and caused them to influence surgical practice on the one hand, while his work in pure science has enlightened the world of science.

full name. He was born in Potsdam, August 31, 1821, On September 8, 1894, after seventy-three years of in which city his father held a position as a teacher in teen years old he entered the University of Berlin in medicine. He desired to be a physicist, but circumstances forced him to take the more practical course of medicine. Later in life he was pronounced in his views of the great utility of the study of medicine to himself, as a guide and basis for his later work in physics.

Herman Ludwig Ferdinand von Helmholtz was his the Charité hospital gratuitously, a privilege which an article on heat for a medical dictionary. The sub-

was his due as a student. On recovering he received the portion of his income which had accumulated during his illness, and this money he at once devoted to the purchase of a microscope, and began to study the nervous processes of the ganglion cells of invertebrates. These studies were used in his graduating thesis, and in 1842 he received his doctor's degree. In 1843 he published a work on putrefaction and fermentation, rejecting Liebig's chemical theory, and laying the foundation for the modern biological treatment of the subject. He was military surgeon in Potsdam during this period, In 1841, sick with typhus fever, he was treated in yet prosecuted his work in science, in 1845 preparing



HERMAN LUDWIG FERDINAND VON HELMHOLTZ.

ject was treated largely from the physiological standpoint. In it he brought out the fact that muscular activity changed the chemical composition of muscular tissue. Later (1847) he proved that muscles in action produce heat.

In the same year he wrote his famous work on "The Conservation of Force," a work which was in line with Robert Mayer's earlier publications of 1842 and 1845, but which was written in ignorance of Mayer's investigations. This was before physicists had accurately distinguished force and energy and before J. Clerk Maxwell had worked up the theory of dimensions of physical quantities. The new doctrine, which was so near an approach to the truth, was enthusiastically received. Faraday, feeling its inconsistencies, bowed to authority and accepted it. Later, when the doctrine was changed to "The Conservation of Energy," all difficulty disappeared, and it is now universally accepted.

He was about this time professor of anatomy in the Berlin Academy of Art and next received the chair of physiology and general pathology in Konigsberg. He applied direct experimentation to the problems of animal life and examined the rate of transmission of nerve impulses and the duration of muscular contractions. This was in 1850. He finally determined that the nerves telegraphed their signals at about the speed of an express train (26.4 meters)—far slower than the velocity of sound.

In 1851 he described the ophthalmoscope. This instrument opened the "windows of the soul" to everyday inspection, and the dark chamber of the eve is now every day explored by its aid for the treatment of the maladies of sight. This invention alone was enough to make the reputation of a life. He followed this achievement by investigations in physiological optics, and his great work on the subject, "Text Book of Physiological Optics," published in 1867, represents ten years of work He was professor of anatomy and physiology at Bonn, 1855-1858, then he went to Heidelberg as professor of physiology. In 1862 his famous work on "The Doctrine of Tone Sensations as a Physiological Basis of the Theory of Music," was published at Brunswig, the third edition appearing in 1870. This was an epoch-making work. The true nature of sounds, the relations of fundamental notes and overtones in the production of vowel sounds, the physical analysis of sound and reproduction of the same by physical means, were treated by Helmholtz by methods and processes which laid the foundation of the science of acoustics. He also tried to find a basis for the action of the ear in harmonic vibration of its membrane. How far the ear can be accepted as a string instrument is, however, as yet a matter open to speculation.

His principal work in the realm of pure physics up to this period was these investigations on sound. Electricity and hydrodynamics occupied his attention after his acceptance of the professorship of physics in the University of Berlin, where he succeeded Magnus, who died in 1871. He applied experimentation to the investigation of the modern ether theory of electricity with signal success. Perceiving the analogy between vortex motions in fluids and electro-magnetism, he founded a mass of theory on the analogies, which has now been assimilated by modern physics of electricity. His work in electricity and the standing awarded him in it by electricians have given him a position in the electric world comparable to that which he holds in physiological science. His recent visit to this country, to attend the electric congress at the Columbian World's Fair, emphasized this fact.

into the laws of rain formation, of lightning discharge, of tides and of waves being classic.

In 1887 he accepted the presidency of the physicaltechnical institution in Berlin founded by the German Emperor, on the basis of a gift of one-half million marks (about \$125,000) by Werner Siemens, at the same time taking the directorship of one section, the pure science department. In 1883 hereditary nobility was conferred upon him by the German Emperor.

It is futile to attempt within the limits of our space to give more than a mere skeleton of his work. His publications embrace not far from one hundred titles; some of them most abstruse, others so popular and interesting as to be veritable classics.

Aluminum Horseshoes.

Recent tests made in Arizona of aluminum horse shoes indicate that while the shoe, so far as perfected, will not wear quite a month when subjected to the severe mountain scouting in that section, Lieut. R. B. Wallace, 2d Cavalry, who made the test, found that the front shoes lasted some 28 days (306 miles) and the hind shoes 23 days (260 miles), through country covered with lava rock. As the country traversed was unusually rough even for Arizona this test may be taken as a fair indication that steel-clad aluminum shoes will answer all ordinary requirements of the cavalry service. These shoes have particles of highly tempered steel pressed into the sole of the shoe by a pressure of some 100 tons, which makes the wearing surface practically steel-clad.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

The Scientific American Supplement

The Scientific American Supplement is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectual last page. Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seven dolars. To foreign countries within Postal Union eight dollars and fifty cents a year.

Building Edition.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor p. ans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural vork in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 a year.

Spanish Edition of the Scientific American. * LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFICA AMERICAN. Every number of La America is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & Co., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, traff or bank check. Make all remittances payable to order of MUNN Beaders are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, NOVEMBER 10, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

Aluminum not sultable for boats 294	Helmholtz, Herman L. F. Von* 28
Astronomical	Horseshoes, aluminum 29
Buffaloes, last of	Kinetoscope in London 2
Burner, hydrocarbon* 292	Leaves, why fall 29
Caledonia, P. and O. steamer* 292	Limbs in man and woman 30
Church, stone, \$6,000*	Marble, artificial 29
Cicada, hut-building	Milk, absorption of odors 2
Cock, stop, train pipe* 297	Moistener, tobacco* 20
Colors in dried flowers 291	Monument to Michaux Brothers*29
Coupling, clutch* 292	Notes, natural history 25
Danube, improvements 292	Pavements, foothold on 29
Detector, submarine 292	Photographs, ceramic 2
Diphtheria, cure of, 298	Piano, street, industry* 29
Earthquake effects on buildings, 299	Planets for November 2
Ehrmann, Charles 294	Powder, beef, homemade 25
Electricity, atom of 295	Projectiles, small caliber 29
Epidemics, causes of 293	Pulp, torrefled 2
Eskimos, curious facts 300	Race, Mussuck* 2
Etiquette, medical, ancient, 298	Railway across Devil's Dike 3
Eyes and eye doctors 294	Sorrow, hygiene of
"Experimental Science," com-	Telescope, large, another 2
pliment 294	Train, passenger, longest 2
Food, fever patients 297	Trouble, New York builders 2
Freezer, nitrate of soda 293	Tunnel, great, completed 2
Heavens in November 291	Vessels, sunken, raising 2
Harness, improved*	Western Union annual report 2

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 984.

For the Week Ending November 10, 1894.

Price 10 cents. For sale by all newsdealers

- AGRICULTURAL CHEMISTRY.—Influence of Nutriment upon the Length of the Roots of Plants.—A curious and direct experi-ment on the action of fertilizers on plants.—I illustration...... ment on the action of tertilizers on plants.—I mustration.

 ANTHROPOLOGY.—Aborigines of the West Indies.—By FREDDRICK A. OBER.—Abstract of a most interesting paper on the
 Indians of the West Indies.—The first human beings found on

 ASTRONOM Y.—Mars.—The Polar Snows.—By PERCIVAL LowELL.—A popular article on recent observations of Mars.—Its snow
 caps and curious markings.
- IV. BIOGRAPHY.—Li Hung Chang.—Note on thelife of the Chinese statesman, with portrait and view of Che-Foo, Corea.—2 illus-
- trations ... 15719
 CHEMISTRY.—Apparatus for WeighingOut Liquids.—A pipette for laboratory use in weighing small quantities of volatile and other liquids.—2 illustrations. ... 15734
 Determination of Combustible Gases.—An apparatus for determining the proportions of air and gas required to produce violent explosions.—I illustration. ... 15733
 Sympathetic Explosions.—By C. A. MITCHELL.—Experiments on the laws of explosion and deductions therefrom ... 15734
 LCIVIL ENGINEERING.—A Cross Planimeters ... 15734

- DRAWING.—Drawing Office Rules.—A. W. ROBINSON.—A paper read before the American Society of Mechanical Engineers, it is not provided in the control of the co II. ENTOMOLOGY.—Insect Secretions.—By E. A. BUTLER.—A curious class of insects producing secretions of use to mankind.—2 illustrations.
- XI. GEOLOGY.—The Sydney Coal Field of Cape Breton, Nova Scotia,

 —By HUGH FLETCHER.—A description of the famous province
 coal beds, now worked for two hundred years.

 XII. MINING ENGINEERING.—Answers to Questions asked Candidates for Mine Foremen's Certificates.—Questions and answers in
 examinations held last January in the Pennsylvania coal region.

 4 illustrations.
- A HILBSTALIONS.

 XIII. NAVAL ENGINEERING.—Improved Hydraulic Capstans.—

 By ARTHUR RIGG.—A capstan worked by a hydraulic engine, with details of its construction.—I illustration.
- XIV. PHOTOGRAPHY.—A Double Refracting Finder.—A finder of a high degree of luminosity, that can be used in direct sunlight.— I illustration...
- 7. PHYSICS.—Experiments in the Liquefaction of Hydrogen.—A popular and exceedingly clear article on the last experiments in the liquefaction of gases.
- I. TRAVEI, AND EXPLORATIONS.—Kilauea Volcano Seen Anew.—By Rev. SERENO E. BISHOP.—A graphic account of the descent to the crater of the famous volcano of the Sandwich Islands......

ASTRONOMICAL.

When unusual opportunities present themselves to astronomers for viewing certain objects or phenomena, and these events are commented on by the press, and brought to public notice by lectures, and in other ways, those who have never before given astronomical subjects a thought begin to look with purpose and a new interest at the heavenly bodies, while some such observers, almost before they know it, become habitual star gazers, and not a few look about them for some means of seeing more than the unaided vision will reveal. They press into service an opera glass, field glass, or, if available, a small army telescope, or telescope of larger dimensions, taking such works as Serviss' admirable book "Astronomy with an Opera Glass," Noble's "Hours with a Three Inch Telescope," Gibson's "Amateur Telescopist's Hand Book," Proctor's "Half Hours with a Telescope," or the charming book of Webb's, entitled "Objects for the Common Telescope," as a guide. They begin to make observations without any special knowledge of the objects viewed. The earliest lesson learned is that the hands make a very poor support for an optical instrument, and the first impulse is to secure some means of holding the instrument steadily, especially if it be one more powerful than an opera glass. After overcoming this difficulty, the next trouble arises from preconceived notions of magnification. When the telescope is directed toward a star, the star appears smaller than it does to the unaided eye, and when the moon is viewed through a telescope, it is with some disappointment at first, as regards size, because ideas of the size of the moon as seen with the naked eye are extravagant and erroneous; but let the observer view the moon with both eyes, with one through the telescope and the other without, and he will be able to superpose the image seen with the unaided eye upon that seen through the telescope. His ideas will then at once undergo a change, as, especially in the case of a small telescope magnifying fifteen or twenty times, he will see the moon fifteen or twenty times larger in the telescope than outside of it. Now the question arises as to why the moon is magnified while the star was not. The fact is the star is so far distant that, although its size may be many times that of our sun, it becomes a mere point of light, which no optical aid at our command can magnify to such an extent as to cause it to appear in the telescope like a planetary disk, and the amateur may have the satisfaction of knowing that even the largest telescope cannot show star images any larger, although it will show them brighter, on account of the superior light-gathering power of the larger instrument. A view of one of the planets reveals a disk of appreciable size even in a small telescope.

A three inch telescope mounted on a convenient stand is a desirable instrument for the amateur. It is very portable, and shows many of the beauties of the heavens to very good advantage. Seen though such an instrument, the stars have much of interest for the amateur astronomer—their color, whether they are single, double or multiple. Some of the star groups are a constant source of delight, as seen with a low power. In a good telescope, large or small, a star appears as a very minute disk of light, with two or three fine diffraction rings around it. Opticians tell us that the appearance of a star as a disk with diffraction rings is due to a radical defect which exists in all refracting telescopes. According to the correct theory, a star, in a telescope of any size, should appear only as a point of light.

How different the appearance of one of the planets! with the magnification of 160, Saturn appears larger than the full moon, as seen with the unaided eye. Jupiter with the same power appears with twice the diameter of the full moon, and with the power of 80 a very little larger than the moon. These statements can be readily verified by looking at the planet and the moon simultaneously, as suggested in the case of the telescopic image of the moon, superposed on its own image, as seen with the unaided eye, the telescopic image of Saturn or Jupiter being superposed on the naked eye image of the moon.

The illusion as to the apparent size of the moon may be said to be a secondary illusion. Some compare the size of the moon at the horizon to that of a small carriage wheel, others to that of a dinner plate; in fact, every observer has his own standard of size, but no one ever measured the moon by actual comparison with any object near at hand, like a wheel or plate, without having the illusion dispelled. A dime held at arm's length will eclipse the moon.

The difficulty lies in comparing the moon with objects at or near the horizon, which themselves being familiar are mentally recognized as appearing of the same size as they would if near by. A fairly tall chimney a quarter of a mile away when compared with a chimney across the street is less in height than three of the bricks of the near-by chimney; in fact, it might be said, as a rough approximation, that the distant chimney subtends a smaller angle of vision than would one of the bricks of which it is composed when placed across the street.

The observer says, perhaps, that the moon is larger

than the chimney; but how large is the chimney? maintaining its light at the second magnitude for more with which the moon is compared.

THE HEAVENS IN NOVEMBER.

The present month is notable in astronomical annals for the occurrence of a transit of Mercury across the disk of the sun on Saturday, the 10th. The United States are specially favored in this case, since the event occurs in the middle of the day, so that not only will every one have an opportunity to witness it. but our circumstances. In Europe only part of the transit will be seen. It will begin here about 10:55 A. M., eastern standard time, and end about 4:12 in the afternoon. The little planet will cross the sun from east to west, considerably north of the center of the disk. field glass will probably suffice to show it as a minute black spot on the sun, but a telescope will do better. piece of smoked or black glass. The safest and most comfortable way to view the transit with a telescope, unless proper solar eye-pieces are at hand, is to project the image of the sun through the telescope upon a sheet of white paper held a foot or more from the eye-piece. Those who watch the transit with powerful instruments will be particularly attentive to observe whether, as the planet passes on and off the disk, it exhibits a a magnifying power of 50 or 75 diameters two stars ring of light, such as that seen surrounding Venus in similar circumstances, and the presence of which would and the smaller deep blue. The small star is again be clear evidence of the existence of an extensive atmosphere on Mercury. Any peculiarity in the appearance of the planet as it crosses the sun should be noted. This event also offers an opportunity to improve our knowledge of the motion of Mercury in its orbit, of which certain unexplained anomalies recently led Prof. dromedæ, being separated by a space of only three Newcomb to suggest the possible existence of a ring of seconds. The larger star is green and the smaller blue. planetoids revolving around the sun between Mercury and Venus. This is the thirteenth and last transit of Mercury for the nineteenth century.

Mars will continue to be conspicuous during November, although it is now receding from the earth. In the middle of the month it crosses the meridian about 20 minutes before 10 P. M. Some of its so-called continents and seas are still visible with telescopes of and one-half inches in aperture. moderate size, but its south polar snow cap, conspicuous last summer, has disappeared. Apparently it has been an exceptionally hot summer in the southern omitted for the present. hemisphere of Mars.

As Mars sinks toward the west, Jupiter will be seen rising in the east, a little to the left and north of Orion. The contrast between the two planets is striking and beautiful, Mars being decidedly reddish in tone and Jupiter white. As the former loses in brightness the latter gains, and by the end of the month Jupiter will have become the undisputed sovereign of the evening skies. Already it is a marvelous object for the telescope, being more brilliantly belted than during its last opposition, and displaying an unwonted profusion of color. Jupiter is in Gemini, rising on the 15th at 7 o'clock in the evening, and crossing the meridian about a quarter before 3 A. M.

The moon will reach first quarter on the 5th at 10:16 A. M., being then near the middle of the constellation Capricornus. It becomes full moon in Aries on the 13th at 2:49 A. M., and attains last quarter in Leo at 9:08 P. M. on the 19th. The new moon of the month occurs on the 27th at 3:54 A. M. It is in apogee | tion due to wind. The ratio of weight to longitudinal on the 4th, and in perigee on the 16th. It is perhaps not generally understood that between apogee and perigee, the moon sometimes changes its distance from the earth by more than 31,000 miles, and that when it is nearest to the earth its attractive force upon our planet is about one-quarter greater than when it is farthest away: the apparent size of the moon also changes to the same extent.

The moon will be near Mars on the night of the 10th, near Neptune on the 14th, and near Jupiter on the force upon it, but for a strong wind and for the first 15th. Neptune, which to a practical eye, with any good second or two the force is not far from constant. astronomical telescope exceeding two inches in aperture, looks different from a star (although it is a mere point with such a glass), may be found rather more fall. Wind pressure in engineering calculations is November. than 8 degrees northeast of Aldebaran and under the taken at a maximum of thirty pounds per square foot. fifth magnitude star Iota in Taurus. Saturn, Uranus As one of the new bullets has a longitudinal area of and Venus are too near the sun for observation this about one half a square inch, such a wind pressure

There are many interesting objects in the stellar than would gravity. Any strong wind would, it is heavens conveniently placed during the evenings in clear, deflect it rapidly from its course. If rifle prac-November. Among these may be mentioned the great | tice were carried on in the assumed thirty pound side Andromeda nebula, which is nearly overhead at 9 wind pressure, then the lateral deviation at first would P. M. about the middle of the month. It will be found exceed the vertical. instructive to turn the telescope—a three inch will do -from this nebula to the still greater and quite dif- never occur. But the possibilities which the above ferent one in Orion, which will be seen not far above figures suggest have been shown to be real, and in a the eastern horizon at the same hour. By waiting an recent trial the deviation due to wind has been found hour or two later the comparison may be more satis- to be very great. While striving for a flat trajectory factorily made, as Andromeda will then have passed and for lightness, the effect of wind in producing away from the zenith and Orion will have risen out of lateral deviation has apparently been overlooked. the mists.

meda nebula. This star, as many readers know, after to wind will be decreased. But to enable the lead to without touching a roost.

The illusion begins with mistaken ideas of the object than two days, suddenly begins to fade, and in the course of about four hours sinks nearly to the fourth magnitude. In a few minutes it brightens again, and within three or four hours resumes its original brilliance. The cause of these remarkable changes, which are very regular, is believed to be the existence of an immense dark body, almost as large as Algol itself, and about the size of the sun, revolving around Algol so close that the distance between their surfaces does not exceed 2,300,000 miles! They swing around their comastronomers will be able to study it under the best of mon center of gravity, Algol flying twenty-six miles and its mysterious companion fifty-five miles per second. There will be a minimum of Algol on the 24th at midnight, Eastern Standard time. By adding 2 days, 20 hours and 49 minutes, the time of the next minimum may be calculated, and from that the next, Some optical aid will be needed to see it. A strong and so on. If the theory of the cause of Algol's changes is correct, what those who watch that star on the 24th of this month will really see is an eclipse of Algol. In any case, the eye must be carefully shielded with a Just at midnight on that date the huge black companion, whatever it is, will be exactly between us and the star, shutting off two-thirds of the latter's light.

There are also some fine double and multiple stars well placed this month. The location of those mentioned may be found by the aid of Proctor's star atlas. One of the most beautiful is Gamma in Andromeda. A small telescope suffices for this object, showing with only ten seconds of arc apart, the larger golden yellow double, but only such a glass as the Lick telescope can at present separate it. Another beautiful double star which crosses the meridian about 10 P. M. in the middle of the month is Alpha in Pisces. The components in this case are much closer than those of Gamma An-A telescope of at least three inches aperture should be used for this star. In Cassiopeia, also favorably situated, will be found the star Eta, which is double, one of the components being straw colored and the other purple. Their distance apart is five seconds, but the purple star is so small that it may be difficult to get a satisfactory view of it with a telescope less than three

Many other splendid objects adorn these mid-autumn evenings, but further reference to them must be GARRETT P. SERVISS.

SMALL CALIBER PROJECTILES.

The recent movement in favor of small caliber arms for use in war has been inspired by several causes. The saving of weight, so that the soldier could carry more cartridges, is an important one. The production of a higher initial velocity is also made possible by the establishment of a heavier powder charge per unit of weight of bullet. To maintain a high average velocity in the face of diminished cross-section the bullet has been greatly elongated, so as to be almost a short arrow. Then, as rapid rotation has to be given it by strong rifling, a steel or other hard metal jacket is put on the bullet to prevent deformation by the lands and grooves, and the problem seems solved. The high initial velocity diminishes in flight so slowly that a low trajectory has been the result, and with one exception the arm is a great improvement on its predecessors of double its caliber. This exception is the lateral deviasection is so unfavorable that it is found that the new bullets are blown to one side by a cross-component of wind.

The action of the wind on a bullet as it leaves the mouth of the barrel is comparable to that of gravity upon a body beginning to fall. The pressure on the side of the bullet represents a force resisted only by the inertia of the mass of the bullet. Of course as the bullet moves laterally the wind exerts less and less

The force of gravity will carry in value a falling body more than sixteen feet in the first second of its would act upon it even more energetically at the start

Such an extraordinary condition practically would

The wind pressure, as has been said, is resisted by the The wonderful variable Algol in Peresus will be inertia of the bullet, which varies with its mass and found some twenty odd degrees east of the Andro- weight. If the weight is increased, the deviation due

stand the strain to which it is subjected, it has been found necessary to use a jacket of metal lighter than lead, which makes the bullet still more subject to the action of wind than a pure lead projectile would be.

The high specific gravity of lead, 11 352-11 388, makes it available for small caliber projectiles. Were it possible to use some other metal still heavier, an important advance would be made in the direction of high average velocity as well as of diminished wind action. The very heavy metals are rare. Iridium (hammered) is over twice as heavy as lead. Platinum and gold have nearly as high specific gravity as iridium, and uranium and tungsten come next with specific gravities of 18.33 and 17.00 respectively.

A rather curious suggestion has been made to the effect that tungsten might be used for bullets and shot. This suggestion was based entirely on its high specific gravity without regard to its other qualities. It seems quite possible that were a demand created for it, it could be produced in quantities at reasonable rates. It is difficultly fusible, combustible and brittle. At least this is as far as the properties are known. But if made in commercial quantities by alloying or otherwise treating it, there would be a chance of modifying its disadvantageous properties so as to obtain the advantages due to its high specific gravity. Even now the jacketed bullet is a compound structure whose jacketing interferes with its efficiency. A jacket of tungsten or of uranium would increase its weight, while the present jacket diminishes it. It seems quite probable that a compound bullet of lead and one of these heavy metals could be made which would have considerable value in the present days of small caliber rifles.

Aluminum has attracted most attention from its lightness. Another St. Claire Deville, who would initiate the production of a heavy metal to replace lead where weight is the principal requisite, might exert his powers on the reduction of the ores of tungsten and uranium.

Planet Notes for November.

The following is from Popular Astronomy:

Mercury will be at inferior conjunction November 10, at 12 h. 34 m. P. M. central standard time. The declinations of sun and mercury differ by only 4' 53", so that the planet will be seen projected on the face of the sun. The transit will last a little over five hours, beginning at 9 h. 55 m. A. M. and ending at 3 h. 12 m. P. M. central time. [An illustration showing how to project the sun's image on a sheet of paper and watch the transit was given in the Scientific American of October 27.]

On the 11th, at 10 h. 21 m. A. M., Mercury will pass by Venus, only 8' south of the latter. On the 27th, at 10 h. 58 m. A. M., Mercury will be at greatest elongation west from the sun, 20° 10'. He will be at greatest brilliancy as morning planet, November 26.

Venus will be at superior conjunction November 30, at 9 h. 17 m. A. M., being then directly behind the sun. She will not be in good position for observation during the month.

Mars has for some time been the most conspicuous object, save the moon, in the evening sky. He far outranks the first magnitude stars in brilliancy, appearing almost to have a disk visible to the naked eye. Having in October passed his point of nearest approach to the earth, he is still comparatively near and in very favorable position for observation by amateurs. He will be in conjunction with the moon, 3° south of the latter, November 9, at 12 h. 56 m. A. M. On the 22d he will reach the end of the westward loop in his apparent path among the stars and will then begin to move eastward.

Jupiter lights up the eastern half of the sky while Mars does the western. The two planets are nearly equal in brilliancy but quite different in color, the silvery hue of Jupiter contrasting strongly with the ruddy light of Mars. Jupiter is in good position for observation after midnight. He will be in conjunction with the moon November 16, at 4 h. 4 m. A. M.

Saturn and Uranus will be behind the sun during

Neptune may be observed all night, the best time being about midnight, when the planet is near the meridian. He is in Taurus, not far from the star l.

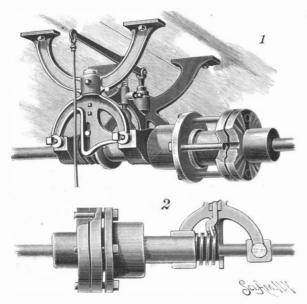
The Absorption of Odors by Milk,

Parville relates some interesting facts upon this subject. If a can of milk is placed near an open vessel containing turpentine, the smell of turpentine is soon communicated to the milk. The same result, occurs as regards tobacco, paraffin, asafetida, camphor, and many other strong smelling substances. Milk should also be kept at a distance from every volatile substance, and milk which has stood in sick chambers should never be drunk. The power of milk to disguise the taste of drugs-as potassium iodide, opium, salicylate, etc.—is well known.

It is said that the frigate bird can fly at the rate of 100 miles an hour and live in the air a week at a time

A CLUTCH TO COUPLE SECTIONS OF SHAFTING.

The clutch shown in the illustration is designed to hold the abutting ends of two sections of shafting so firmly together as to afford practically one continuous two parts when necessary. The clutch is designed for most effective use in rolling mills, as the power comes direct from the engine. The improvement has been patented by Messrs. Thomas F. McGee and Eugene J. McCarty, of Clinton, Mass. Fig. 1 represents the application of the improvement, the sections of shafting uncoupled, and Fig. 2 is a partly sectional view, the



McGEE AND McCARTY'S CLUTCH COUPLING.

sections of shafting coupled. On one of the abutting shafts is a rigid flange with holes to receive coupling pins, which slide through holes in a flange on the opposing shaft, the pins being secured to a flange having a hollow hub sliding over the hub of the flange on the second shaft, and the hollow hub having at its outer end a sleeve terminating in a screw. The sleeve and shaft are supported in boxes in the lower end of brackets, at the upper ends of which are slides or shanks moving in boxes of the hangers, the brackets being held at the right height by set screws. The opposite brackets are connected by a cross arm, in which slides vertically the shank of the clutch blade, adapted to engage the screw, there being secured to the blade a curved guide extending beneath the screw, preventing the latter from working when the shaft sections are coupled. The clutch blade is held normally out of contact with the screw by a spring, and the upper end of its shank is pivoted to a transverse lever provided with a pull cord, which may be extended to such point | connected with that in the box by a light electrical as desired. In the box in which slides the shank of the clutch blade is a spring pin engaging a groove in proaches a mass of steel, iron, or other metal, sounds the shank, whereby the blade is held in engagement | become audible in a telephone on board, while they with the screw when the pressure on the lever is removed. The clutch separates the two sections of the metallic object. Three hundred feet of electrical shafting by power, but must be reset by hand. When cable were employed in this search, which was conthe clutch is closed to hold the sections together, as shown in Fig. 2, the pulling down of the lever carries foundered vessel was at length placed beyond all the clutch blade into engagement with the screw, thus pulling back the sleeve and movable flange to which over a given spot the electric indicator of the detector ing account of the improvements made in the naviga-

the pins are secured, and withdrawing the pins from the flange on the opposing shaft.

THE NEW P. AND O. STEAMER CALEDONIA.

In a recent number of the Steamship we find a collotype engraving of the new steamer Caledonia, built by Messrs. Caird & Co., of Greenock, for the P. and O. Company. The Caledonia, built wholly of mild steel, and in accordance with Lloyd's highest requirements for a spar deck ship, was launched on the 19th May last, her construction having occupied a little under twelve months. The dimensions of the vessel are as follows: Length, 486 feet; breadth, 54 feet; depth, 37 feet 7 inches; displacement at load draught, 11,200 tons; and gross registered tonnage, 7,600 tons. She has been supplied with triple expansion engines of about 12,000 horse power, these having five cylinders-two high pressure, one intermediate, and two

low pressure. The boilers are fitted with Howden's patent system of forced draught, the shafting throughout is of Vickers' steel, and the propeller is furnished with large manganese bronze blades. shaft, but one which may be instantly separated into | The deck machinery embraces all the latest and most approved appliances, and in this connection it may be stated that the cargo gearing is all hydraulic, practically noiseless in its working. The Caledonia is the largest vessel that has been built at Greenock, and is also the largest and most powerful yet constructed for the P. and O. Company. Not only so, but the rate of speed attained by the Caledonia during her official trials, on August 23, over the measured mile at Skelmorlie, goes to show that she will be one of the swiftest steamers engaged in the Eastern trade. There are five decks, viz., the orlop, lower, main, upper and hurricane, and a great attraction is the magnificent promenade on the upper deck, extending a long distance on both sides, and wide enough for eight or ten persons to walk abreast. She can carry 500 passengers (first and second class), the accommodation for whom is of a very superior kind. The staterooms are roomy, and are arranged in one, two or three berths, so that intending passengers can have ample choice. The ship is lighted throughout by electricity by Messrs. Siemens Brothers, Liverpool, and a large refrigerating chamber is fitted up, the machinery for which has been supplied by Messrs. Haslam, of Derby. Very superior accommodation is provided for the officers and crew, the latter numbering between 200 and 300, and of whom 114 are connected with the engine room staff. The Caledonia is commanded by Captain Andrews, R.N.R., an able and experienced officer.

The Submarine Detector.

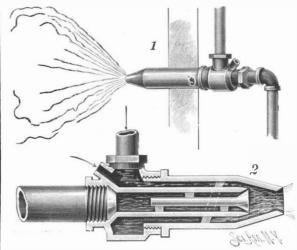
It is now a little over a year since the Russian monitor Rusalka foundered with all hands in a storm in the Gulf of Finland. To discover the precise locality of the vessel, with the view of raising her, an expedition set out with divers and all necessary apparatus, including one of Captain McEvoy's submarine detectors, which was made in London for the expedition. It has recently been ascertained that the spot where the Rusalka went down is a reef near the Waster Tokan, a rocky islet southwest of Mjolo, and one of the outermost rocks off the Finland coast. The reef is submerged, and it is supposed that the Rusalka grounded there and subsequently slipped off into the surrounding deep water. Her precise position has been localized in 30 fathoms of water by means of the detector. This apparatus consists simply of an electrical arrangement contained in a small mahogany box, which is carried on board the searching vessel, and a sinker, which is trailed along the bottom. The sinker also contains an electrical arrangement, and is cable of any required length. When the sinker apare reduced in intensity as the sinker recedes from tinued for several weeks. The exact position of the question, as every time the searching steamer passed

sounded loudly, thus affording evidence that a large mass of metal was submerged below. The divers then descended and examined the ship. She had foundered through serious damage to her stern. The examination was only external, the hatches being so firmly fixed that they could not be opened.

Although most appropriate for the purpose of searching for wrecks of iron ships, the submarine detector was primarily designed by Captain McEvoy to indicate the approach of iron ships to anchored torpedoes, as well as to search for stray torpedoes, lost anchors and chains, telegraph cables, and the like. The approach of a mass of metal, such as an enemy's ironclad, to a torpedo disturbs the balance and causes the sounds to become audible in the telephone. The torpedo may then be fired electrically by means of the cable connection, the invention thus presenting itself as an important adjunct of coast defense.

A BURNER TO FACILITATE THE BURNING OF CRUDE PETROLEUM.

In this burner, which has been patented by Mr. Berend Kamps, the oil inlet is at the top of the casing, there being an adjacent obliquely inclined air inlet, and below this a steam inlet, the nozzle having a contracted end extending into the furnace. The inner end of the steam inlet terminates in a pipe extending into the nozzle, as shown in Fig. 2, and near the front end of the pipe is a collar forming an annular space for oil within the casing around the pipe. The collar has a longitudinal slot or recess to permit the passage of the oil upon the front end of the steam pipe. In the forward end of the steam pipe is a cone-shaped plug, causing the steam to pass out at a high velocity



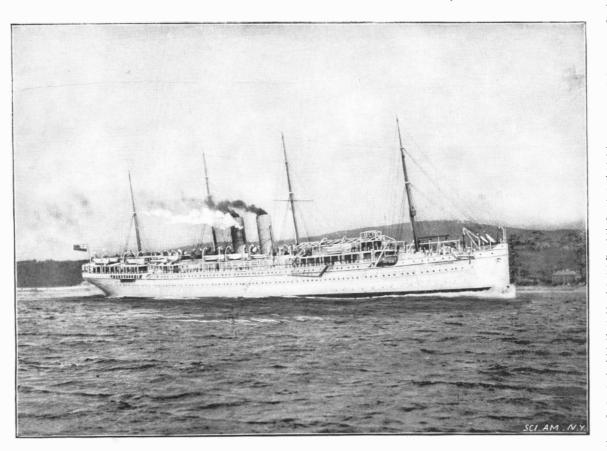
KAMPS' HYDROCARBON BURNER.

in a very fine annular spray, the plug having a rearwardly extending tem on which are lugs fitted in the steam pipe to hold the plug in proper position. Further information relative to the improvement may be obtained of the Zeeland Brick Company, Zeeland, Mich.

Improvements on the Danube.

A recently issued report by Mr. Percy Sanderson, British consul-general for Roumania, gives an interest-

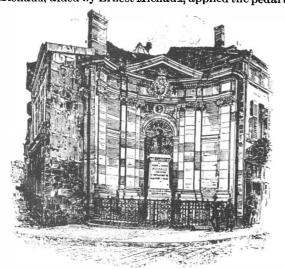
> tion of the Lower Danube during the years 1878 to 1893 inclusive. The engineering works, which have been carried out under the able superintendence of Sir Charles Hartley, K.C.M. G., chief engineer to the Danube Commission, may be classed under three heads, viz., those on the Black Sea coast line, those in the port of Sulina, and those in the river. The approaches to the port have been made safe by beacons, as well as by fog signals and a "whistling' buoy, and the south pier at Sulina has been prolonged considerably. An even depth of 20½ feet has been maintained at the mouth of the river, and will be increased to 231/2 feet by the completion next year of parallel dams. In the river numerous cuttings have been made, with the result that a minimum depth of 15 feet has been obtained on the whole of the Sulina branch of the river, while the course of the river has been shortened by six nautical miles.



THE NEW P. AND O. STEAMER CALEDONIA.

MONUMENT TO THE MEMORY OF THE INVENTOR OF hard and durable as a good old-fashioned japanned visable to employ a tissue that contains a maximum of THE BICYCLE PEDAL.

The velocipede was of comparatively little importance until a few years ago, but at present its use has become almost universal. This remarkable result has been due to the bicycle. This frail machine is used A carbon print is produced, preferably by the single by turns for sporting, exercise, industrial and commercial purposes, and in war as well as peace. The popularity of bicycling in France is largely owing to the efforts of a popular paper, Le Petit Journal, which, since 1891, has not ceased to speak in favor of the exercise which was formerly disdained. In 1861 Pierre Michaux, aided by Ernest Michaux, applied the pedal to



THE MONUMENT TO THE MICHAUX BROTHERS.

the old velocipede, which was propelled by the action of the feet on the ground. Bicycles had then considerable success in the last years of the Empire. The war ruined both the Michaux, and France took little interest in the development of cycling until 1880, when the safety bicycle was put on the market. In 1892 a committee was formed, with M. Pierre Giffard as chairman, to honor the memory of Pierre and Ernest Michaux, who may be looked upon as the real initiators of the great movement in favor of cycling. In a year and a half several thousand francs were collected from ceedingly high polish, and, if amber be the varnish sponges, while exposing a larger moist surface to the cyclists, manufacturers and friends of the enterprise. As Pierre Michaux was born in Bar-le-Duc, the monument to the inventors of the bicycle pedal was erected at the intersection of two streets in that city. The architectural background for the work was designed A thin coating of the white dial varnish was then laid by M. Demoget, while the charming bronze figure is a on with a flat camel's hair brush. It may be mentioned work by the sculptor Houssin. The inauguration of that the varnish used for this coating was thinned this monument took place Sunday, September 30, 1894. For the foregoing particulars and for our illustrations we are indebted to L'Illustration.

Ceramic Photographs.

The picture is on porcelain, or other vitreous ware, well, as the heat was perfectly under control.

tea tray, for example. As the images are produced by the carbon process, it goes without saying that they may be in any color that may be desired.

The process is carried out in the following manner transfer method, on the ware, which may be a porcelain plaque, a glass or metal plate, indeed upon any impervious material upon which a carbon print can be developed, and which will also withstand a considerable degree of heat. So far as the production of the carbon image is concerned, there is nothing different from the ordinary method of procedure; it is after this part of the work is completed that the novel portion of the process comes in. We will here digress for a moment to explain tersely what is known as japanning. This consists of coating the surface with a suitable varnish, in repeated thin layers, and then subjecting it for a time to a tolerably high temperature. The varnishes generally used for this class of work are amber and copal. The former yields, perhaps, the harder film; but the latter, if good, is little, if anything, inferior, while it is whiter, a consideration for our present purpose. It may be mentioned that it is not all amber or copal varnishes that are suitable for japanning. Those that must be used are what are specially prepared for "stoving." The varnish we have used very successfully was purchased under the name of "white dial varnish." It gave a colorless film, and was exceedingly hard and bright when the picture was finished.

Mention was just made as to the varnish being applied in successive thin coatings. They are put on with a camel's hair brush, but a fresh coating must not be applied until the previous one is thoroughly dry and hard, this condition being hastened by a moderate heat. If any brush marks are apparent, they may be disregarded, as they will disappear in the final stoving or in the after operation of polishing. After the work has been stoved, that is, kept at a temperature of from 150 degrees to 200 degrees Fah. for some hours, it is allowed to cool. The surface is then polished first with pumice powder, then with tripoli and oil, and finally with putty powder, as lenses are polished. It will now be seen that the surface will possess an exused, it will be as hard and durable as the amber used for the mouthpieces of cigar holders and the like.

Here is the way we proceeded. The carbon print was developed on an opal plaque and allowed to dry. with about an equal bulk of turpentine. Successive coatings were then applied, and finally the picture was stoved and polished as just described. The source of heat for the stoving in our experiments was the oven of the domestic kitchener, and it answered the purpose

and japanned; that is, its surface when finished is as | In making pictures by this method it may be ad-

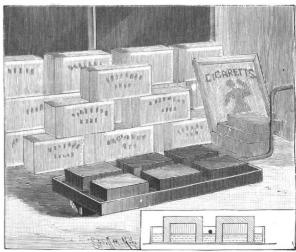


THE MONUMENT ERECTED AT BAR-LE-DUC IN HONOR OF THE MICHAUX BROTHERS INVENTORS OF THE BICYCLE PEDAL.

pigment and a minimum of gelatine, so that the film bearing the image is of a somewhat porous nature. The first coating of the varnish will then permeate it, and so bind it more firmly to the ceramic base. It is needless to mention that the pictures can be colored, if desired, before they are japanned.—British Journal.

A TOBACCO OR CIGAR MOISTENER.

The illustration represents an improvement designed to facilitate the moistening of the air in show cases, etc., in a more effective manner than by the use of sponges, as usually employed. It has been patented by Mr. Jav A. Robinson, of Denver, Col. The moistener consists of a rectangular hollow porous block, having an open bottom and with its lower edges roughened to permit the entrance of water. A number of these blocks are placed in a tray containing water, and the tray may, if desired, be connected with inlet and out. let pipes to maintain a constant supply of fresh water, although this will not be necessary for ordinary use. These blocks are designed to present a better appear-



ROBINSON'S TOBACCO OR CIGAR MOISTENER.

ance and be more conveniently attended to than

The Causes of Epidemics.

In a lecture given recently to the Halifax Scientific. Society, Dr. Solomon Smith drew attention to the fact that to produce an epidemic prevalence of any disease the co-operation of many causes was necessary. These factors might be grouped as:

- 1. Those which increased the susceptibility of individuals, about which we knew but little.
- 2. Those which favored the outside growth and development of the infection-heat, moisture, organic impurity of soil and water, aeration of soil, etc.
- 3. Those which favored the fouling of the water, floods or droughts, according to circumstances, varying level of subsoil water, construction of wells, tanks, and water supplies, their relation to cesspools, and surface pollutions, and social habits of the people by which such pollution was encouraged and carelessness as to drinking foul water induced.
- 4. Those by which the infection was transmitted from place to place, especially movements of large masses of people, as in pilgrimages and wars, and the rapid distribution of cholera-infected people over large areas in some part or other of which a suitable nidus for fresh growth of the infection would be likely to be found.

Cholera was, no doubt, continually being exported from its home in India; but it only occasionally became epidemic in those places where it was an exotic. and when this happened we must look for an explanation not merely to water carriage, which was the mere mechanism of its spread, but to a coincidence of those varied and complex causes which assisted in the intensification of the disease. To some extent the production of an epidemic was analogous to the opening of a word "lock. As all the letters must be placed in position before the lock could be opened, so many factors must combine before an epidemic of cholera could be caused. The converse of this, however, was also true, and on this was founded our protection from cholera, for however little we might know with precision about some of the multiplex causes of a cholera epidemic, we did know that one essential cause, one letter to the lock, was the swallowing of the poison, and thus by a provision of pure water we were able to break up the combination by which alone an epidemic could be produced.—British Medical Journal.

Nitrate of Soda Freezer.

Instead of ice and salt, nitrate of ammonia is used. For a small ice cream freezer, 7 pounds of the nitrate and 3 quarts of water. The freezer is then rotated. The cream or water is quickly frozen if the material is first cooled down before applying the nitrate. The nitrate is recovered for reuse by evaporating the solution to dryness on the kitchen stove.

Charles Ehrmann.

The death of Charles Ehrmann at the age of seventytwo, familiarly called Dr. Ehrmann by his photographic friends, occurred in this city on October 23. He was a man who took great interest in the art of photography, beginning its practice when first discovered. He was educated as a pharmaceutical chemist, taking a position as a prescription clerk in a Philadelphia drug store in the forties. There he met a Mr. McClees, who had opened a daguerreotype gallery, and was having trouble with his chemicals. He asked young Ehrmann if he knew anything about chemistry, he modestly replied in the affirmative and McClees engaged him at once. Ehrmann then began to experivery slow. He improved the method of coating the plates by mixing the citrate of iron and ammonia solution and albumen solutions together, and flowing over the plate as one solution. A daguerreotype from the person was made, then a negative from that by the albumen process, from which duplicate daugerreotypes were printed.

In 1852 he became acquainted with Mr. Ed. Thilgman, who had returned from Europe, having seen Mr. Archer, of Edinburgh, who was the first to introduce the collodion wet plate process.

He met with poor success in experimenting with this process, until the patent of James Cutting, of Boston, was issued providing a method of bromizing the collodion, which made it practical. Operators who became proficient in it earned large wages. For a long time Dr. Ehrmann was the chief operator and chemist of Mr. William Kurtz, a leading photographer in this city, and took portraits by the electric light in a down town office on Broadway. The camera and person were placed on a rotating platform, which was slowly swung around during the interval of exposure, thus inducing very soft shadows.

In 1881 he was taken on the editorial staff of the Photographic Times, of this city, as an assistant to J. Trail Taylor, and remained as one of the principal editors until his death. In 1886 he was appointed instructor in the school of photography established by the Chautauqua University, and won many friends by his genial nature and kindly manner. He took up the problems connected with emulsion photography and the modern gelatine plate in a practical, scientific, experimental manner, was deeply interested in the new developers, particularly praising paraamidophenol.

He was a very clear writer on the chemistry of pho tography, industrious and thorough. He believed there was an immense future for photography, and lived to see marvelous advances. He will be greatly missed, but his work will live to perpetuate his memory.

Compliment for "Experimental Science."

Dr. Frank L. James, editor of National Druggist, in response to the request of a physician to outline a course of reading for one who desires to begin the study of medicine, says in the course of his remarks:

In physics the best book to go into the hands of an intelligent beginner is "Experimental Science," by George M. Hopkins, published by Munn & Co., of the SCIENTIFIC AMERICAN. Mr. Hopkins has, in this work, made the study of physics almost as interesting and entertaining to a healthy boy or young man as base ball or cycling. He illustrates principles by experiments, and these latter are made so simple, by careful description and profuse and accurately drawn pictures. that they can be executed by any person with the least ingenuity. The work covers a wide field, and will introduce you to chemistry, microscopy, and other allied sciences. Even if you have studied physics as taught in the high schools, you will find it a most admirable book, one that will be of great use to you in advanced studies.

Torrefied Pulp.

A new method of preparing and preserving potatoes to be fed to cattle or to be made the basis of dishes for the table has been devised by M. Aime Girard, of ed him he was supposed to have got all the relief which the Conservatoire des Arts et Metiers, Paris. The potatoes having been ground, the pulp is exposed to the eye what specialists are trying to do for the nerves. pressure for the exclusion of all the water that can be removed by mechanical means. The pulp is then sliced and heated in a furnace till it is entirely dried, at a temperature high enough to give it a pleasant taste, without being so high as to convert the starch into dextrin. The substance thus prepared is called by the inventor torrefied pulp, and is suitable for feeding to cattle.

PICTET finds that where powdered sulphide of lime -the material used in the so-called "luminous paint" -was placed in a tube, it glowed as usual in the dark after exposure to the sun's rays, but when the tube was lowered into liquid nitrous oxide at -140° F., the glow was quenched. The phosphorescence did not reappear at once when the tube was removed from the plain that this is work for which the skill of the oculist cold liquid, but it returned when the sulphide had become heated again.

Artificial Marble.

Messrs. Majewsky & Bayenbach have recently patented a process of manufacturing artificial marble from ment the structure of the eye can be determined at gypsum. The method of treatment, according to Le Genie Civil, is as follows:

The gypsum is first worked with the plane, saw, or lathe to the desired form and is then heated'in a furnace for from seven to nine hours, in order to get rid of the water of crystallization. The dehydrated material is then immersed for a few minutes in a saturated solution of sulphite of potassium and afterward in a solution of chrome alum, sulphate of iron, or sulphate of zinc or magnesia, according to the color that it is desired to obtain. At the end of about twenty-four ment with the Whipple albumen process, which was hours it is removed from the bath and allowed to dry in the open air for one or two days. It is then ready to receive a polish.

The object of the treatment with sulphite of potassium is to facilitate the complete impregnation of the gypsum with the substances employed for producing the coloration, in the production of which it plays a direct important part, itself becoming oxidized at the expense of the coloring materials. It forms sulphate of potassa. At the same time it removes from the coloring solutions the oxides of the metals to which the particular color of the finished product is due.

During the course of drying the solutions with which the gypsum is permeated crystallize in the pores of the material, and, filling them, form a solid and im-

If the piece of gypsum is of considerable thickness, the complete impregnation of the mass is assured by forming longitudinal apertures and sucking out the air while the material is immersed in the solutions.

Aluminum not Suitable for Boats.

The Navy Department has just completed a test of aluminum as a material for ship boats, with the object of determining its adaptability to naval uses, with results that demolish some of the elaborate claims made for the new metal.

On account of its comparatively light weight, its utility on board ship would be almost inestimable if it were not for the fact that it has been now shown to be exceedingly susceptible to the corrosive action of salt

Two sheets, one-sixteenth of an inch thick, were immersed for three months at the Norfolk navy yard. One was of pure metal and the other slightly alloyed with nickel. The pure plate was thickly covered with large barnacles throughout its surface and was more or less pitted by the action of salt water. The alloyed plate was incrusted with smaller barnacles and was badly corroded, being perforated and eaten away over much of its exposed surface. This plate was as injuriously affected as a combination of iron and copper would have been with the same exposure.

The claim that barnacles would not adhere to the metal was not substantiated in the smallest degree.

In the opinion of naval experts it will not be advis able to build aluminum boats if they are intended to remain any length of time in the water, though its use may be advantageous on account of the great gain in lightness for metal work exposed to salt water only occasionally. The use of aluminum cannot be recommended near salt water under any circumstances.

Eves and Eve Doctors.

In no branch of surgical science has more progress been made of late years than in that which concerns itself with the eye. Within the memory of men now living persons with defective vision were divided into myops or short-sighted people and hypermetrops or long-sighted people, and for the former concave spectacles were devised which threw the focus of vision back, while for the latter convex spectacles brought the focus in front of the retina. It was assumed that the only differences in these two forms of visual disturbance were differences of degree, and when the half-blind person could by a violent effort read through the spectacles which the optician tenderscience could furnish him. Science has now done for It has diagnosed a variety of ailments which were unknown to our fathers, and for these it is busily engaged in devising remedies. The human eye, when studied under the microscope and in accordance with the laws of optics, is found to be one of the most imperfect organs in the body. There are few perfect eyes in the world. The refracting surfaces are constantly curved so as to blur the image, and to produce what doctors call astigmatism. There are frequently opacities in the transparent media, which cast a shadow on the retina and distort the vision. Sometimes the retina acts like a lens and disperses the various pencils which constitute white light. These and other defects can be detected by the modern oculist, and treated by the knife or counteracted by suitable glasses. But it is is required and which cannot be intrusted to an optician, however well trained he may be. A learned Ger- from the engine.

man named Helmholtz some years ago invented an instrument called the ophthalmoscope. With this instruleisure and its departures from the normal detected. The oculist then goes to work and devises a pair of glasses with just the curves required to correct the defects of the eye; these glasses, described in mathematical symbols, are handed to the patient as a prescription to be filled by a competent optician. There are in European and Eastern cities opticians who do nothing but fill such prescriptions. They work over glasses as Alvan Clark works over telescope lenses; the curves must be mathematically true or the glasses will not fulfill their purpose. But when the mechanic knows his business, and the work is done according to the prescription, the defects of the eye are cured.—San Francisco Call.

Western Union Annual Report.

The annual report of the Western Union Telegraph Company for the year ending June 30, 1894, shows that as compared with 1893 there was a decrease in the revenues of \$3,125,787. There was a reduction in the expenses of \$1,422,235, leaving the net profits lower by \$1,703,733 than in the previous year. The company constructed during the year over 1,300 miles of new pole line and nearly 22,000 miles of new wire, but lines taken down reduced the net increase of pole line to 367 miles; while the net increase of wire was reduced to 21,591 miles. More than half of this is copper; the cost for these additions to the property amounting to \$557,021.64.

The average toll per message was 30.5 cents, and the average cost per message 23.3 cents. The higher cost per message is due to the general depression of business and the impracticability of reducing expenses at the many smaller offices beyond a standard that would provide for the proper handling of the messages. The largest amount expended during the year was for wages. It was found possible to so arrange the hours of duty of the employes of the company at the larger offices as to give each one a fair share of the reduced work at command without materially reducing the number employed. Since the expiration of the fiscal vear the system of the American Rapid Telegraph Company, which comprised 2,684 miles of poles and 20,370 miles of wire, extending east to Boston, south to Washington and west to Chicago, has been purchased for \$550,000 in Western Union stock at par. The company has also purchased since the close of the fiscal year 10,000 miles of copper wire, which will be erected before January 1 on important trunk routes. A five per cent dividend was declared.

The Last of the Buffaloes.

Hunters know that buffaloes will never unless forced cross the iron of a railroad track, and this fact figured largely in the unfortunate work of extermination which these animals have suffered since the Western plains have been spanned by railroads.

The greatest blow dealt the bison herds of the Northwest was the completion of the Northern Pacific track west from Bismarck to the Rocky Mountains. The road practically divided the herds, and those to the south were soon swallowed up in the general slaughter waged by Indians, pot, hide and tongue hunters, foreign sportsmen and others who were out to kill anything they saw on sight.

This was during the winter of 1882-83. The buffaloes to the north were in many scattered bands, but there was one great herd of not less than 75,000 head, which had found a temporary refuge in the triangle formed by the Musselshell. Missouri and Yellowstone rivers in Montana, and as yet they had not been "smelled out" by either red or white hunters. But they were as surely doomed as though already killed, for the railroad iron cut them off from the southern range, and the Indians of the Canadian northwest, as well as those of our country, barred their retreat into the far North, and so they were hemmed in between the two, with no possibility of escape in either direction. This last herd was completely wiped out of existence in less than four months, and before the close of the year there were but a few singles and pairs left as fugitives in that vast country where but a year or two before they could have been counted almost by the hundreds of thousands. At the end of that season 800,000 buffalo hides were shipped east from Glendive, on the Yellowstone River.

Increasing Demand for Otto Gas Engines.

Contracts have just been given out for the erection of several large additional buildings to extend the facilities of the Otto gas engine works in Philadelphia. The company are now also building marine engines in sizes from 2 to 250 horse power, plans of which have been received from the Otto works in Germany, which have a capacity of from 2,500 to 3,000 engines per year. The latter type of machines will also be adapted to the use of running dynamos for electric lighting direct

Scientific American.

Correspondence.

The Hut-building Cicada.

To the Editor of the SCIENTIFIC AMERICAN.

I was much interested in the article which you published in your issue of October 13 on the "Hut-building of the Seventeen Year Cicada," by Mr. Lander. I think he is on the right track to a solution of the problem by agitating the matter, but I can hardly agree with him in his explanation.

According to my experience, he is quite right in not regarding the seventeen year cicada as a migrating insect; but it seems to me that the lack of this trait will not and, in fact, has not prevented it from spreading over a large extent of country. It must have had some means, or may be many means, of being transported from one place to another. Whether the transportation is intended or purely accidental I cannot say. It seems to me that there are many ways that the insect can be spread over the country, the extent of the dispersion depending only on time. In support of this view I will state the following instance:

On Decoration Day I took a long drive about the country in which my home is situated. I drove about 30 miles through all sorts of country; in some places the seventeen year cicada was plentiful, in others scarce, and in many places was not to be seen at all. During the course of the drive I stopped on top of the Watchung Hills, at a point about 400 feet above the sea level and perfectly dry; that is, it was not swamp land. As I was putting blankets on the horses I noticed a seventeen year cicada on the back of one of them. I picked it off and observed that it was a female and then let it go. I thought nothing more about it until I read Mr. Lander's article, then the thought came to me that if that female had been a hut-builder from some lowland, then, according to Prof. Riley's theory, there would be mud huts on top of that hill for the next few generations anyway. How long it would take the trait to die out I am not able to say.

We have stories of their getting on railroad trains. In this way they could be carried quite a distance before the train would be clear of them. So it seems to me that the hut-builders could very easily be carried from low to high land in one way or another.

I do not think it possible for the earth to become in a few weeks so warm from the solar heat rays that any creature living in the earth would be forced to come to the surface: which action I think would only make the matter worse, by reason of its getting into much warmer strata. In the case of the hut-building pupæ, it seems to me that they could do nothing worse than to build such a hut. It would be out of the frying pan and into the fire, as the old saying goes. Dr. Southwick gave me some huts which he collected at New Baltimore, N. Y., they were hard and dry, having the appearance of sun dried clay. Surely the pupa would find it much warmer in such a position than it would below the surface.

The hut receives the heat rays on all sides. It would also receive a great deal of heat by radiation from surrounding ground.

I offer as an explanation of this matter, that the pupæ build these huts to receive heat instead of avoiding it, and that this habit has been developed by those who happened to emerge in wet places where the earth could not become as warm as in dry places.

That these hut-building insects have been in various ways transported to high ground, and have not yet lost the hut-building trait—this I believe is practically Prof. Riley's explanation of the matter.

STEPHEN A. KROM. Plainfield, N. J., October 24, 1894.

Homemade Beef Powder.

Dr. William R. Huggard (Davos Platz, Switzerland) favorable that the speed obtained therein by the corwrites in the British Medical Journal of June 9, 1894: morant is three or four times greater than that which Some of the beef powders in the market smell and it makes upon the surface. taste of the chemist's shop, and are not readily taken by an invalid whose palate requires to be coaxed. A Poirault has found in the thallus and anothecia of happy idea struck the writer several months ago that |lichens indications of very minute channels in the cell | these figures it was estimated by an expert that a horse beef powder might without difficulty be prepared fresh walls, permitting of the intercommunication of the and on a small scale by any ordinary cook. The experiment was made, and the result was satisfactory the perforations in the membrane. Fresh material is beyond expectation. Beef powder made at home is not necessary for the examination, and previous fixaappetizing, has a delicate aroma and flavor, and can be taken with pleasure by invalids who turn with aversion from ordinary food. If a little pepsin be taken at said to exist between distant elements, as well as bethe same time, it is digested even when the ordinary peptonized foods are not retained. The mode of preparation is simple. Lean beef is cut into small pieces; ferina, Peltigera canina, and Calicium chrysocephathese are put into boiling fat, dripping, or butter for a couple of minutes until the surface is browned. They are then removed from the fat and placed on a strainer for a few moments. Afterward they are placed in a mincing machine. The resulting mince is placed in a slow oven and dried. The drying process may take from five to twenty-four hours, or even longer, according to the heat employed. When thoroughly dried, the meat is quite crisp, and can be ground in a coffee mill that has not been used for any other purpose. In region comparable to cortex and epidermis. In the

taken in various ways—with hot water or soup, with mashed potatoes, with bread and butter in a sandwich, parenchyma (conjunctive tissue), the outer layer of or with a little pepsin in a starch wafer. The writer has given this homemade beef powder with such ex- stele. The cortex, the inner layer of which is the endifficulty with food that he thinks others may find it

directions above given, has an agreeable flavor, and admits of being used like potted meat by persons of delicate or fanciful appetite. By regulating the heat applied in making the powder, the albuminous constituents need not be coagulated, but merely dried, and the digestibility of the powder would then be increased; in any case, the finely divided condition would facilitate digestion. A very good beef tea may be made from the powder by infusing it in moderately hot water. For the preservation of the with atmospheric air and to avoid the access of mites or similar deteriorating influences.

Natural History Notes.

Fountain Trees.-Mr. Duchartre recently made its organs-root, stem, and leaf. known to the French Academy of Sciences the results of an experiment made by Mr. Maxime Lecompte in Congo upon a tree of the genus Musenga. Upon making incisions in the trunk of it and placing a pail at the foot of the tree more than ten quarts of pure water were collected in thirteen hours. The gorillas, it seems, are in the habit of slaking their thirst at these hidden fountains, and regulate the flow of the liquid at will by pulling off different sized branches.

Many years ago, Dr. Wallich found in the province of Martaban, Africa, a plant belonging to the same natural order, whose soft and porous wood discharged, when wounded, a very large quantity of a pure and tasteless fluid, which was quite wholesome and was used as a beverage by the natives. This plant was placed in the genus Phytocrene, which signifies "plant fountain."

These plants form a remarkable exception to the usual character of the order, which embraces species that produce a milky juice, such, for example, as the celebrated cow tree, or Palo de Vaca of South America, which yields a copious supply of a rich and wholesome milk, as good as that of the cow, and used for the same purposes.

The Exploits of Diving Birds.—Engineers have often announced that submarine vessels would some day acquire a speed much greater than that of ordinary ships. The diving birds furnish us with a powerful argument in support of this opinion, for they move with surprising rapidity under water. The penguin, for example, can neither fly nor walk, but hops along as if its legs were tied together. Nor does it swim, for it literally flies under water. When, at the Zoological Garden of London, the keeper brings food to these birds, a sudden transformation is witnessed. The bird, which is heavy and awkward, suddenly becomes a superb and rapid creature, covered with globules of silver formed by the air imprisoned in its plumage, and flying in the depths of the placid water with a rapidity of evolution that is unknown in aerial flight. The motion of its wings is identical with that of ordinary flight, and its feet, extended in a line with its body, serve neither as motors nor as rudders. Steering is effected through the acceleration of the motion of one of the wings at the expense of the other. The fish thus chased is captured and swallowed without any retardation of the speed of the bird being visible. The cormorant, on the contrary, swims with his feet, which act like the paddle boards of the wheel of a steamboat. Yet the conditions of the submarine medium are so exceptionally

Intercellular Communication in Lichens.—Mr. G. cell contents, the protoplasm communicating through tion of the protoplasm is not required, as in the case of the phanerogams. In Uspea barbata communication is tween adjoining cells. Other species in which similar phenomena have been observed are Cladonia rangilum. It is proposed to illustrate these peculiarities of structure in a subsequent note.

Classification of Plant Tissues.—Recent attempts to found an internal morphology of plants have given a new life to the study of botany.

The recent progress in this direction is mainly due to Van Tieghem, the French botanist, the characteris tic feature of whose anatomical teaching is the recognition of the central cylinder or "stele," as a definite the drying process the meat loses a trifle more than root the central cylinder is perfectly well defined, in-

four-fifths of its weight. This beef powder can be cluding within it the ring of alternating bundles of wood and bast, accompanied by a certain amount of which constitutes the pericycle, or limiting layer of the cellent effect in several cases where there was much dodermis, surrounds the stele, and outside the cortex is the piliferous layer or epidermis.

The same three regions—central cylinder, cortex, Beef powder, carefully prepared according to the and epidermis—exist in the stem. The stele is made up of the vascular bundles and conjunctive tissue, the latter constituting the pith, primary medullary rays, and pericycle. The last named is often less obvious than in the root, but is characterized by the same power of forming new tissues and organs. At every node the continuity of the main stele is interrupted, and its limits may be difficult to recognize, but it is none the less a distinct region in the stem because it possesses prolongations into the leaves. Where the vascular bundles bend out from the stem into the leaf, they are powder it would be necessary to keep it from contact accompanied by conjunctive tissue, and the name "meristele" is applied by Van Tieghem to such a bundle or group of bundles entering a leaf, with their enveloping conjunctive tissue. Thus the stele tissue of the whole plant is seen to be continuous through all

> In the typical stems of phanerogams there is a single central cylinder in direct continuation with that of the main root. This "monostelic" condition is constant in the embryonic stem of all vascular plants. But in many vascular cryptogams and in the genera Gunnera and Primula, section Auricula, the cylinder divides up above the hypocotyl or first stage of the stem, a number of equivalent steles thus resulting. In most ferns, and in many selaginellas, this "polystely" occurs.

"Astely," or "schizostely," is a departure from typical structure characterized by the stele completely breaking up into the individual bundles, each surrounded by its own "peridesm" (the conjunctive tissue at the periphery of any portion of a subdivided stele, as distinguished from the pericycle which surrounds named by Dr. Wallich the water vine, and has been an entire stele) and endodermis. Typical examples occur in Equisetum limosum and other species, in Nvmphæa and aquatic species of Ranunculus, etc.

> Change of Color in the Hare.-From a study of seventy-five specimens of the northern hare or white rabbit (Lepus americanus, Erxl.), collected for the purpose of investigating the spring and autumn change of color, Mr. J. A. Allen reaches the following conclusions:

- 1. The change of color, both in autumn and in the spring, is due to change of pelage, and not to a change in the hair itself.
- 2. The change is gradual, occupying many weeks.
- 3. The method of change, as regards the parts first affected, is the reverse in spring in the order characterizing the autumnal change.
- 4. In the early part of spring, after the white overhair has been shed, the pelage consists of the heavy coat of soft winter underfur. This gradually disappears as the summer coat thickens.
- 5. In spring the moult occurs quite as early and proceeds just as rapidly in the females as in the males. and the moult is practically completed before the

These conclusions differ widely from views hitherto entertained by both scientific and non-scientific

Foothold on Pavements.

Some little time ago officers of metropolitan police were deputed to make certain observations concerning road traffic generally during the discharge of their daily duty in the busiest thoroughfares. These observations extended over fifty days of twelve hours each day, namely, from 8 A. M. to 8 P. M., and granite, asphalt, and wood pavement were considered. In one day of twelve hours no fewer than 12,366 horses and vehicles passed along Cheapside, and 5,350 along Cannon Street. During the fifty days upon which observations were taken, 542 accidents took place on wood pavement, 719 on granite, and 1,066 on asphalt. From could travel 330 miles on wood pavement during the fifty days without meeting with an accident, 191 on granite, and 132 on asphalt; therefore the great superiority of wood pavement over all others—at least, where horses are concerned—is at once apparent, Altogether, 1,054 falls were recorded, and an analysis of this number (London says) affords some curious information. On asphalt, 247 partial and 190 complete falls took place; on wood 326—only 39 complete falls. Roughly, for every fall on wood pavement four took place on granite and asphalt.

An Atom of Electricity.

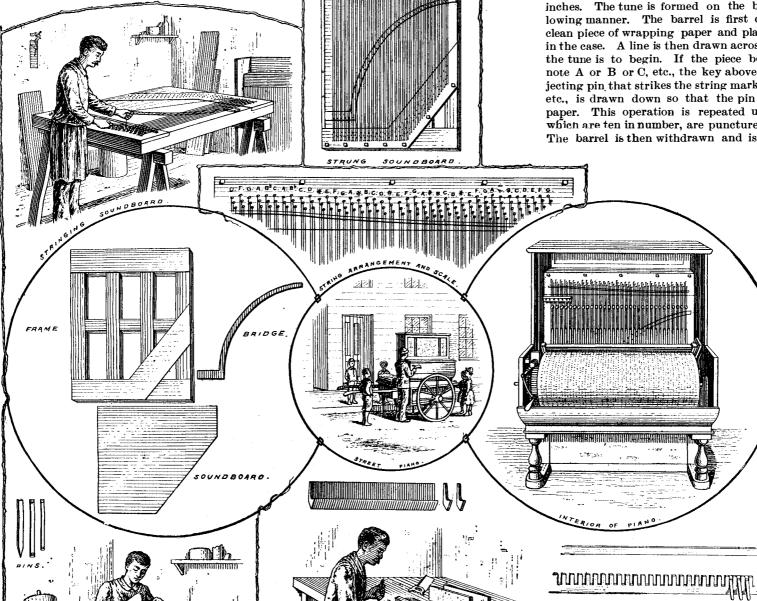
According to a recent determination of Professor Richarz, the smallest possible quantity of electricity, which may be termed an atom of electricity, is such that 430 multiplied by a million three times, that is, by the cube of a million, will give the number of these atoms contained in a coulomb. That such a thing as an atom of electricity exists is the opinion of no less an authority than Professor Von Helmholtz.

STREET PIANO INDUSTRY.

The handle or street piano was first manufactured They are used principally by in Torino, Italy. Italians, who push them around the streets in twowheeled carts or wagonettes, stopping from house to house, grinding out the popular airs of the day. A great many are now in use as parlor instruments. The construction of the soundboard of these pianos is similar to those used in our upright pianos, the framework in the street instrument being made of wood instead of iron. The frame over which the soundboard width, about 5 inches in thickness, and placed about the center of the end of the frame passes through the 6 inches apart, blocks of the same material being bolted and glued between them at the ends and through the center. The strips containing the tuning and hitch pins, which are bolted at the top and bottom of

proper widths, ranging from 1/2 inch to 3/4 of an inch. the strings. These pins are of three sizes. The large The felting is white in color, and runs from 1/8 inch to 1/2 inch in thickness. After drving, the felt hammers are covered with a strip of thin leather. The hammers are connected to the keys by means of a straight piece of iron wire, which is screwed down into the top about 34 of an inch. These keys are made of maple and are also sawed off a prepared strip into the proper width. They are about 1/2 inch in width and about 6 inches in length. The key frame is also made of maple, a number of slots being sawed into the strip 1/2 inch in width and strings are placed is made of strips of thoroughly and about 1/2 inch apart. The lower ends of the keys seasoned pine. These strips are about 2½ inches in are then put into the slots. A wire running through

or square pins representing whole notes, the circular medium size, the half notes and the small ones the trills. When the cylinder revolves, these pins strike or come in contact with a pin connected to the bottom of each key. As the pin on the cylinder moves forward it pushes the key pin backward, which in turn draws the hammer forward. As soon as the key pin escapes from the cylinder pin the hammer flies back and strikes the strings. The space between the pins and their height above the surface of the barrel distinguishes the whole and f notes from the half notes. These pins project from the surface of the barrel from 1/2 inch to 1/4 inch. The half notes, which are the medium sized pins, project up about half the height of the whole notes. The trills are made with the small pins, they being placed one after the other as close as possible. In striking, the hammers are drawn back from 34 of an inch to 2 inches. The tune is formed on the barrel in the following manner. The barrel is first covered with a clean piece of wrapping paper and placed in position in the case. A line is then drawn across the top where the tune is to begin. If the piece begins with the note A or B or C, etc., the key above with the projecting pin that strikes the string marked A or B or C, etc., is drawn down so that the pin punctures the paper. This operation is repeated until the tunes, which are ten in number, are punctured on the paper. The barrel is then withdrawn and is ready for the



the frame, are made of maple, about 11/2 inches in thickness. The soundboard, which is made of strips of 1/4 inch spruce, is placed snugly between the tuning and hitching strips. The frames range in size from 30 by 44 to 42 by 54 inches. The tuning pins are made of steel, about 2 inches in length and about 1/4 inch in diameter, the bottom end being threaded. Slanting holes are bored into the pinboards, their diameters being a little less than the pins. The ends of the pins are then inserted into the holes, the hitching pins being driven and the tuning pins screwed in by means of a key fitting over the square top. The strings are made of the best steel wire of seven different sizes, ranging from No. 13 to 19. They are arranged over the sound board containing the bridge in sets of from center of each key, holding them in place. Connected three to five strings each. The tuner first making a loop in the end of a string and placing it over the hitch pin, the other end is passed through the hole or eye in the tuning pin, the operator twisting it around by means of the key until it is drawn taut. Each set octaves. The hammers are made of maple and English ness. The barrel revolves on a movable table or plat-

PUTTING

PINS IN BARRE

THE STREET PIANO INDUSTRY.

ARRESTAL

to each key is a brass wire spring, one end being at tached to a key and the other to the key frame.

When the stroke of the hammer is made this spring draws the hammer back instantly, causing the strings to give a full round tone. If the hammer remained of strings is lettered A. B, C, etc., each string of each against the string after the stroke, the tones would be set being tuned up to the same pitch, according to the dead. The barrel or cylinder containing the pins runs note wanted. There are from 40 to 48 sets of these from 28 to 36 inches in length and 141/2 inches in diamestrings in each piano, which contains from four to five ter and is made of whitewood about 1 inch in thickform which can be removed from the case by means of The felting, which costs about \$5 per pound, is first a circular door in the side of the piano. The placing takes four skilled men about three weeks to make one glued to a prepared maple strip and sawed off into the of the pins on the barrel causes the hammers to strike of these pianos. They cost from \$160 to \$180 and are

pins. These pins are about ¾ of an inch long and made of steel. They are forced into the surface of the barrel by hand, the operator putting the pins into the slotted jaws of a pair of pincers and pressing them down and into the paper and wood, where it is punctured. For ten tunes it takes about 6 pounds of these steel pins, amounting in numbers to about 16.800, the operation taking from 3 to 6 days. The barrel is shifted from one tune to another by means of a small wheel, the surface of the side nearest the barrel being raised at different elevations. The wheel is operated by turning a knob or button on the outside of the case. A small pin projecting out of the end of the shaft bears against the small wheel, which when turned causes the barrel to shift its position. The barrel when turned revolves at the rate of 1 revolution per minute, each revolution making one tune. It

guaranteed for two years. New tunes are put on the barrels at a cost of \$5 each. The cases are made of birch highly polished. The piano when finished weighs about 300 pounds. The sketches were taken from the manufactory of Giovanni Mina, New York City.

Food for Fever Patients.

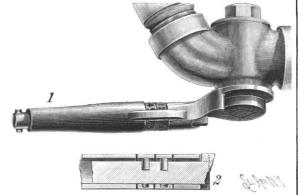
Dr. Peabody, in the Medical Record, expresses his belief that, in all kinds of illness, and especially in fevers, attention should be paid to the appetite and desire of the patient, and that, if a patient is really hungry, solid food, of a properly selected kind and in judicious quantities, will rarely disagree with him. Dr. Peabody believes there is less danger of doing harm to an ulcerated ileum in typhoid fever by giving finely divided egg, beef or chop than by giving milk, and habitually gives his typhoid patients who are hungry such food. He believes that it is a mistake to withhold solid food merely because a patient has fever, and that it is incorrect to regard milk as a fluid food, as is commonly the case, the simple fact being that milk will always remain the most serviceable general food in disease, but where it fails to nourish the patient, or where it is not well borne, or for any reason cannot be taken, it is to be considered that efficient adjuncts and substitutes are within reach.

A MUSSUCK RACE.

At the Calcutta swimming bath ladies attend in large numbers to witness the annual sports and races. Among all the exhibitions of swimming, racing, and diving, none produce merriment like the mussuck race, which has to be swum in full costume, with boots and tall hats, any competitor being counted out who are rives at the goal—one hundred feet from the starting point-with head uncovered. A mussuck is a tanned goat skin, which, when used by water carriers, has all the openings sewed up except at the neck, and is in use throughout all those parts of India where British civilization has not laid on pipes. For the race they are inflated with air, the neck of the opening closed and the racers have to bestride them and make their way by paddling along the bath. Our illustrations (which are from sketches by Mr. Frank Scallan, of Calcutta) show how those who hurry get underneath, while the wary one who goes slowly preserves his equilibrium till the end.—From the Graphic, London.

A LOCKING STOP COCK FOR TRAIN PIPES.

To prevent the interference by unauthorized persons with the operation of air brake systems, a locking mechanism for the stop cocks of train pipes has been invented by Mr. John T. Eldridge, of Murfreesboro N. C., and is illustrated herewith. The stop cock casing has in its lower portion a segmental recess at whose ends are shoulders or lugs, and the stem of the valve has on its upper side a lug which works in the recess,



ELDRIDGE'S LOCKING STOP COCK FOR TRAIN PIPES.

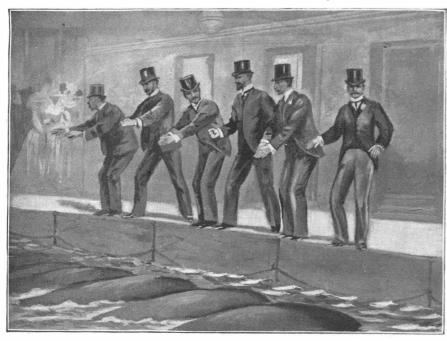
engaging one shoulder when the cock is open and the other shoulder when the cock is closed. On the lower side of the handle, near its inner end, are longitudinally aligned studs, and a locking sleeve turns and has longitudinal movement on the handle, being held from a removal by a stop at the outer end. The sleeve has a longitudinal internal groove, permitting it to pass the studs, and is cut away on opposite sides to form an open chamber within which are permutation rings having internal annular and intersecting transverse grooves which operate in connection with the studs. as shown in Fig. 2. The inner end of the sleeve also has on opposite sides notches which alternately engage the outer edge of the lug on the valve stem when the sleeve is moved inward to be locked, there being besides an inner extension or arm of the sleeve which engages one of the shoulders of the valve casing, as shown in Fig. 1, when the cock is to be locked in open position, the arm engaging the other shoulder when sides of the permutation rings are turned to bring the figures which form the "combination" into align-

ment, the internal transverse slots or grooves of the rings will register with the stude on the lower side of the handle, and the locking sleeve will then be free to be moved and rotated.

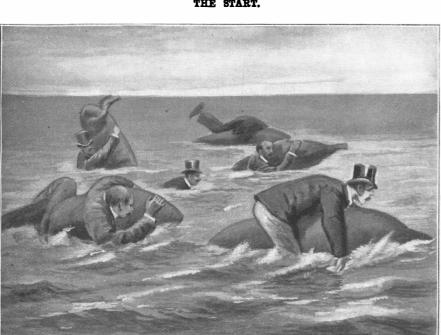
The Trouble New York Builders Have.

A prominent builder tells one of our city contemporaries that building in New York is at the present time quite a game of chance. After the contracts are all made, the cellar blasted out and the foundations laid, it would appear to be an easy matter to go ahead to

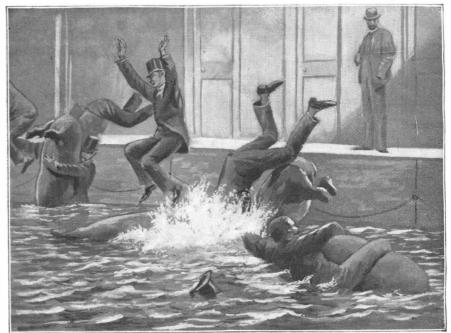
"On the contrary," said he, "your troubles are likely to just begin. There are the stone workers, the brick contractors, the terra cotta man, the plasterers, the trimmers, etc. I've got some houses not done yet which were to have been completed by the first of September. My money is invested in an expensive piece of ground, and the houses will not be ready to catch the fall renter and buyer. Even when completed now they will probably remain vacant till next May. The stonework was delayed, in the first place, by trouble between a contractor and his men. Then the brick contractor commenced delivering the wrong kind of brick. When that dispute was settled in my favor and the brickwork begun, we were a full month behind. The terra cotta came from the West and the bricklayers had scarcely got to it before we found certain pieces missing and had to send out to Ohio or Indiana for them. Then everything appeared to be going on satisfactorily and we thought of catching up the lost time. But as soon as the first coat of plaster was on, a strike among plasterers broke out. We had nothing to do with it, but all our men went out just the same. This threw out the trimmers. By the time the difficulty had been settled with the plasterers we were threatened by a similar row among the trimmers and joiners. I don't know how it is going to come out. The building trades of this city are united, and no builder is really safe until he is completely out of the woods. These sympathetic strikes have so many ramifications you never know where you are. There are hundreds and thousands of dollars tied up in uncompleted work in this city-yes, and other hundreds of thousands that would go into labor if there were any the cock is locked in closed position. When the outer certainty about it. Wherever we lose money by this labor also loses, for it makes building cost more and makes capital timid of investment."



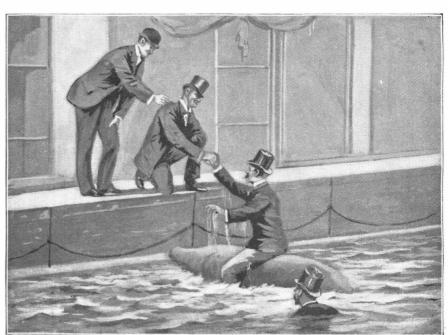
THE START.



THE RACE.



THE PLUNGE.



THE WINNER.

Mr. Edison's Kinetoscope in London,

The latest, and not the least remarkable, of Mr. Edison's inventions is the kinetoscope, of which a by sorrow. Music, when it can be borne, has a soothprivate demonstration was given recently at 70 Oxford ing power beyond words. Books, too, have their place, Street. The London Times says: This instrument is to the eye what Edison's phonograph is to the ear, in that it reproduces living movements of the most complex and rapid character. To clearly understand the effect it is necessary to explain the cause, but to appreciate the result the working of the invention must be witnessed. The moving and, apparently, living figures in the kinetoscope are produced in the following manner: Mr. Edison has a stage upon which the performances he reproduces are enacted. These performances are recorded by taking a series of 43 photographs in rapid succession, the time occupied in taking them being one second only. Thus every progressive phase of every single action is secured, and the photographs are successively reproduced on a film of celluloid of the length required for recording a given scene. When this film is passed before the eye at the same rate of speed as that at which the photographs were taken, the photographically disjointed parts of a given action are united in one complete whole. Thus supposing a person to be photographed taking off his coat—as is done in one case—the successive views representing the phase of action at every forty-third part of a second are joined up, and the complete operation of taking off the coat is presented to the eye as it would appear in reality. In other words, the kinetoscope is a perfect reproduction of living action without sound.

The apparatus in which the reproduction takes place is a cabinet about 4 ft. high, 2 ft. wide, and 1 ft. 9 in. deep. It contains the celluloid film band, the apparatus for reconstructing the disjointed views, and a small electric motor for driving the apparatus. The chief detail of the mechanism is a flat metal ring have ing a slot in it, which makes about 2,000 revolutions per minute. The film passes rapidly over the ring, beneath which is a light. The spectator looks through a lens on to the film, and every action recorded on it passes under his view. Ten machines were shown, in which the most rapid and complex actions were faithfully reproduced. One scene represents a blacksmith's shop in full operation, with three men hammering iron on an anvil, and who stop in their work to take a drink. Each drinks in turn and passes the pot of beer to the other. The smoke from the forge is seen to rise most perfectly. In another view a Spanish dancer is shown going through her graceful evolutions, as is also Anna Belli in her serpentine dance. There is likewise a wrestling scene and a cock fight, in which feathers are seen to fly in all directions. All the features of an original stage production are given, of course on a small scale, but possibly only for the present on a small scale, for Mr. Edison promises to add the phonograph to the kinetoscope and to reproduce plays. Then by amplifying the phonograph and throwing the pictures on a screen, making them life size, he will give the world a startling reproduction of human life.

The Hygiene of Sorrow.

by Dr. Louise Fiske Bryson formulates some distinctly modern views upon the effects of grief. The attempt to act as if nothing had happened after the advent of represented in Fig. 2. The latter plate is locked in some misfortune, and to conduct life exactly as before, is one of the greatest possible mistakes. It is an outrage on nature, which she resents sharply in the end. Pay day comes sooner or later; and the overth row caused by blinding catastrophe arrives, even if deferred.

The nervous system requires complete rest after blows caused by sorrow. Recent medical observations (Fere, Bassi, Schule, Zenker) show that the physical results of depressing emotions are similar to those gaging the straps attached to the shafts, thus recaused by bodily accidents, fatigue, chill, partial star-leasing the animal from the vehicle. The saddle has vation, and loss of blood. Birds, moles, and dogs which the usual belly band, and on the shafts are held loops apparently died in consequence of capture, and from conditions that correspond in human beings to acute belly of the horse, to prevent the rising of the shafts. nostalgia and "broken heart," were examined after death as to the condition of their internal organs. Nutrition of the tissues had been interfered with, and the substance proper of various vital organs had at Paris, which has the following: "On approaching at Port Richmond. The drydock being in use at the undergone the same kind of degeneration as that the patient you should assume a calm expression and brought about by phosphorus or the germs of infec- avoid any gesture of greed or vanity, greet those who tious disease. The poison of grief is more than a name. salute you with an humble voice, and sit down when To urge work, study, travel, the vain search for amusement, is both useless and dangerous. For a time the he is, and examine his urine. To the patient you whole organism is overthrown, and temporary seclusion is imperative for proper readjustment. After some bereavement the custom of wearing mourning has a result will be that if you cure him, your merit is system." distinct moral value. But its period of use must be greater, and you will receive the greater praise and brief: a few weeks, months, perhaps a year; otherwise fee, while, if he dies, they will say that you had no dense black draperies become a burden, an æsthetic hope from the first." On the subject of table manners For a time they have a place, securing consideration preside over the house ask you to the table, conduct from strangers and silence from mere acquaintance, yourself in a seemly manner. Each time that a new since sorrow is one of the touches of nature that makes dish is brought on do not fail to ask for the condition the whole world kin.

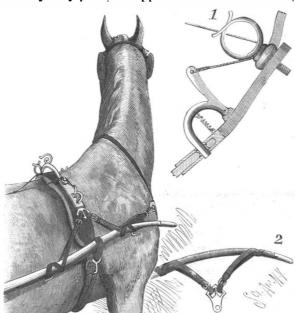
rambles in the open air, days alone with the sea, alone repast you do not forget him. On leaving the table Academy of Medicine has reported in favor of Dr. in the forest, console as nothing else can. Quiet, silent return to the patient, and tell him that you have dined Roux's treatment.

new heaven and a new earth to one fatigued and worn those gentle companions without speech whose calm society helps annihilate time and space, and who always receive us with the same kindness. The familiar faces of newspapers and journals bring a stray comfort that even the tenderest heart is powerless to bestow. The care and companionship of children is another source of strength. Children are not watching to see how the afflicted are bearing up under sorrow, nor are they waiting for some expression of sentiment or the overthrow of self-control. A child is always the best comforter, uttering no word of sympathy, yet rousing interest in life because its nature is sweetness and light.

Grief cannot be ignored, neither can it be cheered up. It must be accepted, and allowed to wear itself away. Readjustment comes slowly. Sorrow, grief, and all great misfortunes should be regarded as conditions similar to acute infectious diseases, which they resemble in result: and later, as convalescence from such diseases. Seclusion, rest, sleep, appropriate food, fresh air, sunshine, interests that tax neither mind nor body, these are requirements in this class of illness. The care of the condition following depressing emotion calls for the same treatment in greateror less degree Medical Record.

AN IMPROVEMENT IN HARNESS.

The illustration represents a harness with which a horse may be readily hitched to the shafts or instantly detached therefrom in case of a runaway. It forms the subject of a patent issued to Mr. Ricardo Ortega, of Ciudad Porfirio Diaz, Coahuila, Mexico. On the jockey plate, on opposite sides of the saddle,



ORTEGA'S HARNESS.

In a recent issue of a New York newspaper an article is secured a separate bar, as shown in Fig. 1, having in its lower end a recess to receive the apertured end of a plate engaged by straps fastened to the shafts as place on the bar by a pivoted U-shaped bolt, the pivoted end of the bolt having an upwardly extending arm connected with one end of a cord passed around the base of the terret and thence extending to the driver's seat. There is a spring connecting the bolt and bar, to hold the bolt normally in the position shown in Fig. 1, but by pulling on the cord the outer end of the bolt is withdrawn to release the plate enconnected with an additional band passing under the

Medical Etiquette among the Ancients,

they do. Then turning to the sick person, ask him how promise to cure, but immediately on leaving the room you say to the relatives that the disease is grave. The of the patient. This will give him great confidence in Where there is nearness of relationship to nature, you, as he sees that in the midst of the variety of the

drives, or even short journeys by rail, will reveal a most excellently, and that everything was served to perfection. The sick person who was anxious about these points will rejoice at your words."

Why Leaves Fall,

Why leaves fall is thus explained in a recent number of the Gardeners' Magazine:

As Kerner remarks, in stating his views on the question, it appears strange that the fall of the leaf should be sometimes connected with the approach of cold, and sometimes with hot weather; but it is very conclusively shown that this is the case. Heat and cold are only indirect causes, the primary cause being the danger threatened to the plant by the continuance of transpiration; and it is contended that the throwing off of the transpiring surface and the temporary stoppage of the sap current furnish one of the best protective measures in plants surrounded by air against excessive transpiration. Again, in autumn the absorbing activity of the roots is so reduced by the low temperature of the soil that the water which is lost by transpiration is no longer replaced. Frost hastens the fall of the leaf, but it was partially accomplished before frost set in; and where the leaves still cling to the branches preparations are already made for their detachment. Kerner is careful to point out that it must not be assumed that the plants foresee the approach of either the dry season or the winter, and he explains the phenomenon on the assumption that in a climate which renders a long cessation of transpiration necessary those plants flourish best whose natural characteristic is to follow a period of energetic working by a season of rest. Plants differ materially in the time of their shedding their leaves, trees growing on mountains losing their foliage several weeks in advance of those in the plains, although much later in coming into leaf. Primarily, the stripping of the leaves depends upon the drying up of the sources from which they obtained their water, and the detachment is brought about by the formation of a special layer of cells known as the layer of separation. This consists of a parenchymatous tissue, and the walls are so constructed that they are easily separated by mechanical or chemical agents. As soon as restriction of transpiration commences, thin-walled cells are formed in the lower part of the leaf or leaflet, and form a zone. When the layer has attained its proper thickness its cells separate from each other, the so-called middle lamella of the cell wall is dissolved by organic acids. and continuity between the cells of the layer of separation destroyed, with the result that the most trifling cause will effect a fracture and bring the leaf to the ground.

Sunken Vessels Raised by Air Bags,

An improved method of raising vessels, in which air bags are employed, has been invented by Grant Brothers, of New York and Tacoma. The bags are attached to the vessel and air pumped into the bags, the invention being such that the air pressure never exceeds the water pressure; hence no bursting of the bags can take place. When a sufficient number of bags are attached to the vessel and the air pressure admitted to them, the vessel rises to the surface and there remains so long as the air pressure is main-

The new method was lately applied in raising a chooner which had been sunk in this harbor by a collision with steamer. Messrs. Grant write as follows:

"We raised the schooner Almira, register 90 tons, 23 feet beam, 95 feet long, 5 feet 8 inches hold, on Saturday, October 13, 1894, at Quarantine Station, Staten Island, which was sunk in about 10 feet of water, or 4 feet over all. She was stove in so the tide rose and fell in her, rendering it impossible for any pumps now in use to keep it clear or raise her. It required only six bags, 4½ feet in diameter and 24 feet long, to give sufficient displacement to raise her, leaving her decks dry. Her deck was partially torn off and several deck beams were broken away at the ends. In one hour and five minutes after lying alongside we had the bags placed and ready to raise, and inside of There is an old manuscript in the National Library, four hours from that time we had her at the drydock time, we let the schooner sink near by, and on Thursday, October 18, we raised her the second time and placed her on the dock for repairs, and upon examination, after she was on the dock, disclosed the fact that she was in such a condition that it would have been impossible to pump her out or expel the water by any other process except Grant Brothers' air bag

Dr. Roux's Cure for Diphtheria.

A few weeks ago the Paris Figaroopened a subscripblunder, and a source of depression in themselves. for the doctor, it proceeds to say: "When those who tion list in order to enable the Pasteur Institute to supply Dr. Roux's antidiphtheria serum to all medical applicants. The appeal has resulted in a sum equivalent to about \$50,000 being raised. It is hoped that institutes in which experienced physicians will administer the cure will soon be established. The Paris

A STONE BAPTIST CHURCH

Our engraving represents the Eirst Baptist Church, recently completed at Warberth Park, Pa. The design is unique. It is of the Gothic style of architecture. It is built of rock-faced Chestnut Hill granite of a grayish blue color, laid up at random in red mortar. Roof slated and finished with a tiled cresting. Dimensions: Front, 29 feet; side, 69 feet. The interior thoughout is finished with oak. The auditorium, 26 feet × 57 feet, has a seating capacity of 280. It is lighted by stained glass windows, shedding a pleasant light over the auditorium, altar and choir box. The pastor's study is placed conveniently. The basement contains Sunday school room, two class rooms, and furnace room, besides other apartments. These apartments are furnished complete. Class rooms are connected to Sunday school room by double sliding doors, and are so arranged that they can be thrown together at pleasure. Cost of church, exclusive of furniture, \$6,000. The stone was accessible,

horizontally and vertically, no part of the building being omitted; and, further, in building the exterior slightly inclined inward. The walls are built unusually thick. The designs purposely showed no gables, and in vaulting very narrow spans were arranged for. On referring to official information regarding the earthquake, we hear that at Tokio and Yokohamatogether no less than 4,551 buildings were damaged, and that sixty-one persons were killed and 428 hurt by falling houses. Thirty-two buildings collapsed completely, and eighty-one were practically razed; five bridges gave way. Of course, the majority of these buildings were of native construction; but these, as usual, apparently withstood the shock far better than the average "European" structure.—The Builder.

A Great Tunnel Completed.

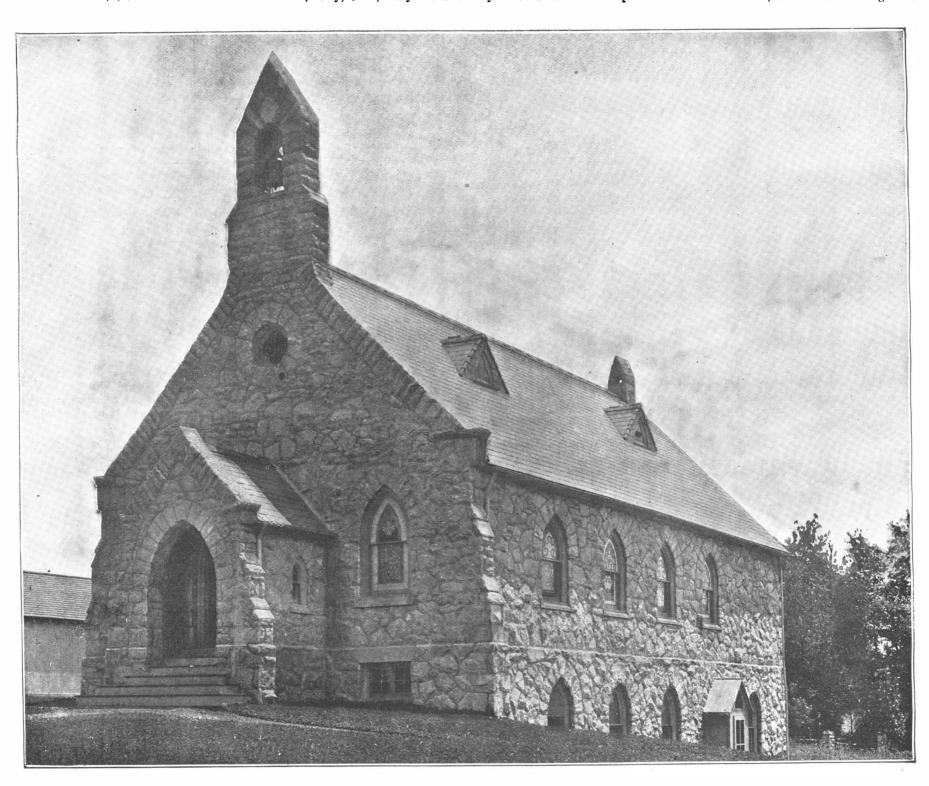
A notable piece of mining work was brought to completion, says the Mining and Scientific Press, at Park City, Utah, lately after over six years of constant labor.

tons from the Ontario and Daly-this would effect a saving of \$280,000 and the tunnel would more than pay for itself in two years. Add to this saving the amount that has been expended yearly in the tunnel, and it will be seen that the mines will be in a position to resume dividends. The mines will continue to be worked, notwithstanding the low price of silver.

----Another Large Telescope.

The great 16 inch equatorial telescope under the guidance of Dr. Lewis Swift, at the Lowe Observatory on Echo Mountain, Cal., was inaugurated September 16. The Mount Lowe Echo says: The night was black dark, the atmosphere clear and pure, and the stars stood out as brilliantly as diamonds. Dr. Swift says, never before in his experience has he enjoyed such perfect brilliancy, and in these conditions, observations become a rich delight.

In sweeping over a field doubtless often before explored when in Rochester, to his intense delight he



A SIX THOUSAND DOLLAR STONE CHURCH.

for in many other places.

Our engraving was made direct from a photograph of the building, taken specially for the ARCHITECTS AND BUILDERS edition of the SCIENTIFIC AMERICAN.

Earthquake Effects on Brick Buildings.

our contemporary, the Deutsche Bauzeitung, gives us some interesting particulars of the effects of the late earthquakes on the new public buildings these architects have erected at Tokio. We refer to the earthquake that passed over Japan on June 20 last. It seems that the shock lasted no less than four minutes and fifty seconds, and that the buildings rolled perceptibly. While all the other brick buildings suffered badly, Messrs. Ende & Boeckmann's blocks apparently withstood the shocks without showing a crack. This escape seems to have been mainly due to the precaution of tying in all the brickwork with iron bands, both | ton. On the basis of last year's production—56,000 | train.

rendering the cost less than the church could be built | This is the Ontario drain tunnel, which will drain | speedily discovered four new nebulæ, thus, at once, the Ontario, Daly and Daly West mines, with which it demonstrating the superior capacities of his wonderful has direct connection. It is expected that it will also reduce the water in the Silver King and other properties. The rate of flow through the tunnel before its connection was made was about 13,000 gallons per minute. As soon as the cleaning up is all done the A letter of Messrs. Ende & Boeckmann, of Berlin, to great Cornish pump will be stopped, and all the water will flow through the tunnel. The mines are capped at a depth of 1,500 feet.

This tunnel is 15,490 feet long and it took six years and three months to run it. The average cutting per day was six and three-fourths feet. The completion of this tunnel will effect an enormous reduction in the operating expenses of the mines. The great Cornish pumping plant, which represents an outlay of nearly \$500,000, will now be stopped, and no fuel will be required except for hoisting. It is estimated that the passenger coaches. It is estimated that there were cost of ore production will be reduced about \$5 per something like three thousand passengers on this

glass in this pellucid atmosphere, and giving a foretaste of what may be confidently anticipated when all the final adjustments of the telescope are made and it is in regular operation. Dr. Swift is ably seconded by his gifted son Edward, who will soon inaugurate a system of making stellar photographs with the 16 inch equatorial.

The Longest Passenger Train.

A correspondent sends us a clipping from the Sioux City Journal, which states that about five miles west of there is a park called Riverside Park. It is situated on the Sioux River. At this park was held an interstate fair. On October 11 the Milwaukee Railroad pulled in from Riverside Park a train consisting of 28

The Relative Strength and Length of Limbs in journey. When the house was finished, several men pliable. Chewing the skins is very hard on the wo-Man and Woman.

From the last report of the Anthropometric Laboratory, of London, we extract the following interesting data as to the relative strength and length of limbs in man and woman.

In man, in 50.9 cases out of a hundred, the right arm is stronger than the left. In 16.4 cases, the two arms are of equal strength. Finally, in 32.7 cases out of a hundred, the left arm is the st onger. Thus (and here is a fact that appears to be lit le known), out of every ten men, there are more than three whose right arm is not as strong as the left. The proportion is better distributed in women. Out of a hundred, only 46.9 possess more strength in the right arm, and 24.5 (say nearly one-fourth) have more strength in the left. Dynamometric experiments have likewise proved that in wo men the upper limbs possess the same strength much oftener than in men, since out of a hundred there are 28.6 that have given the same results in the two arms. As regards the respective length of the limbs, we see that in most cases the right arm and the left leg are the longer. Upon measuring fifty skeletons of adults, of men as well as women, the Laboratory found the following proportions. In twenty-three cases, the left leg and the right arm were the longer, in six cases it was, on the contrary, the right leg and the left arm, and in four cases only the limbs of the right side were longer than those of the left. Finally, in seventeen cases, all the limbs were more or less unequal in length.

Curious Facts About the Eskimos.

Mrs. Peary, the only lady to take part in any Arctic expedition, spent a year in Greenland. She has recently published her journal,* the contents of which are summarized in the Spectator, London. We quote:

"The wooden house which the exploration party built on the north coast of Inglefield Gulf, some miles due north of Whale Sound, was the base of operation for Mr. Peary's expedition to the north coast of Greenland, across the inland ice. The explorers sighted Greenland on June 24, 1892, and at the end of July landed and built the house. Mr. Peary, his leg having been broken by a blow from the ship's tiller, was unable to take any active part in work, and it was not till the spring was at hand that the broken limb recovered its real strength, just in time, indeed, for the ice

* "My Arctic Journal: A Year Among Ice Fields and Eskimo."

of the expedition were sent to search Herbert and Northumberland Islands for an Eskimo settlement. and to induce a family to settle down near the house and make themselves useful—the man to act as hunting guide and the woman to do the sewing of the many skin garments. They returned with one family, and the first proof of his skill the Eskimo gave was to cut up a huge walrus with a six-inch pocket knife.

"Of course the prevailing characteristic of the Eskimos in Mrs. Peary's estimation was their dirtiness, and it was as a very great favor that she finally allowed the best sewer to squat on the floor in her own room. Indeed, the habits of the Eskimos never failed to excite her disgust, and she tells with horror how, when the Eskimo man had been given leave to bring home a cached seal, the most awful smell pervaded the place from the two-year-old corpse. Ikwa, the Eskimo, was most indignant at the refusal to allow it to be carried in the boat, declaring it to be 'the finest kind of eating for himself and family.' On November 23, Mrs. Peary notes that it was impossible to read ordinary print at noon, and henceforth the only difference between day and night at Redcliffe House was the addition of a 'large Rochester lamp' to the bracket lamps from 8 A. M. to 10 P. M., called by the Eskimos the 'Baby Sun.' A rule was made by the commander of the expedition that no member should occupy his bunk between 8 A. M. and 7 P. M., unless ill. The best sewer was a woman named M'gipsu, and she was Mrs. Peary's favorite, having also the additional distinction of forming with her husband and children the most northerly family on the globe. Mrs. Peary tells us the manner'of preparing the clothes for the great ice journev. Her husband gave her an idea of the kind of garment he wanted, and she cut out experimental outfits of canton flannels; these, if satisfactory, served as patterns for the skins, so that no waste of skin occurred. How the natives prepared the skin, let Mrs. Peary relate:

"'The native method of treating the skins of all animals intended for clothing is first to rid them of as much of the fat as can be got off by scraping with a knife; then they are stretched as tight as possible, and allowed to become perfectly dry. After this they are taken by the women and chewed and sucked all over in order to get as much of the grease out as possible; ley's oil engine. There are two cars at present in use. then they are again dried and scraped with a dull im-

men, and all of it is done by them; they cannot chew more than two deerskins per day, and are obliged to rest their jaws every other day.'

"More Eskimos arrived, till the permanent camp of the expedition became an Eskimo village. Two of the men were reported to 'swap' wives every year; they were the only two men in the tribe who did so; and though the other men regarded it as reasonable, the women were not satisfied with it. One of the newcomers, who had recently lost her husband, drowned by a seal, was asked by Mrs. Peary if the three children she had with her were all; she burst into tears, and left the room. On questioning her favorite, M'gipsu explained, after much hesitation, that Klayuh, the widow, had just strangled her youngest child, about two years old. She could not support the child herself, and no man would take her to wife with a child in the hood, where the women carry their children till they can get about themselves. M'gipsu, when asked if this was always done, said, 'Oh, yes; the women are compelled to do it.' When M'gipsu sat in Mrs. Peary's room, her husband, Annowkah, came in as often as he could find an excuse for doing so. 'He frequently rubs his face against hers, and they sniffle at each other; this takes the place of kissing. I should think they could smell each other without doing this, but they are probably so accustomed to the (to me) terrible odor that they fail to notice it."

Railway Across the Devil's Dike.

A new telpher railway across the Devil's Dike, on the Sussex Downs, was recently opened by the Mayor of Brighton. The track cables of the railway are carried upon a series of supports attached to a powerful catenary cable which is secured to the sides of the gorge, the structure being steadied and further strengthened by iron columns at about 200 feet from the extremities of the railway. The main cable is 1,200 feet in length, the space between the two stations about 1,100 feet, while the span between the columns is 650 feet. The wheels on which the cars run cannot get off the tracks, one set of wheels always controlling the opposite set. The cars are conveyed at a height of about 230 feet above the lowest point of the gorge, and are moved by an endless cable worked by a Cross-The mayor and mayoress were the first to cross and plement so as to break the fibers, making the skins spoke of having had an agreeable experience.

RECENTLY PATENTED INVENTIONS. Railway Appliances.

CAR VENTILATOR.—Benjamin F. Hughson, Cold Spring, N. Y. This device has a tubular body, open at both ends, which flare outwardly, and is fastened to the side of the car roof to afford passageways leading into the interior, there being pivoted at the junction of the two passageways a flap valve, operated by the motion of the car to create a current which draws out the foul air. The device is very simple and cheap, and may be readily applied to an old car as well as when the car is being built. It operates automatically and may also be conveniently operated by hand.

MAIL BAG HANDLER.-Edward Da vies, Whittington Hall Farm, near Stourbridge, England To deliver mail bags, etc., to or from trains in motion, this inventor has devised an apparatus consisting of two members, one attached to the car and the other to the roadside platform, the members acting as radius links, and the package while being transferred gradually ac quiring or ceasing to partake in the motion of the train The arrangement is such that the radius members act conjointly on the package throughout its flight, both as regards the initiation, the change of direction, and the arrest of its actual or relative motion.

Mechanical.

GRINDING MILL.—Charles C. Howe, Westerly, R. I. 'This is a mill more especially designed for grinding mica and similar substances in a liquid. It has a receptacle with a bed in its bottom and a circular band at the side, the muller carried around resting on the bed, while there is an elastic band in the periphery of the muller in frictional contact with the band in the side of the receptacle. In grinding mica the muller is of stone and runs on a hard wood bed, the blocks having their grain on the end, and thus giving great brilliancy cally fills itself when lowered into the water in the mine to the mica, which is rather smoothed or flaked than ground.

WATER ELEVATOR. - Joseph McMurrin, Shoshone, Idaho. This elevator is adapted to be placed in a running stream and operated by the current. A substantially triangular frame is temporarily anchored or permanently placed in the stream, its upper portion carrying a sprocket wheel, and there being at its lower corners drums having sprocket sections, actuating an endless sprocket chain carrying a series of buckets. The end drums on the lower horizontal section of the frame are driven by paddles propelled by the current, these paddles being on endless belts passing over the end portions of the drums

CHILL FOR MAKING CHILLED CAST-INGS.-Herbert Schon, Apollo, Pa. The chilling surface of this chill is formed by a series of hollow chill blocks, constituting cooling chambers, each connected at its lower end by a port with an annular waterway connected with a water supply source and also with a steam supply. Each chamber is also connected at its upper end with another waterway and an outlet for water and steam. The chill may thus be first heated up with hot water and steam, and cold water only be circulated through it after the metal has been poured, the temperature of the water,

and the consequent hardness of the casting, being largely under control.

Agricultural.

RIDING ATTACHMENT FOR PLOWS. James Kleihauer, Jr., Johnson, Neb. This is a device of simple and inexpensive construction, readily applied and adjusted to any kind of walking plow. It virtually comprises two frames, a forward and right hand frame em. bracing a cross bar and attached parts, and a left hand rear frame, both frames being of angular construction. When the plow is to be used again as a walking plow the attachment may be readily removed.

Miscellaneous.

DRAG FOR SUCTION PIPES.—Ernest O. Patterson, Charleston, S. C. The body of this device has wide, downwardly curved mouth, on the front side of which is a shaft carrying a valve for closing an inlet near the mouth opening, there being on one end of the shaft a veighted lever connected by a rope with the dredging boat on which is the pumping machinery. The valve is normally closed, but when a large amount of sand or other material fills the mouth so as to cut off the neces sary supply of water to insure proper suction, the valve is opened by means of the rope, permitting water to be drawn in to cut up the choking material. The improvement precludes the necessity of pulling up the suction pipe in case of its choking.

BAILING DEVICE.—John Fatkin, Aspen, Col. A bucket having a valved outlet for its lower portion, and also an inlet valve, with a tripping device for unseating the valve in the outlet, form the main features of this invention, which has been devised for readily emptying flooded mines of their surplus water. It temporarily takes the place of the usual cage, and automatishaft, automatically discharging into an outlet chute slight turning of the knob will operate a tripping cord when raised to the mouth of the shaft or other discharg-

REFRIGERATING APPARATUS.—Ernest W. Carleton and James M. Odell, Austin, Texas. This invention provides means for lowering the temperature in a partially closed chamber by evaporating water by means of capillary attraction, automatically maintaining, also, a specified water level in the water chamber and good ventilation of the cooling chamber. The warmer the weather, the greater will be the difference between the temperature inside of the cooling chamber and that of the outside air. The apparatus is especially adapted for preserving meat, butter, eggs, milk, etc. in warm weather, without the use of ice or chemicals.

BALE BOX CLAMP.—Thomas M. Wallace, Marion, Ala. With a bale box of the ordinary construction, whose ends and sides open by the expansion of the bale when the clamping devices are released, preferably two clamps of this design are used, one near each end of the box, suspended above the box by chains. The clamps have at one end a catch to engage one side of the bale box, and at the other end the clamps have eyes in which is held a shaft resting in closed position against plates whereby the side and end doors are held

closed. The shaft has a handle by which it may be rolled up and off the plates when the doors open, leaving the bale free.

FLOOR CLAMP.—Moses Schlatter, Innan. Kan. The body of this device consists of two rigidly connected members in which are arranged opposing toothed studs, one of the studs being held to turn in its member, and the other turning and sliding in the opposite member, there being a lever and cam for actuating the sliding stud. With this clamp board for flooring, siding or ceiling may be brought and held in close contact while being secured in place. The construction of the device is very simple and inexpensive.

UMBRELLA. — Zebulon Wirt. Monticello, Ind. The frame of this umbrella may be readily applied to a walking stick or easily removed therefrom and placed in a pocket or small bag. It has a tubular shell, with cap flange and latches, a runner sliding on the shell and sectional ribs hinged to its cap, while tional braces are pivoted to the runner and to the ribs. A second runner engages the latches of the shell and braces connect this runner and the ribs. The cover i attached to the frame in any manner known to the

RIBBON DISPLAY CABINET. — Lewis Schoolhouse, New York City. This cabinet has a drawer with a transparent front, a wire forming a guide and handle for the drawer, and the casing and drawer being made slanting rearwardly, so that the rolls of ribbon are readily retained and can be easily placed in the drawer, where their size and color may be seen to great advantage. The drawer is dust proof.

PORTABLE BURGLAR ALARM. - Lars G. Larson, Moscow, Idaho. This is a small device readily connected with the knob of a door lock or latch, to sound an alarm should the knob be partly turned. Its operative mechanism is held in a small case, with hanger loop to hang on the neck of the door knob, when a releasing a spring-driven escapement wheel, causing a clapper to vibrate and sound a bell.

CHILD'S CRADLE.—Willis E. Phillips, Saguache, Col. The rocking supports of this cradle are pivotally connected with its ends, one at each side of the center, and pivotally connected with one another. There are link connections between the legs of the supports at opposite ends. The cradle may be readily swung with a long, regnlar motion, instead of the usual short, quick motion, and it is impossible to throw or move in the least the child held therein. The construction is particularly adapted to self-moving mechanisms, such as clockwork, electric motors, etc.

SASH FASTENER.—William R. Abrams. Los Angeles, Cal. This is an improvement in sash fasteners in which a toothed pawl is pivoted in a box on the window frame to engage a rack on the sash. The fastener has two toothed pawls, with teeth projecting in opposite directions, and with transverse bores in which are internal lugs out of alignment, a key engaging either lug independently. With this device the window may be left open at the top and bottom, and the further movement of the upper and lower sashes in either direction will be prevented.

CURTAIN.--Albert M. Branshaw, Escanaba, Mich. This curtain is designed to render air tight the opening over which it is drawn, and to afford a substitute for folding doors, awnings, arch closures, etc. Slideways are located at opposite sides of the opening to be closed, and have apertures through which extends a guide slot, while the curtain roller has guides which project into the slideways, and a slat bar at the lower end of the curtain has spring-controlled latches entering the apertures in the slideways. When made of fireproof cloth, for use as an awning, it is designed to afford the best possible protection, and it may be raised or lowered so that it will not be necessary to have any curtain on inside of building.

FRUIT HOLDER. - Thomas Leach, Taunton, Mass. This device has in its inner walls rigid vertical ribs and a series of downwardly projecting ratchet teeth, designed to hold oranges and other fruit placed therein, thereby enabling one to serve the fruit in a dainty way without it being necessary to hold the fruit in the hand.

PORTABLE COAL BOX.—Thomas Buenhofer and Ernest H. Weiss, Terre Haute, Ind. This is a receptacle having a hinged cover adapted for extension as a scooping or discharge chute, there being a transverse bail on the upper part of the box and a looped handle at its front. A full box may be carried with more ease than the ordinary coal hod with the same amount of coal, and when the top of the box is closed there is no danger of spilling the coal.

LAMP HEATER.—Frances Rader, Prescott, Wis. This heater design consists of a truncated cone, with overhanging annular flange, provided with openings at the top.

HANDLE FOR FORKS, ETC.—Charles Osborne, New York City. This design has rosettes and leaves at the base and top of the handle and bud-like figures at its sides.

CARPET.—Pierre C. Chambellan, West Hoboken, N. J. The carpet body, according to this design, is decorated with bouquets of the rose, dahlia and lilac type, and it has a shaded subborder.

The same designer also produces a design in which the carpet body is decorated with connected leaf scrolls, alternate scrolls being reversely curved and varied, the porder being nearly the same, but with a fan-like dado.

FABRIC RENOVATOR.—Mary S. Kjelltrom, New York City. A conical tube-like figure has a narrow opening at one side, from which extend side plates in the shape of triangles, with projecting sides

LAST. - Nicholas Bier, Salem, Oregon. This design represents the ball portion of two lasts icined at the heel, each reversed as to the other.

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.

LABORATORY MANUAL OF PHYSICS AND APPLIED ELECTRICITY. A ranged and edited by Edward ranged and edited by Edward L. Nichols. In two volumes, Vol II. Senior Courses and Outlines of Advanced Work. By George S. Moler, Frederick Bedell, Homer J. Hotchkiss, Charles P. Matthews and the Editor. New York: Macmillan & Co. 1894. Pp. 444. Price \$3.25.

We have before now reviewed the author's course of physics for the lower classes. In the present book one finds more advanced researches, with the use of satisfactory apparatus given in full detail, with especial reference to electrical work. As arranged, it makes excellent reading, being far more than a mere laboratory guide, and in it the author no longer appears to avoid proper apparatus, something which, to our minds, has been a defect in some manuals used for the lower classes in practical physics; so it may be recommended to readers not only as an exponent of college teaching and methods, but also as an actual manual of physics. Its make-up is of the most advanced description, as indicated by the capitalization of as few words as possible, although italics are used in considerable number.

THE RELIGION OF SCIENCE LIBRARY.
Fundamental Problems. The Method
of Philosophy as a Systematic Arrangement of Knowledge. By Dr.
Paul Carrie Scand edition, and Paul Carus. Second edition, enlarged and revised. Chicago: The Open Court Publishing Company. 1894. Pp. xii, 373. Price, cloth, \$1.50; paper, 50 cents.

SCIENTIFIC AMERICAN

BUILDING EDITION

NOVEMBER, 1894.-(No. 109.)

TABLE OF CONTENTS

- 1. Elegant plate in colors showing a cottage at Bronxville, N. Y., recently erected for B. L. Clark, Esq. Two perspective elevations and floor plans. Estimated cost \$5,000. Mr. William A. Lambert, architect, New York City. A modern and pleasing design.
- 2. Plate in colors showing the residence of John Cottier, Esq., at Bensonhurst, L. I. Three perspective elevations and floor plans. Cost \$6,750 com plete. A good example of Colonial architecture. Messrs. Parfitt Bros., architects, Brooklyn, N. Y.
- 3. A dwelling at Edison Park, Ill. Cost \$1,700. Architect, Mr. F. W. Langworthy, Chicago, Ill. A model designifor its class and cost. Two perspec tive elevations and floor plans
- 4. A very attractive residence recently erected for A. C. Garsia, Esq., at Flatbush, L. I. Two perspective elevations and floor plans. Mr. John E. Baker, architect, Newark, N. J. A modern design
- 5. An \$800 summer cottage built for A. R. Doten, Esq., at Casco Bay, near Portland, Me. Perspective elevation and floor plans. Mr. Antoine Dorticos, architect, Portland, Me.
- 6. Perspective elevations and floor plans of a handsome residence recently completed for George W. Catt, Esq., at Bensonhurst, L. I. A very picturesque design. Cost \$8,100 complete. Mr. S. S. Covert, architect, New York.
- 7. A church at Short Hills, N. J., built entirely of rubble stone. Estimated cost \$6,000. Perspective elevation and floor plan. Messrs. Lamb & Rich architects, New York City.
- 8. The house of Francis I. at Abbeville, France.
- 9. A stable and conservatory attached to the residence of John Cottier, Esq., at Bensonhurst, L. I. Perspective elevation and ground plan. Messrs. Parfitt Bros., architects, Brooklyn, N. Y.
- 10. A residence at Ardmore, Pa., in the Queen Anne style. Perspective elevation and floor plans. Cost complete \$6,750. Architects and builders, Messrs. J. B. Cornell & Sons, Philadelphia, Pa.
- 11. A cottage at Edgewater, Ill., erected for Edgar Smith. Esq. A unique design in the Colonial style. Cost \$7,800 complete. Two perspective elevations and floor plans. Mr. G. W. Maher, architect, Chicago,
- 12. An attractive cottage at Bath Beach, Long Island. N. Y., recently erected for G. W. Snook, Esq. Two perspective elevations and floor plans. Mr. Percey Emmett, architect, Bath Beach, Long Island.
- 13. Miscellaneous contents.—Wood pavement in London. Preservation of wood.—Methods of con chimney flues and pipes at Paris, illustrated.—The passing of red brick.—Long distance house moving.—Carved and fancy mouldings, illustrated. -A new sash lock.-Automatic heat regulation in houses, etc., illustrated.-Woodwork vs. flame. Curiosities about wood.—Cement water tanks.-An improved hot water heater, illustrated.-How to cool a cellar.-A new woodworking machine. ıllustrated. - An improved stage bracket iron, illustrated.—Party walls.—Architectural metal orna ments, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITEC-TURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Adver-tisements must be received at publication office as early as Thursday morning to appearin the following week's issue

"U.S." metal polish. Indianapolis. Samples free. Ill. catalog tools, 15c. Frasse, 19 Warren St., N. Y. Wood pulp machinery. Trevor Mfg. Co., Lockport, N.Y. For mud dredging engines, J. S. Mundy, Newark, N. J.

We make absolutely a perfect loose pulley oiler. Kridler Mfg. Co., Grand Rapids, Mich. Send for circular.

Address W. W. Carder, Oldtown, Md.

Metallic bag and sack tie patent for sale, or on royalty,

Screw machines, milling machines, and drill presses The Garvin Mach. Co., Laight and Canal Sts., New Universal drawing tables and steel ribbed drawing boards. Just out. Morse Machine Co., Rochester, N. Y.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N.Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps acid blowers, filter press pumps, etc.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Emerson, Smith & Co., Ltd., saw manufacturers Beaver Falls, Pa., will send Sawyers' Hand Book on Circulars and Band Saws free to any address in the world-

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shea s, etc., address J.S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail. \$4; Munn & Co., publishers, 361 Broadway, N. Y.

A Frenchman speaking English wishes to represent a a few American firms in France and in Belgium. Good Knowing the velocity at point of discharge, at what pres references. Write to F. Demesmay, a Cysoing, Nord, France.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office. 361 Broadway, New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.



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

Minerals sent for examination should be distinctly marked or labeled.

(6285) W. A. S. E. asks how or in what way the canvas is prepared which is sold at art stores and whether the pores are filled with some composition or sized. A. 1 part white lead, 2 parts whiting; a small portion of litharge and sulphate of zinc for driers; mix with equal parts of boiled linseed oil and raw linseed, tinted with either brown umber or lampblack, for a neutralground. The canvas is tacked upon a stretching frame, and sized with weak glue size, to which a small portion of zinc sulphate is added. When dry it is stippled over with some driers and linseed oil, as thin as possible, not saturated. When very nearly dry the white lead, whiting, etc., is mixed up very smooth, and put upon it very thin and smooth with a large palette knife, and hatched over with a large sash tool, drawing it across one way and then at right angles, until the face presents a face like a piece of fine linen or cartridge paper, when it is left to dry.

(6286) W. H. S. and A. K. W. ask for a cement for lining acid tanks. A. An oaken trough will last from twelve to fifteen years if coated with Burgundy pitch 1,500 grammes, old gutta percha in shreds 250 grammes, pounded pumice 750 grammes. Melt the gutta grammes, pounded pumice 750 grammes. Melt the gutta percha, mix with the pumice, and add the pitch. A hot ink; for red, substitute Venetian red for lampblack; iron passed over the surface smooths it, and assists adhesion. The box resists sulphate of copper baths, but marine and chrome vellow. not cvanides

(6287) H. F. asks: Does not the attraction of the field (in a motor) of the armature, at all points directly opposite the poles, tend to stop the revolution of the armature? In other words, are not the pole of the armsture, and the equal repulsive force of the opposite outer edge of the field, the only propelling forces that cause the armature to revolve? A. Your query is not very clear. The simplest general statement is that the armature is kept so polarized that the line connecting the poles of the field is constantly at an angle with the line connecting the poles of the armature, and the latter are constantly shifting in the direction opposed to the rotation.

(6288) L. P. says: Given a 30 inch turshould be the width and depth of race to convey water to together, add salt, 1 oz.; grape juice or sugar to sweeten, of this work have won for it the Largest Circulation the wheel? What would be the minimum space that and sufficient water to form the mass into a thin paste of any Architectural Publication in the world. Sold by could be allowed between bottom of wheel and bottom by trituration in a mortar. When put into pots a red hot could be allowed between bottom of wheel and bottom by trituration in a mortar. When put into pots a red hot power could be expected from a wheel of a good make | a little wine vinegar added.

of size named, working under 7 feet of fall, having all the water it could use? A. A 30 inch turbine using 750 cubic feet of water per minute under 7 feet head will equal 9 horse power and will need a race 3 feet de p 4 feet wide to maintain an approximate full head at the flume. There should be at least 216 feet clearance under the bottom of the wheel. Wheels are made of various sizes up to 114 inches, with proportional increase in quantity of water used and size of raceway. The 114 inch wheel under 7 feet head will use 10,000 cubic feet of water per minute and produce 120 horse power

(6289) W. L. B. says: In a double cylinder gasoline engine with cylinder $4 \frac{1}{2} \times 6$ inches, maki 250 revolutions per minute, giving 6 horse power, what is the pressure per inch at time of explosion and at what point of stroke should exhaust be located to give best r sults? A. There is considerable difference shown in pressure and expansion lines in gasoline engines, owing to the various mixtures of gasoline vapor and air, its ost powerful effect being for a mixture 1 part vapor to 10 parts air. Under the various conditions in ordinary use, the explosive pressure may vary from 50 to 100 pounds per square inch. The exhaust should take place at the end of the stroke. See a valuable work on "Gas, Gasoline and Petroleum Engines."

(6290) J. B. D. asks: Does it make any difference in the working of a bicycle if the large sprocket wheel is set higher than the small sprocket wheel? A. There is a little difference. The chain grips best when nearly horizontal. A slight departure from horizontal will do no harm.

(6291) F. M. M. writes: 1. I wish to know how large an air pump running at say 200 feet piston speed should hold a pressure of 30 pounds per square inch, with 1/4 inch nozzle outlet, open wide. Roper says steam has a velocity of 1.601 feet per second at 30 pounds pressure. Now, figured on this basis, how much air will be delivered from 1/4 inch orifice, or does the velocity of air differ from that of steam? sure is the cubical contents of discharge represented, I mean, at free air pressnre, tank pressure or an intermediate? By answering the above you will confer a great favor. Can you furnish me a book with data by which air capacities can be floured? A. The velocity of air from a nozzle of good form at 30 pounds pressure is 640 feet per second. Hence the flow from a quarter inch nozzle will be

 $640 \times 049 \times 3 \text{ vol } \times 60 \text{ sec.}$ = 39+ 144

or say 40 cubic feet of free air per minute, and

40^C =0·2^c′ area, 200 ft. pr. m.

or 29.8 square inches, but owing to the loss in the pump by clearance, leakage and imperfect piston packing, not less than a cylinder 8 inches in diameter will do the work at the feet per minute speed as stated. The stated flow of steam as above is the theoretical velocity of steam flow ing into a vacuum, but practically it is but 900 feet from 100pounds pressure into the atmosphere. The flow of air, which is much heavier than steam, is but 952 feet per econd into a vacuum, and varying in nozzle velocity from 632 to 658 feet per second, between 15 pounds and 75 pounds pressure and flowing into free air. Computations are made on the basis of free air volume plus pressure We have no complete works on air compression, but much can be gained from back numbers of Scientific AMERICAN SUPPLEMENT, on air compression and its uses. A few useful formulas and tables are published in Haswell's "Engineer's Pocket Book," \$4 by mail.

(6292) D. P. B. says: Please answer through the columns of your valuable paper, when and where the first electric car in the world was operated, also when and where the first cable car? A. The electric railway system was invented and model railways exhibited with cars driven by electricity in 1839, in New York. A practical trial was made on the Edinburgh and Glasgow Railwayin 1842. See Scientific American, November 3, 1894, for an interesting account of the first trials. The first cable car was operated in San Francisco by A. S. Hallidie, in 1871.

(6293) E. S.—The bird's skin sent is that of a female golden crowned kinglet (Regulus satrapa), a common winter bird from the Northern States south-

(6294) W. A. V. asks how to make stencil paint. A. Take shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; lampblack ficiency. Boil the borax and shellac in water till they are dissolved, and withdraw from the fire. When the solution has become cold, complete 25 oz. with water, and add lampblack enough to bring the preparation to a suitable consistence. When it is to be used with a stencil, it must be made thicker than when it is to be apmarine and chrome yellow.

(6295.) M. J. W. asks for a formula for economical fuel. A. Mix coal, charcoal or sawdust, 1 part; sand of any kind, 2 parts; marl or clay, 1 part; in quantity as thought proper. Make the mass up wet lateral attraction of the outer edge of the field, of the into balls of a convenient size, and when the fire is sufficiently strong place these balls, according to their size, a little above the bar, and they will produce a heat considerably more intense than common fuel, and insure a saving of one-half the quantity of coals. A fire thus made up will require no stirring nor fresh fuel for ten

(6296) G. de B. asks for a formula for French mustard. A. The following is M. Lenormand's receipt : Flour of mustard, 2 lb.: fresh parsley, chervil. celery and tarragon, of each, 1/2 oz.; garlic, 1 clove (or bine water wheel to work under 7 or 71/2 feet fall, what head); 12 salt anchovies (all well chopped); grind well of wheel pit to give good results? About what horse iron is momentarily thrust into the contents of each, and

TO INVENTORS.

An experience of neally fifty years, and the preparation of more than one hundred thousand applications for nateurs at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and person contemplating the securing of patents, either at homeor abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office Scientific American, 381 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 30, 1894,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Advertising device, automatic, May & Morrisey Advertising sign device, W. C. Morrison	enta.j
	528,334 598 256
Alarm. See Burglar alarm. Fire alarm. Alkaline salts, process of and appa atus for elec-	020,200
Alarm. See Burglar alarm. Fire alarm. Alkaline salts, process of and appa atus for electrolytic decomposition of, H. Y. Castner. Alloy, aluminum, R. I. Roman Aluminum, improving surfaces of, A. V. Davis Aluminum, reducing, Gooch & Waldo Armature for dynamo-electric machines and making same, T. H. Hicks. Axle, vehicle, J. Miller. Ballot box, registering and canceling, E. K. Tolman.	528,322 528,181
Aluminum, improving surfaces of, A. V. Davis Aluminum, reducing, Gooch & Waldo	528,513 528,365
Armature for dynamo-electric machines and making same, T. H. Hicks	528,204
Ballot box, registering and canceling, E. K. Tol-	500 101
	528,491
tery. Red and table combined folding I. Kabell	598 270
Bedclothes holder, G. H. Hollidge	528,432 528,328
Beer, manufacturing, P. Kropf	528,374 528,134
Belt tightener, M. Waddell Beverage cooler, J. Busch	528,242 528,463
Beverages from ice, making, C. Fong Bicycle, J. Carr	528,514 528,145
tery. Bed and table combined, folding, L. Kabell. Bed clothes bolder, G. H. Hollidge. Bed, folding, E. M. Knoblaugh. Beer, manufacturing, P. Kropf. Bell ringing mechanism, W. G. Alexander. Bell tightener, M. Waddell. Beverage cooler, J. Busch. Beverages from ice, making, C. Fong. Bicycle, J. Carr. Bicycle, L. Ferguson. Bicycles, etc., drive gear mechanism for, S. Kaltonia.	528,423
Boiler. See Heating boiler, Steam boiler, Steam	
or hot water boiler. Boiler, R. Wildman. Boiler cleaner, automatic, J. H. Barr. Boiler cleaner, automatic, J. H. Barr. Boiler furnace, steam, E. R. R. Hoyt Bolting reel, E. R. Draver Book hat opening, W. A. Palmer Book holder for desks, G. W. Paisley. Boot drak attachment, W. H. Cole Boot or shoe polishing device, E. Stauwood. Boring machine, H. C. Schulz. Bottle cap. cork holding, W. H. Northall Bottle cap. gork holding, W. H. Northall Bottle stopper or cap, F. W. Flet cher. Box. See Ballot box. Dice box. Match box. Shipping or service box. Brace and bit, J. W. Banner.	528,352
Boiler furnace, steam, E. R. H. Hoyt	528,229 528,504
Book, flat opening, W. A. Palmer	528,340 528,488
Bootjack attachment, W. H. Cole	528,363 528,349
Boring machine, H. C Schulz Bottle cap. cork holding, W. H. Northall	528,307 528,380
Bottle capping machine, G. W. Lebolt	528,329 528,470
Shipping or service box. Dice box. Match box.	F00 10W
Shipping or service box. Brace and bit, J. W. Banner. Bracket. See Staging bracket. Bracket. See Car brake	028,107
Brake beam and reinforcing clamp therefor, H. B. Robischung	528.238
Brush holder, M. Wool Bucket fastener, H. L. R. Wolf.	528,267 528,316
Burglar alarm, door locking, H. J. Mitchell Burner. See Gas burner. Oil burner.	528,206
Button, J. Skilling. Cable grip, Ormerod & Charles.	528,397 528,384
Brace and bit. J. W. Banner. Bracket. See Staging bracket. Brake. See Car brake. Brake beam and reinforcing clamp therefor, H. B. Robischung. Brush holder. M. Wool. Brucket fastener, H. L. R. Wolf. Burglar alarm, door locking, H. J. Mitchell. Burner. See Gas burner. Oil burner. Button, J. Skilling. Cable gripper, J. Whitall. Camera, J. E. Blackmore. Camera, J. E. Blackmore. Can body forming machine, H. Schaake. Can body forming machine, H. Schaake. Can bodder, W. V. McKenzie.	528,313
Can body crimping machine, H. Schaake	528,305 528,305
Can head flanges, machine for crimping, H.	528 306
Can holder, W. V. McKenzie	528,259 528,371
Can opener and vegetable parer, combined, G. H. Mitchell	528,517
Can top cleaning machine, C. A. Burt. Car brake, P. McMullen	528,462 528,302
Can head flanges, machine for crimping, H. Schaake. Can holder, W. V. McKenzie. Can opener, C. F. Keller, Can opener and vegetable parer, combined, G. H. Mitchell Can top cleaning machine, C. A. Burt. Car brake, P. McMullen. Car brake ratchet handle, J. Seeberger. Car brake shoe and dresser, J. E. Warswick. Car coupling, J. Bird.	528,492 528,198
Car coupling, J. Bird	528,460 528,466
Car coupling, S. Selden	528,383 528,346
Car, dump, G. A. Roberts	528,279 590,407
Car fender, W. G. Kerr	528,298 528,158
Car brake ratchet handle, J. Seeberger. Car brake shoe and dresser, J. E. Warswick. Car coupling, J. Bird. Car coupling, Q. G. Oden. Car coupling, O. G. Oden. Car coupling, O. G. Oden. Car coupling, S. Seiden. Car curtain fixture, W. H. Bean. Car, dump, G. A. Roberts. Car, elevated railway, A. L. Widdis. Car, elevated railway, A. L. Widdis. Car patenting system, E. H. Gold. Car mover A. Kuebeler. Car platform, J. Krehbiel. Car patenting railway, C. Klettner. Car platform, J. Krehbiel. Car wheel, C. Roberts. Car ventilator, H. Love. Car wheel, C. Roberts. Carburctor, O. Moncur. Card setting machine, C. W. A rnold. Carriage spring, C. A. Behlen. Carting machine, R. Morgeneier. Caving machine, R. Morgeneier. Caving machine, R. Morgeneier. Caster, Schlientz & Fink. Caster, Schlientz & Fink. Caster, ball, L. B. White. Chimney, E. V. Wingard. Chlorine and caustic soda, electrolytic apparatus for the manufacture of, T. Drake. Chopper. See Cotton chopper. Churn dasher, C. S. Rogers.	528,171 528,170
Car protector, automatic railway, C. Klettner Car safety device, electric, J. M. Kelly	528,254 528,438
Car wheel, C. Roberts	528,231 528,278
Carburetor, O. Moncur Card setting machine, C. W. A rnold	528,377 528,354
Carriage spring, C. A. Benien. Carrier. See Egg carrier. Package carrier. Cart self-loading G. F. Fischer.	528,494
Carving machine, R. Morgeneier	528,337
Caster, Schlientz & Fink Caster, ball, L. B. White	528,210 528,366
Chimney, E. V. Wingard Chlorine and caustic soda, electrolytic apparatus	. 528,453
for the manufacture of, T. Drake	528,153
Churn dasher, C. S. Rogers. Cigar bunch mach ine, H. Jerstrum. Cigarette paper, mach ine for applying paraffin to, A. C. Marchal. Clamp. See Lace clamp. Cleaner. See Boiler cleaner. Sewer trap	528,519 528,166
A. Clamp See Lace clamp	528,332
Cleaner. See Boiler cleaner. Sewer trap cleaner.	
Cloth cutting machine, J. Bloch	528,220 528,217
Cloth notching machine, J. Wolf, Jr. Clothes drier, C. E. Cochrane.	528,216 528,222
Coal or ore separating apparatus, F. Pardee	528,498 528,386
Coal screen, G. W. Cross	528,289
Coffee or tee not W O P3	500,000
Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow	528,497 528,201 528,421 592,490
Coffee mill, C. D. Anderson. Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, borse, M. T. Burke. Collar, borse, W. T. Fell	528,420 528,421 528,420 528,420 528,143
Coffee mil (c. D. Anderson. Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, borse, M. T. Burke. Collar, borse, W. T. Fell Collar, borse, E. C. Phillips. Collars or cuffs on shirts, device for holding	528,499 528,421 528,420 528,143 528,422 528,490
Coffee mill, C. D. Anderson. Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, borse, M. T. Burke. Collar, borse, W. T. Fell. Collar, borse, E. C. Phillips. Collars or cuffs on shirts, device for holding, Feiner & Saxton. Concentrator, J. Norbom.	528,421 528,421 528,420 528,420 528,420 528,422 528,490 528,469 528,469
Conee mill, C. D. Anderson. Coffee or tea pot. W. O. Byrdow. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, borse, M. T. Burke. Collar, borse, W. T. Fell. Collar, borse, E. C. Phillips. Collars or cuffs on shirts, device for holding, Feiner & Saxton. Concentrator, J. Norbom. Conduit sections, apparatus for manufacturing, J. F. Cummings.	528,490 528,421 528,420 528,420 528,420 528,422 528,490 528,469 528,442 528,442
Conee mill, C. D. Anderson. Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, borse, M. T. Burke. Collar, borse, W. T. Fell. Collar, borse, E. C. Phillips. Collars or cuffs on shirts, device for holding, Felner & Saxton. Concentrator, J. Norbom. Conduit sections, apparatus for manufacturing, J. F. Cummings. Conduit, underground, J. F. Cummings. Conveying material, F. E. Duckham.	528,497 528,201 528,421 528,420 528,420 528,422 528,490 528,469 528,442 528,290 528,291 528,417
cleaner. See Boiler cleaner. Sewer trap cleaner. Cloth cutting machine, J. Bloch. Cloth cut in gm zhi ne.j. Wolf, Jr. Cloth notching machine, J. Wolf, Jr. Clothes drier, C. E. Cochrane. Clothes fack. T. M. Anderson. Coal or ore separating apparatus, F. Pardee. Coal screen, G. W. Cross. Coffee mill, C. D. Anderson. Coffee or tea pot. W. O. Byrd. Combination case, A. J. Estlow. Combination case for cards, etc., A. J. Estlow. Collar fastener, horse, M. T. Burke. Collar, horse, W. T., Fell. Collar, horse, E. C. Phillips. Collars or cuffs on shirts, device for holding, Feiner & Saxton. Conduit sections, apparatus for manufacturing, J. F. Cummings. Conduit sections, apparatus for manufacturing, Conduit sections, apparatus for manufacturing, Conduit, underground, J. F. Cummings. Conduit property of the conduits	
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Joney. Coupling. See Car coupling. P.pe or rod coup- ling. Rod or pipe coupling. Thill coupling. Crane, traveling, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulf. Culivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic, Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band	528,137 528,389 528,294 528,248 528,248 528,497 528,382 528,425 528,413 528,186
Cotton elevator and distributer, Moffitt & Williams Cotton opening machines, feeding mechanism for, J. C. Potter. Counterbalancing momentum of reciprocating elements, means for M. N. Jorney. Coupling. See Car coupling. P.pe or rod coupling. Rod or pipe coupling. Thill coupling. Crane, travelins, W. M. Brooke. Crystallization of saccharine or other solutions, L. Wulff. Culinary vessel, A. W. Obermann. Cultivator, hand, E. Franklin. Cultivator, wheel, E. Children. Cut-out, automatic electro-magnetic. Stanley & Braddell. Cutter. See Kraut cutter. Thrasher band cutter. Dental mirror, E. B. Hitchcock. Dice box, E. Gregory. Digester, H. W. Stebbins. Disinfecting apparatus, H. K. Andersson. Door attachment, N. W. Cowdrey. Door check and closer, E. I. Blount. Door fexible, E. Brown. Door stop, C. Ø. Case. Dredging apparatus, F. A. Hyatt. Dredging apparatus, F. A. Hyatt. Dredging apparatus, F. A. Hyatt. Dredging implement, C. Meler.	528,177 528,389 528,294 528,294 528,294 528,497 528,822 528,413 528,163 528,163 528,163 528,299 528,323 528,323 528,323 528,324 528,323 528,324 528,323 528,324 528,323 528,324 528,324 528,324 528,324 528,324 528,324 528,324 528,325 528,324 528,324 528,324 528,325 528
	528,177 528,389 528,294 528,294 528,294 528,497 528,822 528,413 528,163 528,163 528,163 528,299 528,323 528,323 528,323 528,324 528,323 528,324 528,323 528,324 528,323 528,324 528,324 528,324 528,324 528,324 528,324 528,324 528,325 528,324 528,324 528,324 528,325 528

302	<i>O</i>
Drilling machine, W. P. Norton	Rod or pipe coupling, hollow, S. M. Jones
Drilling machine, W. P. Norton 528,381 Earring, G. T. Woglom 528,197 Egg carrier, F. E. Ten Byck et al. 528,187 Electric conductors. coating, A. F. Montgomery 528,301 Electric worter was constant, A. F. Montgomery 528,301	Rod or pipe coupling, hollow, S. M. Jones. 528,167 Roll ing apparatus, L. D. York 522,200 Rot ary engine, L. Sivertson 528,493 Rotary trimmer, A. S. Vose 528,311 Bubbor and Compute Section 528,311 Rotary trimmer, A. S. Vose 528,311 Rotary trimmer 526,473
	itubber and blocking, iumberman s, m. D. Girard. 520, 210
Goldsmith. 528,440 Electric transformer, E. Thomson 528,188 Electro-magnetic switch, J. G. Hartel 528,430 Elevator. See Cotton elevator. Grain elevator. Hydraulic elevator.	ing L. K. Scotford
Enamel from metal, removing, G. W. Goetz 528,156 Engine. See Direct-acting engine. Gas engine.	Sad iron, P. C. Greenawalt 523,366 Sash balance, G. Lusher 528,331
Rotary engine. Steering engine. Engine indicator, steam, W. M. Henderson 528,226 Engine pilot. J. Drake	Rubber articles, vulcanizing hard, H. Traun 528,264 Rubber type, method of and apparatus for making, L. K. Seotford. 528,308 Rubbing or polishing machine, C. S. Yarnell 528,198 Ruling device, J. Grundy 522,476 Sad iron, P. C. Greenawalt 522,308 Sash balance, G. Lusher 522,308 Sash fastener, A. H. Parslow 522,208 Saw, J. Danielson 522,415 Saw, J. Danielson 522,415 Saw mill carriage, M. Cox 522,237 Saw safety guard, rip, G. A. Shields 522,202 Scale, spring, M. H. Hansen 525,326 Screen See Coal screen Screen or sash fastener, M. Hauser 528,327
Engline. See Direct-acting engine. Rotary engine. Steering engine. Engine indicator, steam, W. M. Henderson. 523,226 Engine pilot, J. Drake. 523,152 Engine reversing gear, C. E. R. Martin. 523,275 Extension table, center revolving folding, H. Graham 522,250	Saw filing machine, A. J. Neff. 528,179 Saw mill carriage, M. Cox. 528,287
Extension table, center revolving folding, H. Graham. 528,250 Faucet, oil can, B. F. Warren. 528,244 Feed water purifier, S. L. Bailey. 528,318, 525 Fence and gate, iron, I. K. Hollinger. 528,318, 525 Fence and gate, iron, I. K. Hollinger. 528,318, 525 Fence building machine, C. Neate. 522,303 File, invoice or other, M. Buchsbaum. 522,325 Fire alarm, Hackworth & McLellan. 522,326 Fire escape, C. Bartholomew. 528,241 Fire escape, C. Bartholomew. 528,241 Fire sting substances with water, apparatus for automatically mixing, G. Muller. 528,414 Fishing net, G. Trouve. 528,351 Foundations or underground structures, tube for, R. L. Harris. 528,308 Foundations or underground, J. R. Cadwell. 528,368 Foundations of Goldsmith. 528,144	Scale, spring, M. H. Hansen
Fence and gate, iron, I. K. Hollinger	Screen . See Coal screen
Fire alarm, Hackworth & McLellan 528,160 Fire escape, C. Bartholomew 528,284	Seal or stopper, bottle, W. Painter
Fire extinguishing substances with water, apparatus for automatically mixing, G. Muller 528,441 Fishing net. G. Trouve	Secondary battery, J. E. Rhetts. 523,445 Separator, R. W. Jessup. 523,435 Sewer trap cleaner, I. Beliveau. 523,459 Sewing machine for barring buttonholes, E. H.
Flashlight compound, A. Hensley	Sewing machine for barring buttonholes, E. H. Harris 528,225 Shede belder Crandell & Russell 528,988
Fountain and sprinkler, combined, J. R. Cadwell. 528,144 Frog, spring, N. O. Goldsmith. 528,474	Sewing machine for barring buttonnoies, E. H. Harris
Frog, spring, N. O. Goldsmith. 528,474 Fruit huller, J. A. Murray 528,257 Fruit jar, J. H. Williams 528,315 Furnace. See Boiler furnace. Heating furnace.	Bain
Furnace, E. & A. W. Bennis	$\begin{array}{llllllllllllllllllllllllllllllllllll$
Furnace, E. & A. W. Bennis. 528,219 Furnace or stove grate, A. Jahant 528,165 Furnaces, air moistening device for hot air, G. 528,202 W. Fridrich 528,202	Sink trap, H. C. Montgomery 528,335 Skirt elevator, A. L. Zeller 528,455
Furnaces, shafts, chimneys, etc., construction of blast, W. P. Ingham	Skiving machine, J. R. Scott 228,448 Slicing machine, J. E. Austin 528,247 Snan hook, R. C. Eldridge et al. 528,270
Gas burner, C. H. Robbins 523,446 Gas engine, J. & W. Paterson 528,469	Solar energy, apparatus for utilizing, Monks & 528,255
water or oil from bottoms of, R. H. Sta ley 528,449 Gate, A. W. Maclarren	Spacing nail, J. J. White
Glass, apparatus for producing flat objects of, P. Sievert	Spreader rod, S. D. Poole
Governor, engine, C. E. R. Martin 528,276 Governor motor, engine, C. E. R. Martin 528,274	Staging bracket, Kenison & Burk 528,169 Steam boiler, D. Ahern 528,409
Grain conveyer, F. E. Duckham 528,418 Grain conveyer, pneumatic, F. E. Duckham 528,419 Grain elevator, F. Kaucher 528,230	Steam of not water polier, E. Gurney
Grain scouring machine, R. W. Welch. 528,405 Grate, water heating fire, J. H. Phillips. 528,388 Grater for culinary burposes J. Psyddon 508,418	Spreader rod, S. D. Poole 528,236 Spring. 528,236 Sprinkler, J. B. Haberle 528,256 Stagging bracket, Kenison & Burk 528,169 Steam boiler, D. Abern 528,325 Steam shovel or excavator, J. B. Webber 528,312 Steel, decarbonizing, W. K. Topley 522,214 Steering engine, M. A. Beck 523,352 Steering gear, vessel, O. Schleicher 528,183 Stoyepip e attachment, W. Wilson 524,408 Stoyepip e attachment, W. Wilson 528,139 Strap, See Hitching strap 528,139
Furnace or stove grate, A. Janant Furnace air moistening device for hot air, G. Furnaces, air moistening device for hot air, G. Furnaces, shafts, chimneys, etc., construction of Blast, W. P. Ingham. Galvanic battery, M. M. Clark. Gas engine, J. & W. Paterson. Gas engine, J. & W. Battin. Gatte, A. W. Maclarren. Glass, apparatus for removing 528,449. Gatte, A. W. Maclarren. Glass, apparatus for producing flat objects of, P. Sievert. 528,343. Governor, engine, C. E. R. Martin. 522,274. Grain conveyer, F. E. Duckham. 523,418. Grain conveyer, F. E. Duckham. 524,419. Grain elevator, F. Kaucher. Grain conveyer, P. Kaucher. S28, 202 S28, 460 Grater for culinary purposes, J. Davidson. 528, 208 Gun frame, R. C. Fay. Guns, ejecting and cocking mechanism for break- 628, 228	Stovepi pe attachment, W. Wilson. 528,408 Stovepipe thimble, W. Biermann. 528,139
Guns, ejecting and cocking mechanism for breakdown, G. A. Horne	Structure, tubular underground, R. L. Harris 528,367
Gun frame, R. C. Fay 528,567 Guns, ejecting and cocking mechanism for break-down, G. A. Horne 528,228 Guns, ejector for breakdown, Fay & Humphreys. 528,228 Hanger. See Door hanger. Pipe hanger. Harrow, disk, J. Macphail 528,172 Heat magazine, refractory and non-conducting. 528,272 C. H. Land 528,272 Heater, C. B. Wanamaker 528,401 Heating boiler, H. C. Steinhoff 528,407 Hides, treating, D. A. Goodman 528,427 Hides, treating, D. A. Goodman 528,427 Hoistoing strap, J. H. Valleau 528,258 Hootsing mechanism, G. F. Jennings 528,297 Hook and eye, G. B. Pearson 528,341 Horse boot, J. Duffy 528,341 Horse detacher, M. M. Benster 528,410 Hulter, See Fruit huller 529,291	Nadal actions for sint wissbands, etc., 528,339 Surgical cabinet and irrigating device, E. M. Lundholm
C. H. Land	Switch. See Electro-magnetic switch. Railway switch.
Heating boiler, H. C. Steinhoff	Table. See Extension table. Tablesux vivant, apparatus for displaying. E. Von Kilanyi. 528,372. 528,372. 528,372. 528,372. 528,372. 528,372. 528,362.
Hinge, stop, G. A. Mackenzie. 528,258 Hitching strap, J. H. Valleau. 528,495	Tawing hides, C. Heinzerling
Hook. See Snap hook. Hook and eye, G. S. Pearson. 528,341	Telephone, mechanical, J. Prince
Horse boot, J. Duffy 528,249 Horse detacher, M. M. Benster 528,410 Huller See Fruit huller	Tent fastenting, J. J. Rinn
Huller. See Fruit buller. Hydraulic elevator, J. R. Wade	Thill couplings, antirattler for, M. McKinnon 528,338 Thrasher band cutter and feeder, Schauer & Bartlett
Invalid lifting apparatus, W. E. Goulding 528,475 Iron. See Sad iron. Jar. See Fruit jar.	Bartlett 528,336 Time recorder, workman's, D. M. Cooper 528,223 Tire and wheel rim, pneumatic, P. W. Tillinghast 528,451
Kitchen cabinet, P. L. Ramsey	Time recorder, workman's, D. M. Cooper. 528,223 Tire and wheel rim, pneumatic, P. W. Tillinghast. 528,451 Tire, pneumatic, G. F. Stillman 528,213 Toboggan, roller, C. N. Grant 522,224 Toy bank, com controlled musical, H. W. Porter. 528,277
Knob, door, C. O. Case. 528,147 Kraut cutter, W. A. Goforth 528,157	Trap. See Mole trap. Sink trap. Trimmer. See Rotary trimmer.
Lace clamp, shoe, L. D. Craig	Trolley catcher, W. D. Cobb
Lamp, electric arc, R. Segerdahl 528,184 Lamp shade, electric, E. Vedovelli 528,241 Lanton M. La	Tug, hame, J. C. Clausen 528,414 Turntable, C. L. Strobel 528,402
Huller. See Fruit buller. Hydraulic elevator, J. R. Wade	Top bank, con controlled musical, H. W. Porter. 528,277
Lock, C. Swanberg	F. Van Fleet. 528,215 Umbrella, folding, D. A. Smith, Jr. 528,212 Valve, check, A. J. Caldwell 528,302
Loom sbuttle guide, G. W. Farmer. 528,505 Lubricator, T. J. Hart 528,429 Margazine company G. P. C. Margazine 528,175 528,175	Valve for gas burners, air, H. Ruppel 528,344 Valve operating device, C. Otis 528,385 Valve lography 528,385 Valve device, C. Otis 528,385 Valve device, C. Otis 528,385
Manhole cover, C. Parkins. 528,387 Manicure instrument, C. J. Bailey. 528,317	Vise, S. Frisbie
Match Dox, M. Strakosch	Watchcase spring, C. Nobs
Mechanical movement, I. S. Bryant	grain, L. P. Summers
Sedgwick 528.211 Mill. See Coffee mill. Mixing machine, J. Markus 528,175	wheel: 528,411 Wheel rim for pneumatic tires, T. Birch. 528,451 Wheelbarrow, J. B. A Grenier. 528,251 Window, A. Massalski 528,333 Window appliance, E. Keuser 528,418 Wire stretcher, S. A lison 528,218 Wire stretcher, J. E. Crisp 528,151 Wire tightener, C. H. Van Wagoner 528,182 Wool washing machine, F. G. & A. C. S rgent 528,182 Wrench, J. L. Stambaugh 528,338
Mill. See Coffee mill. 528,175 Mixing machine, J. Markus. 528,175 Mould. E. L. Ransome. 528,295 Moulding machine, C. Herman. 528,295 Mole trap, A. Arnold. 528,136 Monuments, construction of memorial, W. B. 528,136 Van Amringe. 528,461 Motor, Browne v. Little 528,461 Moving machine, E. Pridmore. 528,304 Nail. See Spacing nail. 528,304 Nozzle, F. W. Herbkesmann. 528,431	Window, A. Massaiski
Monuments, construction of memorial, W. B. Van Amringe 528,193 Motor, Browne V Little 528,461	Wire stretcher, J. E. Crisp
Motors, cylinder and valve for steam, A. Holmgren 528,227 Mowing machine, E. Pridmore	Wrench, J. L. Stambaugh 528,398
Nozzle, F. W. Herbkesmann 528,431 Nut and bolt lock, T. Berridge 528,320	DESIGNS.
Nut, axie, k. Fawcett 528,361 Nut for spindle supports, spring, E. J. Carroll 528,361 Nut jock, F. S. Robbins 528,237	Brush handle, W. J. Lloyd 23,749 Dish, covered, C. W. Franzheim 23,748
Oar lock, H. Brinkmann 528,221 Ohmmeter, A. H. Armen 528,268 Oil burner 1 Dubolmen 59,208 59,208	Fish scaler, W. J. Ruedisale
Oil burner, C. G. Moore 528,336 Oil burner, C. Whittingham 528,314	Brush handle, W. J. Lloyd 23,749 Dish, covered, C. W. Franzheim 23,748 Fish scaler, W. J. Ruedisale 23,752 Headlight case, E. A. Edwards 23,754 Picture frame, C. F. Mosman 23,751 Spool holder box, F. A. Phelps 23,750 Spoon, etc., H. J. Robinson 23,747 Trimming, J. Muller 23,746 Vehicle step, H. C. Swan 23,753
Open near 10 101 nace, J. Purves. 528,510 Orange polishing machine, A. Warr. 528,195 Organ, M. Hetherington 528,478	Vehicle step, H. C. Swan 23.753
Oven, bakers', J. Adair 528,456 Package, airtight, A. Roder 528,260 Package carrier, E. C. Gine 509,200	TRADE MARKS.
Nail. See Spacing nail. 528,431 Nozzle, F. W. Herbkesmann 528,233 Nut and bolt lock, T. Berridge 528,233 Nut, axle, E. Faweett 528,233 Nut, or spindle supports, spring, E. J. Carroli 528,237 Nut lock, F. S. Robbins 528,237 Oar lock, H. Brinkmann 528,232 Ohmmeter, A. H. Armen 528,238 Oil burner, J. Dubelman 528,232 Oil burner, C. G. Moore 528,333 Oil burner, C. Whittingham 528,334 Open hearth furnace, J. Purves 528,510 Organ, M. Hetberington 528,436 Oven, bakers, J. Adair 528,436 Oven, bakers, J. Adair 528,436 Package, airtight, A. Roder 528,038 Package carrier, E. C. Gipe 528,038 Paper machine suction box, E. Sanderson 528,238 Piano tuning hammer, B. F. Fuchs 528,237 Pipe cleaning apparatus, A. C. Mueller 528,339 Pipe or rod coupling, S. M. Jones 528,339 Placer machine, R. L. Chatterson 528,339 Placer machine, R. L. Chatterson 528,638 Plait forming machine, C. C. Emmons	Absorbents for surgical and other purposes, Jaros Hygienic Uderwear Company
Piano tuning hammer, B. F. Fuchs	Hygienic Uderwear Company 25,419 Antiseptic powders, ointments, liniments, and lotions, E. Bland. 25,418 Beer, lager, Grand Rapids Brewing Company. 25,423 Beverage, effervescing powder for a summer, H.
Pipe hanger, A. J. Beaton 528,319 Pipe or rod coupling, S. M. Jones 528,168 Placer machine, R. L. Chatterson 528,563	Beverage, effervescing powder for a summer, H. Meakin 25,422 Binding and paper box machines, Gebruder Breb-
Plait forming machine, C. C. Emmons	Boots and shoes, J. B. Lewis Company 25,409
Compton 528,364 Plow attachment, Culbertson & Burke 528,324	Brooms, Merkle-Wiley Broom Company
Plow attachment, Culbertson & Burke 228,324 Plow, rotary, L. D. Railsback 28,521 Power wheel, A. J. B. Berger 282,521 Power wheel for endless conveyers or elevators, A. J. B. Berger 528,357	& Sons. 25,431 Collars, men's, Miller, Hall & Hartwell 25,437 Cords, sash and curtain, Ossawan Mills Company 25,411 Corests and waists, G. D. Nich ols. 25,406 Gloves and mittens Saranac Glove Company 25,408
Printed matter, producing copied effects on, C. E.	Corsets and waists, G. D. Nichols. 25,496 Gloves and mittens, Saranac Glove Company. 25,408 Iron, steel, and lead manufactures, certain named,
Printing machine, rotary, J. Michaud 528,233 Propeller, screw, W. H. Jay 528,353	Rylands Brothers
Propelling apparatus, B. Bernstein. 528,138 Pump, M. W. Hall 528,161	Rylands Brothers. 25,486 Lard, Joseph R. Peebles' Sons Company. 25,427 Lard, F. W. Wagener & Company. 25,426 Lead, white, H. A. Carroll. 25,432 Licorice roots, sticks, paste, and pellets, Careno. 26,432
Pump, H. Jones 528,436 Pump, E. M. McGee 528,378 Pump, C. C. Worthington 589,882	& Tur 25,421 Meats, cured, Joseph R. Peebles' Sons Company 25,425
Adamson 582,132 Printing machine, rotary, J. Michaud 582,233 Propeller, screw, W. H. Jay 583,233 Propeller, vessel, S. S. Whipps 582,353 Propelling apparatus, B. Bernstein 528,138 Pump, M. W. Hall 528,161 Pump, H. Jones 528,438 Pump, E. M. McGee 528,438 Pump, E. M. McGee 528,337 Pump, C. C. Worthington 528,232 Pump governor, steam, J. R. Nixon 528,232 Pump governor, steam, J. R. Nixon 528,337 Punch, check, J. C. Robinson 528,347 Punch, check, J. C. Robinson 528,230 Punching machine, W. E. Bennett 528,502	Licorice roots, sticks, paste, and pellets, Carenou & Tur.
Punching machine, W. E. Bennett. 528,502 Puzzle, M. W. Brooks. 528,141 Rack. See Clothes rack. Scythe rack.	articles, W. S. Thomson
Kailway, closed conduit electric, J. F. McLaugh-	Pomodice cortain internal and oxtornal W Dit-
In	meier 25,420 Sheetings, J. A. Robinson
Railway gripper, cable, B. Brownstein. 528,359 Railway sanding device, C. B. Andrews. 528,500	Silk, embroidery, sewing, and floss, New London Wash Silk Company. 25,410 Soap, toilet, Graham Brothers & Company. 25,429 Whisky, Carstairs, McCall & Company 25,424
Wood 528 454	Wool piece goods, including serges, estamens, and suitings, Hamlyn Brothers
Railway supply system, electric, C. H. Harkins 528,477 Railway switch, Santee & Ryan	A printed copy of the specification and drawing of
railway systems, electric machine for, E. Deining	any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number
Ratchet mechanism W H. Voung Jr 528 353	of the patent desired, and remit to Munn & Co., 361 Broadway, New York.
Recorder. See Time recorder. Reel. See Bolting reel.	Canadian patents may now be obtained by the inventors for ny of the inventions named in the foregoing list, provided they are simple, at a cost of \$40 each.
Register, C. C. Fields 528,509 Revolver, O. E. Smith 528,233 Rheostar, M. Waddell 528,243 Roaster. See Meat roaster.	going list, provided they are simple, at a cost of \$40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 351 Broadway, New York. Other foreign patents may also be obtained.

Mdvertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line Back Page, each insertion - - - \$1.00 a line **For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

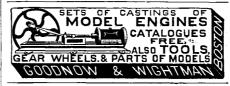


Foot Lathe Swings 9x25 in.

Screw Cutting Automatic Cross Feed, etc. LATHE Scroll Saws, Circular Free Saws, Lathes Mortisers.

Seneca Falls Mfg. Co. 695 Water St., Seneca Falls, N.Y.

LATHES, Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO., 120 CULVERT ST., CINCINNATI, O.



Pumping Water by Compressed Air. We take pleasure in announcing that by arrangements made with J. G. Pohle, we are enabled to furnish our customers with the

POHLE AIR LIFT PUMP,

protected by numerous American and Foreign patents.
This department of our business will be under the personal supervision of Dr. Pohle, the inventor and pat'ee.
THE INGERSOLL-SERGEANT DRILL CO.,
Havemeyer Building, 26 Cortlandt St., New York.



VELOCITY OF ICE BOATS. A COL-lection of interesting letters to the editor of the SCIEN-TIFIC AMERICAN on the question of the speed of ice boats, demorstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 214. Price 10 cents. To be had at this office and from all newsdealers.



ARTESIAN WELLS -BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 943. Price 10 cents. To be had at this office and from all newsdealers.

OIL WELL SUPPLY GO.

Manufacturers of everything needed for ARTESIAN WELLS for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illus'd catalogue, price lists, and discount sheets on request. for either Gas, Oil, Water, or Mineral Tests,
Boilers, Engines, Pipe, Cordage, Drilling
Tools, etc. Illus'a catalogue, price lists,
and discount sheets on request.

Pittsburg, Oil City and Bradford, Pa.
Also, 32 Cortlandt St., New York.

23,746
23,753
23,754
TO INVENTORS. E. Konigslow. Manufacturer of Fine Machinery and Models, offers Special Facilities to Inventors. Guarantees to work out ideas in strictest secrecy, and any improvement that he can suggest goes with the work. Thousands of men have cruce though really valuable ideas, which they lack mechanical training to develop. Novelties and patented articles manufactured is, and 25,418

GATES ROCK & ORE BREAKER Capacity up to 200 tons per hour.



Has produced more ballast, road metal, and broken more ore than all other Breakers combined.
Builders of high grade Mining Machinery, King-Darragh Concentrator, Connersylle Blowers. GATES IRON WORKS,

The Scientific PUBLICATIONS FOR 1894.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL. The Scientific American (weekly), one year - \$3.00
The Scientific American Supplement (weekly), one year, 5.00 The Scientific American, Spanish Edition (monthly), one year, 3.00 The Scientific American Architects and Builders Edition (monthly), one year. COMBINED RATES

The Scientific American and Supplement

The Scientific American and Architects and Builders Edition, - 5.00 The Scientific American, Supplement, and Architects and Builders Edition, - - -Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal rexpress money order, or draft to order of MUNN & CO., 361 Broadway, New York

HARDEST ABRASIVE KNOWN. EMERY AND BIAMOND POWDER SUBSTITUTE. IN F. GURT-POWDER CRYSTAL-WHEELTSLAB & HONE FORM. CAMBURUNDUM CO. MONDOGAMELA GIT. PA. U.S.A.

Parson's Horological Institute. School for Watchmakers

ENGRAVERS AND JEWELERS.



TYPEWRITERS.

makes half-price. Rebuilt to equal new. Shipped ut deposit to responsible parties in all parts of the Unprejudiced advice given. Illust'd cata. free TYPEWRITER HEADQUARTERS, 3 45 Liberty Street, New York, U. S. A.



The Typewriter EXCHANGE,

8 Barclay St., New York. We will save you from 10 to 50 per cent. on Typewriters of all makes. Send for catalogue.

HYPNOTISM: its Uses and Abuses. The science book, \$1. Dr. Anderson, S.A.11, Masonic Tem., Chicago

THE MODERN ICE YACHT. - BY THE MUDERN IUE LAUTIL — DI
Geo. W. Polk. A new and valuable paper, containing
full, practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of
the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position,
and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 624. Price 10
cents. To be had at this office and of all newsdealers.

New Full Mounted Lightning Screw Plate, Send for Catalogue

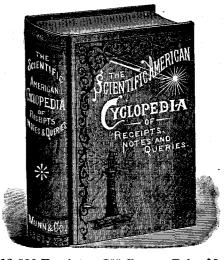


Wiley & Russell Mig. Co., Greenfield, Mass., U.S.A

CONSULTATION INVENTORS.
AND ADVICE TO
Experimental work of every description. Automatic
machinery designed and built. For Send for circular.
MALTBY MFG. CO., Brooklyn, N. Y.



Valuable Book



12,500 Receipts. 708 Pages. Price \$5. Bound in Sheep, \$6. Half-Morocco, \$6.50.

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arus being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the stud-ies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

Send for Descriptive Circular MUNN & CO., Publishers,

SCIENTIFIC AMERICAN OFFICE, 361 Broadway, New York, Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.

INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS S10 Walnut St., Philadelphia, Pa., U.S. A. 210 WHIDH SL, FHHAGEIPHIR, FA., U.S.A.

EF Our New and Revised Catalogue of Practical and
Scientific Books, 90 pages, 8vo, and our other Catalogues
and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage
to any one in any part of the world who will furnish his
address.

For the Pictorial and Literary Presentation of the Events of the Day

TAKES THE LEAD.

In addition to its many other attractions, illustrated records of the achievements in .

◆• SCIENCE AND ART •◆

form a notable feature. During 1894 there have been capital articles on such topics as: . .

Chicago Drainage Canal. Recent Excavations at Dashur, Egypt. Gold Mines of Colorado.

Need of a National Health Board. Electrical Industries.

Cleansing the Streets of Paris.

Constant advancement in excellence is the chief guide in the direction of HARPER'S WEEKLY, and, with almost boundless resources, it will continue to treat every scientific event of public interest comprehensively and at the shortest notice.

Ginn & Company **PUBLISH**

SCHEINER'S ASTRONOMICAL SPECTRO-SCOPY.

Descriptive Circulars sent free to any address. GINN & COMPANY, Publishers,

NEW YORK. CHICAGO.

Map of the United States

A large, handsome Map of the United States, mounted and suitable for office or home use, is issued by the Burlington Route. Copies will be mailed to any address, on receipt of fifteen cents in postage, by P. S. EUSTIS, General Passenger Agent, C., B. and Q. R. R.,

Experimental & Model Work

Electrical Instruments, Fine Machinery, Special Apparatus, Telephones, Photograph Machines, Repairs, etc. E. V. BAILLARD, 106 Liberty Street, N. Y.



Register. It gives you a record of the days' sales that can be sworn by. Enforces accuracy and honesty. Three duplicate tickets, one for customer, one for cashier and one for you. It makes no mistakes and will save you many times its cost. Best "Day Book" on earth. Send for an illustrated catalogue which tells you all about it.

CHICAGO AUT. REGISTER CO.

PHOTOGRAPHY AS APPLIED TO Process Work.—By Leslie E. Clift. An interesting review of the various photo processes that a block must go through before it is ready for the hands of the printer. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 976. Price 10 cents. To be had at this office and from all newsdealers.



WOODEN TANKS.

For Railroads, Mills and Manufactories,
Builders of Steel Towers and Tanks.
La. Red Cypress Wood Tanks a specialty.
W. E. CALDWELL, CO.,
217 E. Main Street, Louisville, Ky.

Architectural Books

Useful, Beautiful and Cheap.

Any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the Architects' And Builders' Edition of the Sci-ENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder. and persons about to build for themselves will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Seventeen bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address and remit to

MUNN & CO., Publishers, 361 Broadway, New York.

THE "MUNSON" TYPEWRITER. *

This machine is an "evolution," the outgrowth of years of experience and the best results of scientific work. Its principles appeal at once to the educated mechanic. It is Light, Small, Compact, Easily operated, with Universal Key Board.

INTERCHANGEABLE STEEL TYPE WHEEL, durable and easily kept in order. 30 keys, 90 characters. Weight, with carry-case, 16 pounds. Special wheels for different languages. Highest Medal Awarded, World's Fair, Chicago, 1893. Send for circular to

The Munson Typewriter Co., 171 E. Division Street, Chicago, III., U. S. A.

SCIENTIFIC AMERICAN DYNAMO. Harper's

SULENTIFIC AMERICAN DYNAMO.
Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 lile-volk incandescent lamps, or of being used as a 5 h. p. motor. This machine was constructed especially for the benefit of the readers of the Scientific American, by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. S65. Price 10 cents. To be had at this office and from all newsdealers.



MATCH * MACHINERY

Latest improved. Complete plants furnished. JOS. C DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa

RECEIVER'S SALE. The entire plant and good and Tool Co., including real estate, tools, machine ery, patterns, etc. also thousands of dollars of orders on hand. This plant is located at the corner of Hudson and Seventh Sts. Buffalo, N. V., and consists of a four story brick building fully equipped for the manufacture of timer's machines and tools, machinery for working sheet metal, presses, dies, etc. The factory is now in operation, and all information in reference to same cheerfully given. Address MICHAEL NEWELL, Receiver, cor. Hudson and Seventh Sts., Buffalo, N. Y.



GAS - GASOLINE ENGINES FOR ELECTRIC LIGHTING. PUMPING. AND ALL SMALL POWER PURPOSES

LAUNCH ENGINES AND LAUNCHES.

MONITOR VAPOR ENGINE
POWER COMPANY,
ERIE ST., GRAND RAPIDS, MICHIGAN.
SEND FOR CIRCULAR.



STATES AND ESTATISHED TANKS OF THE WHEELS MODELS AND STREET THE WHEELS MODELS AND STREET WHICH WORK STREET WAS STREET.

MAXIM'S FLYING MACHINE.—FULL description of the remarkable apparatus which Mr. Maxim recently propelled through the air with marked success. With 12 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 976. Price 10 cents. To be had at this office and from all newsdealers.

HIGH GRADE ONLY. Warranted. Contractors desiring a trustworthy Jack Screw, address Rumsey & Co., Ltd., Seneca Falls, N.Y.

KEEP THE HEAD COOL.





ICE-BOATS-THEIR CONSTRUCTION and Management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sauling boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

The Bailey Automatic Bicycle Brake



is as quick in action as thought it-self. So unobtrusive, the rider would never know he had it were it not for the instant and effective aid it gives him when wanted. BAILEY MFG. CO., 207 S. Canal St., CHICAGO.



SCIENTIFIC ENIGMAS.—BY LORD Salisbury. Inaugural address before the British Association, Oxford, August, 1894, on the subject of the condition in which we stand toward three or four of the most important physical questions which it has been the effort of the last century to solve: the enigmas of the elements, the enigma of the ether, the enigmas of life, the Darwin theory. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 975. Price 10 cents. To be had at this office and from all newsdealers.



SINTZ GAS ENGINE CO.

GRAND RAPIDS, MIOH,
U. S. A.

Manufacturers of the Sintz Stationary and Marine Gas and
Gasoline Engines. Especially
adapted for Boats and Electric
Lighting. Runs with manufactured or natural gas—Boats and
launches. Prices within the reach
of all. EF Send for Catalogue.

Mention this paper.

ELECTRICAL APPARATUS DESIGNED.
Inventions Developed. 15 Correspondence Solicited.
F B. COREY, M.E., 73 Hathaway Building, Boston.



NEW CELLULOSE DERIVATIVES. BY CAPTON Beadle. A paper on a new class soluble cellulose derivatives and a description of a large number of products derived from them that promise to prove of great value in the industries, as a substitute for glue, for cloth sizing, as a vehicle for pigment printing, for paper sizing, etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 974. Price 10 cents. To be had at this office and from all newsdealers.

STEREOPTICONS. MAGIC LANTERNS AND ACCESSORIES, SEND FOR CATALOGUE TO CHAS BESELERMAKER 218 CENTRE ST.

How To Make a Dynamo OR MOTOR. 4 horse power size, illustrated with full working drawings. By Edw. Trevert. Price 10c. Bubier Publishing Co., Lynn, Mass.

SUPERINTENDENT WANTED in N. Y. City. A bright, energetic, all-around man, must be familiar with piping buildings for gas, water, etc., capable of bandling men, pay roll, etc. A permanent position to the right sort of man. Address C. J. W., Box 773, N. Y.



YOU CAN BECOME A WATCHMAKER

And establish yourself in a paying business, by securing our set of tools and instruction Book. All first-class jeweler's tools, which cost at wholesale 36,60. Book tells you how touse them-makes success easy.

Book and Tools \$4.75. (see picture). Sent by express on receipt of price; \$4.75 or C. O. D. where \$1.00 accompanies the order. Send for our price the price; \$4.75 or C. O. D. where \$1.00 accompanies the order. Send for our price ilists. HOFMAN SUPPLY CO.;

Wholesale Bealers in WATCHMARERS TOOLS AND SUPPLIES, 155.Eay \$t., Columbus, Ohio.

BUY TELEPHONES

That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are BOTH GOOD. WESTERN TELEPHONE CONSTRUCTION CO.,

Largest Manufacturers of Telephones in the United States.



THE NANDU; AN ORNITHOLOGI-cal Sketch.—By Dr. Adolph Erich Boecking. A very in-teresting paper on the ostriches of the Western Hemi-sphere. from a study of the subject made in the field. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 974. Price 10 cents. To be had at this office and from



Sole Agency for the United States

Experienced and active Agent wanted by a large European firm for the sale of Magnesite Bricks already well introduced in this country. Must be a competent civil engineer, thoroughly familiar with the Siemens-Martin system of manufacturing. References as to integrity and competency required. Address "MAGNESIA," Box 773, New York.

MALLEABLE CASTINGS FROM SPECIAL THOMAS DEVLIN & CO. FINE TINNING JAPANNING AND THE THOMAS DEVLIN & CO. FINE TINNING JAPANNING AND THE CO. THOMAS DEVLING AND THE CO. T



CRITERION MAGIC LANTERNS Stereopticons.

If you want the best_CHUCKS, buy Westcott's



Chucks, Cutting - 0 fl
Chucks, Scroll
Combination Lathe Chucks, Geared
Combination Lathe Chucks, Independent Lathe Chucks, Made by
Westcott Chuck Co., Oneidan, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1838.

HAVE HAD 13 YEARS' EXPERIENCE INTROducing Mining and Concentrating Machinery in California and the Pacific Coast, and know the trade thoroughly. Have large office in San Francisco, and wish to handle something of merit on commission or otherwise. Correspondence solicited. Address VANNER, Room 15, 132 Market St., San Francisco, Cal.

If You Want the Best, Send Stamp for Our New Catalogue.

Magneto Bells, Switchboards and

Parts of Telephones. MIANUS ELECTRIC CO., Mianus, Ct.

WITH WORKSHOP EQUIP-YOUR PED With outfits of Barnes Wood and Metal Working
FOOT POWER
Machinery you can successfully compete with Factories that use steam
power, both in quality and profit on product.
The only complete line of such machines
made. Have stood the test twenty years.
Send for catalogue. Address:
W. F. & JOHN BARNES CO.,
1999 Ruby St., Rockford, Ills.

Wanted. One young man with general knowledge of electricity in every town to do electrical work. Enclose name of responsible party for reference. A. E. CANEDY, 3114 Wabash Ave., Chicago



You Cannot Cut Yourself.
A Delicious Shave.

Machine and Strop, \$1.75. Both in one box, \$3.75. E. LOTHAR SCHMITZ, 92 Reade St., New York.

HOW SHALL YOUNG MEN BE EDU-

cated in Applied Chemistry?—By Peter T. Austen, Ph. D., F.C.S. A valuable raper in which is pointed out that kind and nature of a course in chemistry which will best educate men and enable them to fill the demands made by this country. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 978. Price 10 cents. To be had at this office and from all newsdealers.



UP-TO-DATE CLOTHING

Sold direct to consumers AT LOWEST PHICES ever before offered. Buy direct from importers and manufacturers. We ship wITH PRIVILEGE OF EXAMINATION. We save you from 30 to 50 per cent. A tailor fit suit, \$8.50. Fall or winter overcoats, \$5.50. Boys' combination Suits \$2.18. FUR OVERCOATS A SPECIALTY. Send to-day for FREE mammoth catalog. Address OXFORD MFC.CO., Clothing Dept. 344 Wabash Ave., Chicago, III.

NOW READY!

Fourteenth Edition of

Experimental Science



120 Pages and 110 Superb Cuts added.

Just the thing for a present for any man, woman, student, teacher, or any one interested in science. In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects. new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc. Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.

840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail. \$4. Half morocco, \$5.

Send for illustrated circular.

MUNN & CO., Publishers, Office of the SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK.

Mdvertisements.

ORDINARY RATES.

Inside Page, each insertion. - 75 cents a line Back Page, each insertion. - \$1.00 a line For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

COLD FORGED PRODUCT.

Forged Wood Screw Patented May 10, July 19, 1887; Oct. 29, 1889;

Aug. 19, Oct. 21, 1890; April 7 May 12, 1891 July 19, 1892.

Its Advantages are:

- Stronger than a common screw.
- 2. Uniform and wide slot.
- 3. Requires the use of but one bit in hard wood.
- 4. Inserted easier.
 5. Centralized point.
- 6. Superior holding power.
- 7. The screw being ('old Forged. instead of Cut. leaves on its entire surface a metallic skin.

Send for samples to

AMERICAN SCREW CO. PROVIDENCE, R. I.

ELECTRO MOTOR. SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures—Contained in SCIENTIFIC AMERICAN SUPPLEWINT. NO. 641. Price 10 cents. To be had at this office and from all newsdealers.

W. L. Douclas \$3 SHOE IS THE BEST.



\$5. CORDOYAN, *4.*3.5.º FINE CALF&KANGAROD \$ 3.50 POLICE, 3 Soles. \$250 \$2. WORKINGMENS \$2.\$1.75 BOYSSCHOOLSHOES. *LADIES • \$3.\$2.59.\$2.\$1.75 BEST DONGOLA

BROCKTON, MASS.

You can save money by wearing the W. L. Douglas \$3.00 Shoe.

Because, we are the largest manufacturers of this grade of shoes in the world, and guarantee their value by stamping the name and price on the bottom, which protect you against high prices and the middleman's profits. Our shoes equal custom work in style, easy fitting and wearing qualities. We have them sold everywhere at lower prices for the value given than any other make. Take no substitute. If your dealer cannot supplyyou, we can.



Can be used any blace, to do any work, and by any one. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost of operation about one cent an hour to each indicated horse power. For circulars, etc., address Charter Gas Engine Co. P. O. Box 148. Sterling, Ill.

AGENTS WANTED FOR FINE TOOLS IN EVERYSHOP. WRITE FOR CATALOGUE AND AGENCY.

CHICAGO, ILL.U.S.A.

The American Bell Telephone Company,

125 Milk Street, Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, and controls Letters-Patent No. 474,231, granted to Thomas A. Edison May 3, 1892, for a Speaking Telegraph, which Patents cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

Assignee's "Forced" Sale



Owing to the necessity for an immediate Reorganization of our business, we must sell a lot of new MEDICAL BATTERIES at practically the cost of production

They are of the "Dry Cell" type, now so popular, and received the Highest World's Fair Award for "Compactness, Range of Action, Efficiency and Beauty of Workmanship." Each one bears the stamp "Queen & Co." and is guaranteed.

Should be "Forced Price." \$7.50 12.00

No. 2. FOUR CELLS, "No. 3. SIX CELLS, " Not more than three Batteries will be sold to one party (except the trade) at these prices. Remit cash with order and save boxing charges.

Almost our entire stock of Scientific Apparatus, valued at hundreds of thousands of dollars, is temporarily offered at far less than regular prices. Ask for circular No. 620, specify what is wanted, and receive our "Reorganization" figures by return mail. QUEEN & CO., Incorporated (J. G. Gray, Assignee), 1015 Chestnut St., Philadelphia, Pa.



Mistakes in Addition,

Office Headache, and mistakes in carrying forward don't occur where the Comptoand missascome of the Compto-meter is used. It saves half the time in doing the work and all time looking for errors. Solves with great rapidity and absolute accuracy all arithmetical prob-lems. Why don't you get one! Write for Pamphlet.

FELT & TARRANT MFG CO. 52-56 ILLINOIS ST., CHICAGO.

Scientific Book Catalogue

Our New Catalogue containing over 100 pages, includ-ng works on more than fifty different subjects. Wil-ne mailed free to any address on application. MUNN & CO., Publishers SCIENTIFIC AMERICAN,

361 Broadway, New York





New Steam Washing Machine Fits any boiler. Cleans in 15 minutes. Agents wanted in every City and Town.

Bolgiano Manufact'g Co. BALTIMORE, MD. 414 Water Street.

Ricycles, Watches, Guns, Buggies, Harness, Sewing Machines, Organs, Pianos, Safer, Tools Scales of all varieties and 1000 other articles. Lists free. Chicago Scales Co., Chicago, Ill.



to \$100.00. The lightest and most practical cameras for hand or tripod use. An illustrated manual, free with every Kodak, tells how to develop and print the

Eastman Kodak Company,

Rochester, N. Y.

ADJUSTABLE HOLDERS
INCANDESCENT LAMPS.

O.C. WHITE CO. WORCESTER.
SEND FOR CIRCULARS.

MASS.

ASBESTOS

H. W. JOHNS MFG. CO., 87 Maiden Lane, N.Y.

LICHT PROOF FILM CARTRIDGES

Best and Most Practical Camera in the World regard-less of price. Prices, \$8 to \$15.

Boston Camera Mfo. Co., 382 Tremont St., Boston, Mass.

JESSOP'S STEELTHE VERY
FOR TOOLS, SAWS ETC.
WM JESSOP & SONS LE 91 JOHN ST. NEW YORK

LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.

78 Reade Street. - - New York, N. Y.

Manufactory Established 1761.

STARRETT'S Adiustable Jaw Cut-Nipper.

Jaws are detachable, so they can be removed, ground, and adjusted when worn, all parts case-hardened except jaws. Flat spring below cutting edges obviates danger of breaking jaws.

Price, 6 inch M (for music wire) ... \$2.00

To like the datalogue Free.

L. S. Starrett, Manufact'r of Fine Tools, P.O. Box 13, ATHOL, MASS.

BULL'S-EYE
THE NEW KIND OF CAMERA.
ated in SCIENTIFIC AMERICAN, March 31st, p. 197



STEEL, IRON, COPPER, ZINC, BRASS, TIN,

all other Metals Perforated as Required for Grain Cleaning and Min-Machinery, Woolen, Cotton, Paper and Pulp Mills, Rice, Flour and Oil Mills, Sugar I Mait Houses, Distilleries, Filter Presses, Stone, Coal and Ore Screens, Brick and e Works, Filters, Spark Arresters, Gas and Water Works, Oil, Gas, and Vapor Stoves office Machinery, etc., etc. Standard Sizes Perforated Tin and Brass always in Stock THE HARRINGTON & KING PERFORATING CO., Chicago.

BOOKS ON PHOTOGRAPHY

Cyclopædic Photograph 500 pages, \$4.00 Quarter Century in Photography..... 4.00 Wilson's Photographics...... 4.00 Photo Engraving. Photo Etching, etc. 3.00 WILSON'S PHOTOGRAPHIC MAG-

AZINE. Monthly, illustrated, bright, practical......\$3.00 per year. Sample copy, 10c.

EDWARD L. WILSON, NEW PROPERTY AY GAS ENGINE CASTINGS



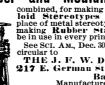
A.F.WEED&CO. 106 & 108 Liberty St. New York.

Castings and Parts for Small Engines **Send stamp for Illustrated Booklet.

SCIENTIFIC AMERICAN SUPPLE-MENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.



THE "CLIMAX" Stereotyper and Moulding Press



combined, for making perfect Celluloid Stereotypes to be used in place of metal stereotypes. Also for making Rubber Stamps, Should be in use in every printing office.

See SCI. AM., Dec. 30, 1893. Send for circular to

THE J. F. W. DORMAN CO.
217 F. German St...

217 E. German St.,
Baltimore, Md.
Manufacturers of
Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

THE ONLY STORAGE BATTERY IN USE IN CENTRAL STATIONS OF AMERICAN MANUFACTURE. THE ELECTRIC STORAGE BATTERY CO.,



Electrical Storage Cells of any Desired Capacity. Catalogues giving Capacities, Dimensions, Weights, Prices, etc., on application.



CASH PAID for all kinds of good Second-hand Wood-Working Machinery. Address W. P. DAVIS. ROCHESTER, N. Y.

EMERY, Emery Wheels, Grinding Machines and Grinders' Supplies, Quick process and large stock, When in a hurry, buy of THE TANITE CO., NEW YORK CITY, CINCINNATI, and STROUDSBURG, PA.

The Kombi 📭 lamera

Makes a picture the size of this and in any shape you please. It is a combined camera and graphoscope. 154 by 2 in.—weighs 4 oz. Goes in any pocket, no tri-pod to carry. Ef Any Boy or Girl can use it.



Will photograph anything or anybody. Can be made very profitable.

The Kombi, complete, \$8.50.

Strip of Film (25 exposures) 20 cents additional.
If not for sale by your photo dealer, the Kombi will be sent to any address, postage paid, on receipt of price. ALFRED C. KEMPER, 208 Lake St., Chicago

UNIVERSAL LAMP MOLDER.



Trade Supplied. Salesmen Wanted,

FARIES MANUF'G CO., DECATUR, ILL.

ICE-HOUSE AND COLD ROOM.—BY R G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 59. Price 10 cents. To be had at this office and from all newsdealers.

- - THE --



ET ESTABLISHED 1845.

The Most Popular Scientific Paper in the World Only \$3.00 a Year, Including Postage.

Weekly--52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains six-eenpages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription. - One copy of the Scien-TIFIC AMERICAN will be sent for one year -52 numbers— postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of Three Dollars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Post-masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address

all letters and make all orders, drafts, etc., payable to MUNN & CO., 361 Broadway, New York.

-- THE --

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography. Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication,

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, anada, and Mexico, \$5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLE-MENT, both mailed for one year to one address for \$7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check.

MUNN & CO., 361 Broadway, New York.

Building Edition.

BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residenees, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work

have won for it the Largest Circulation of any newsdealers. \$2.50 a year. Remit to

MUNN & CO., Publishers, 361 Broadway, New York.

PRINTING INKS. The SCIENTIFIC AMERICAN is printed with CHAS, ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York